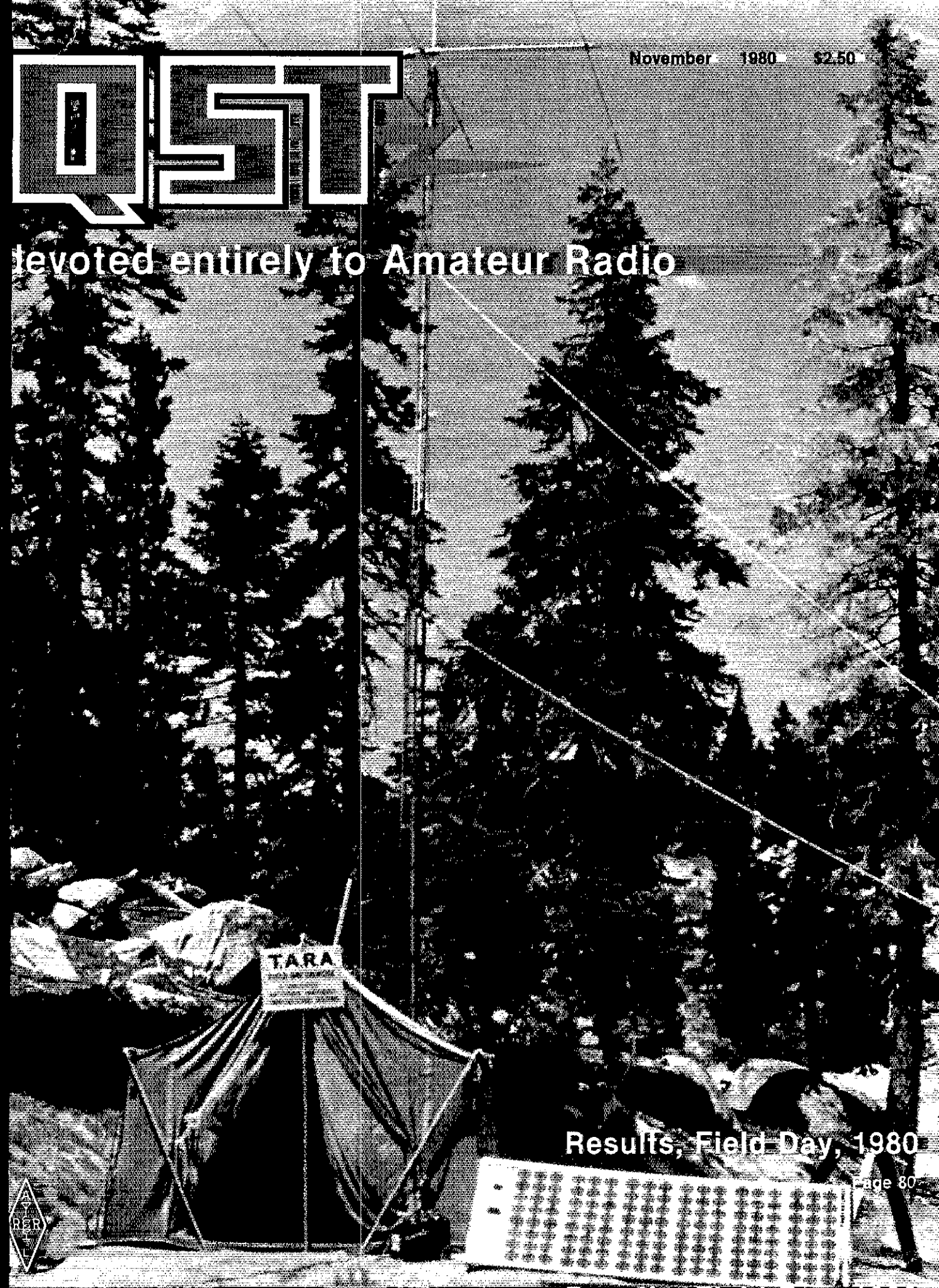
QST

November 1980 $2.50

devoted entirely to Amateur Radio



Results, Field Day, 1980

Page 80

tempo...

the first in synthesized portables gives you the broadest choice at the lowest price

Shown with optional touch tone pad

...the new S-5

* The only synthesized hand-held offering 5 watts output. (Switchable for 1 or 5 watt operation)
* The same dependability as the time proven S-1. Circuitry that has been proven in more than a million hours of operation.
* Heavy duty battery pack.
* External microphone capability.
* The S-5's exciting low price...only $299.00
* With touch tone pad $339.00

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 900 ma-transmit
Antenna Impedance:	50 ohms
Dimensions:	40 mm x 62 mmx 170 mm (1.6" x 2.5" x 6.7")
Weight:	17 oz.
Sensitivity:	Better than.5 microvolts nominal for 20 db

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

OPTIONAL ACCESSORIES
12 Button touch tone pad (not installed): $39 • 16 Button touch tone pad (not installed): $48 • 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 VCD power amplifier (S30): $89 • Matching 80 watt output power amplifier (S80): $149

The new improved Tempo S-1

- The first and most thoroughly field tested hand-held synthesized radio available. 800 channels in the palm of your hand.
- Simple to operate. (You don't need a degree in computer programming)
- Heavy duty battery pack allows more operating time between charges.
- External microphone capability
- The lowest price ever...$259.00
- *The S-1T (With touch tone pad installed)...$289.00*

Now available is the expanded line of Tempo commercial hand helds..."big name" quality at affordable prices. The FMH-12 & FMH-15 operate in the 135 to 174 MHz range and the FMH-40 & FMH-44 in the 440 to 480 MHz range. Tempo also offers the FMT-2 & FMT-42. They provide excellent VHF or UHF mobile communications and feature a remote control head for hide-away mounting.
Also available is the superb MR-3 pocket receiver...a miniature, 2 channel VHF high band monitor or paging receiver.
Please call or write for complete information. Also available from Tempo dealers throughout the U.S. and abroad.

The Tempo S-2

Tempo is first again. This time with a superior quality synthesized 220 MHz hand held transceiver. With an S-2 in your car or pocket you can use 220 MHz repeaters throughout the U.S. It offers all the advanced engineering, premium quality components and exciting features of the S-1. The S-2 offers 1000 channels in an extremely lightweight but rugged case.
If you're not on 220 this is the perfect way to get started. With the addition of the S-25 (25W output) or S-75 (75W output) Tempo solid state amplifier it becomes a powerful mobile or base station. If you have a 220 MHz rig, the S-2 will add tremendous versatility. Its low price includes an external microphone capability, heavy duty ni-cad battery pack, charger, and telescoping whip antenna.
Price...$349.00 With touch tone pad...$399.00

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.

TOLL FREE ORDER NUMBER: (800) 421-6631
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Henry Radio

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DS3100 ASR

We've Been Taking Notes.

Combining your ideas with some of our own, we've come up with what has to be the most advanced and convenient terminal available. These are some of the conveniences you can now enjoy by putting the DS3100 ASR in your RTTY and CW station:

ASR Operation (Compose your transmission *WHILE* receiving)

- 150-line Receiver Buffer
- 50-line Transmit Buffer
- Split Screen to Show Buffers
- Internal Real-Time Clock
- 10 Programmable Messages
- Automatic Answer-Back (WRU)
- Morse, Baudot, or ASCII Operation
- RTTY and CW Identification
- Full 128-Character ASCII
- 110-9600 baud ASCII
- 60-130 WPM Baudot
- 1-175 WPM Morse

Write or call for the DS3100 ASR specifications and see how *YOU* have helped design the new standard in amateur radio terminals.

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2A & 2AT

10 Options Guaranteed to Make the Extremely Popular 2A and 2AT Even More Popular!

ICOM

November 1980 *Volume LXIV Number 11*

QST (ISSN: 0033-4812) is published monthly as its official journal by the American Radio Relay League, Newington, CT USA. Official organ of the International Amateur Radio Union and the Canadian Radio Relay League.

Offices

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

Member of the Audit Bureau of Circulations

Subscription rate $18.00 per year postpaid, U.S. funds, U.S. & Possessions; $20.00 in Canada; $21.00 elsewhere. Individuals may apply for membership at the rates shown. Membership and *QST* cannot be separated. Fifty per cent of dues is allocated to *QST*, the balance for membership. Single copies $2.50. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds.

Second-class postage paid at Hartford, CT and at additional mailing offices. Postmaster: Form 3579 requested.

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

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No.: 21-9421. Microform editions available from Xerox University Microfilms, Ann Arbor, MI 48106.

THE COVER

Old Sol donated his energy to the WB6NQJ/7 Field Day effort. The Tahoe ARA was one of the scores of groups using natural power during Field Day 1980.

Contents

Rack Attack from DenTron

Components are the latest in communication systems adapting to your stations' needs. The DTR-3KA and DTR-1200L are equipped with heavy-duty handles for easy rack mounting and rack brackets that can be easily removed. The DTR-1200L linear amplifier provides 1200 watts SSB and 1000 watts CW input continuous duty. It features large 3½" shadow box, back lit meters for easy reading, and tuned input for compatibility with solid state or tube transceivers. The DTR-3KA antenna tuner handles a full 3KW PEP. It features a built in 2KW dry dummy load with thermostatically controlled forced air cooling, a remote sensor box to insure meter accuracy and 50 OHM impedance. Component racks available at your DenTron Dealer.

DTR-1200L Linear Amplifier

Frequency Ranges:

80 Meter Band	3.45 - 4.6 MHz
40 Meter Band	6.00 - 9.0 MHz
20 Meter Band	10.00 - 16.00 MHz
15 Meter Band	20.95 - 23.50 MHz
10 Meter Band	Export Model
Modes:	USB, LSB, CW, RTTY, SSTV
Power Input:	1200W - SSB, 1000W - CW
Power Requirements:	234/117 VAC 50/60 Hz
RF Drive Power:	150 Watts maximum and 65 watts minimum for 1 KW DC input.
DC Plate voltage:	Idle + 2300V approximate
Duty Cycle:	100% SSB, CW, RTTY, SSTV
Input Impedance:	50 Ohms nominal
Input VSWR:	1.5 to 1 average
Output Impedance:	50 Ohms nominal
Antenna load VSWR:	2 to 1 maximum
ALC:	negative going, adjustable from front panel
Spurious Emissions:	IMD - greater than 30 db down Harmonics - greater than 40 db down
FCC Type Accepted	
Size:	5¼" H x 17" W x 13" D (19" W with rack brackets)
Weight:	46 pounds

Switchable 12VDC accessory output voltage

Multimeter:

Plate Voltage	0 - 3000VDC
Plate Current	0 - 500ma
Relative Output	Adjustable

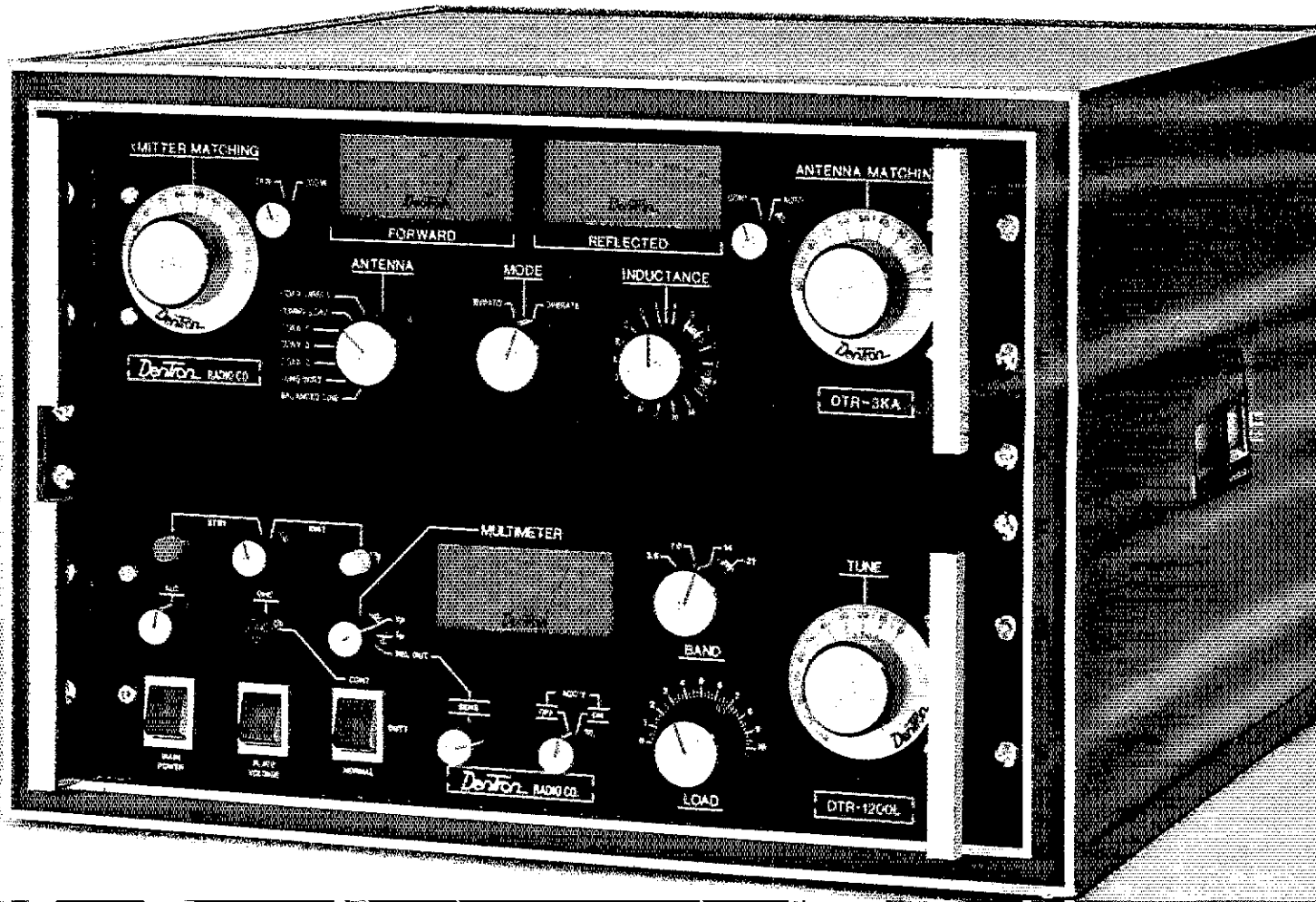
Front Panel Plate Voltage Switching

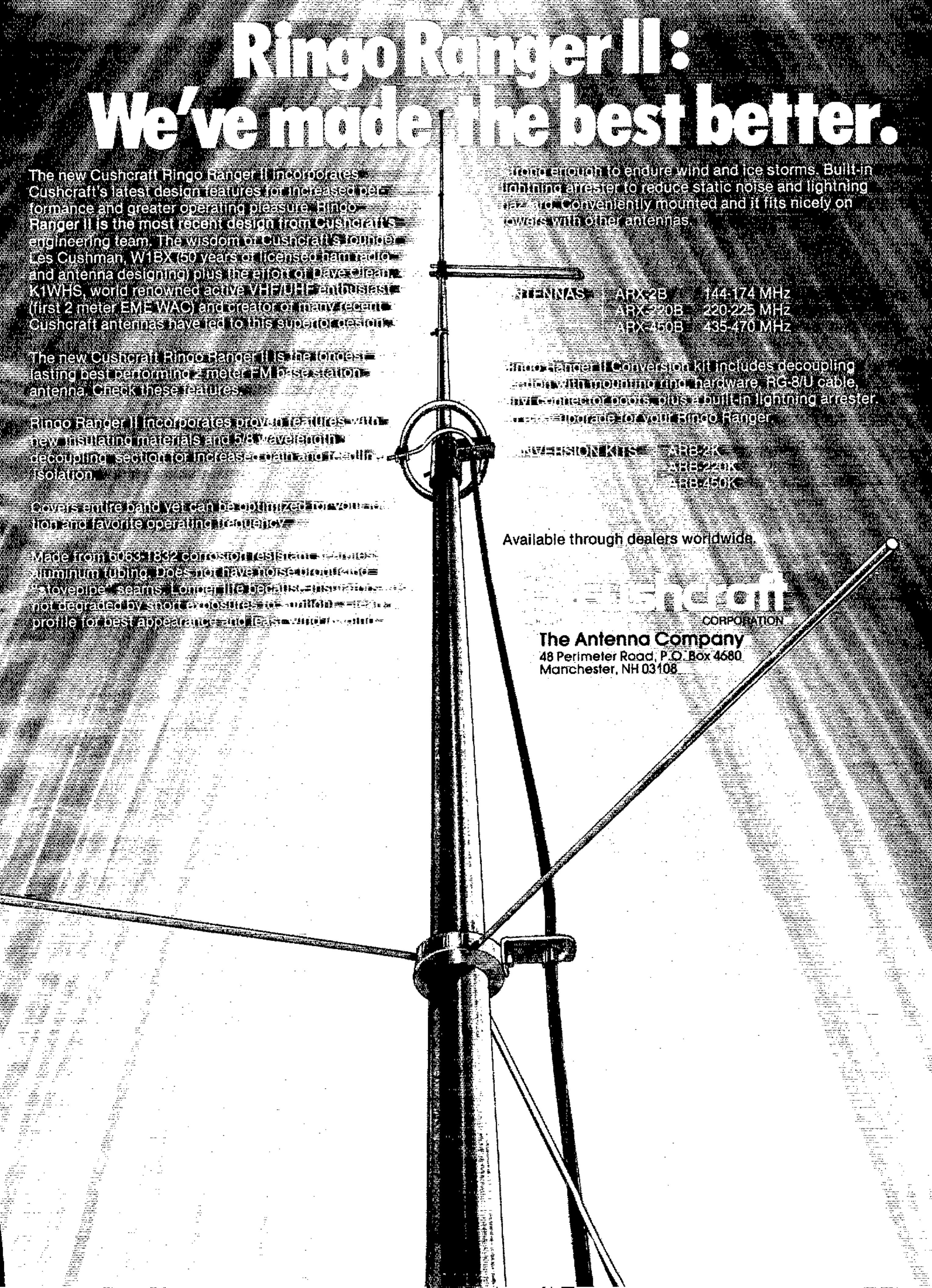
DTR-3KA Antenna Tuner

Frequency Coverage: 1.8 - 30 MHz continuous
Built in 2 KW PEP Dummy Load - Forced Air Cooled
Input Impedance: 50 ohms (Resistive) to transmitter
Antenna Inputs
- Coax 1, 2 & 3 - unbalanced—may range from a few ohms to a high impedance
- Long wire - low to high impedance
- Balanced line - 75-660 ohms

Power Capability: 3000 watts P.E.P.
Wattmeter: 200 watts forward
2000 watts forward
200 watts reflected
Accuracy: ± 5%
Remote sensor box
3½" backlit meters
Dummy Load: with manual or automatic forced air cooling.
Integral 3KW Balun

DenTron Radio Co., Inc.
1605 Commerce Drive
Stow, Ohio 44224
(216) 688-4973





Ringo Ranger II:
We've made the best better.
The new Cushcraft Ringo Ranger II incorporates Cushcraft's latest design features for increased performance and greater operating pleasure. Ringo Ranger II is the most recent design from Cushcraft's engineering team. The wisdom of Cushcraft's founder Les Cushman, W1BX (50 years of licensed ham radio and antenna designing) plus the effort of Dave Olean, K1WHS, world renowned active VHF/UHF enthusiast (first 2 meter EME WAC) and creator of many recent Cushcraft antennas have led to this superior design.
The new Cushcraft Ringo Ranger II is the longest lasting best performing 2 meter FM base station antenna. Check these features:
Ringo Ranger II incorporates proven features with new insulating materials and 5/8 wavelength decoupling section for increased gain and feedline isolation.
Covers entire band yet can be optimized for your
tion and favorite operating frequency.
Made from 6063-T832 corrosion resistant
aluminum tubing. Does not have noise
"stovepipe" seams. Longer life
not degraded by short exposures
profile for best appearance
strong enough to endure wind and ice storms. Built-in lightning arrester to reduce static noise and lightning hazard. Conveniently mounted and it fits nicely on towers with other antennas.
ANTENNAS ARX-2B 144-174 MHz
ARX-220B 220-225 MHz
ARX-450B 435-470 MHz
Ringo Ranger II Conversion kit includes decoupling section with mounting ring hardware, RG-8/U cable, vinyl connector boots, plus a built-in lightning arrester.
upgrade for your Ringo Ranger.
CONVERSION KITS ARB-2K
ARB-220K
ARB-450K
Available through dealers worldwide.
Cushcraft
CORPORATION
The Antenna Company
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108

KENWOOD
...pacesetter in amateur radio

TS-830S

"Top-notch"... VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

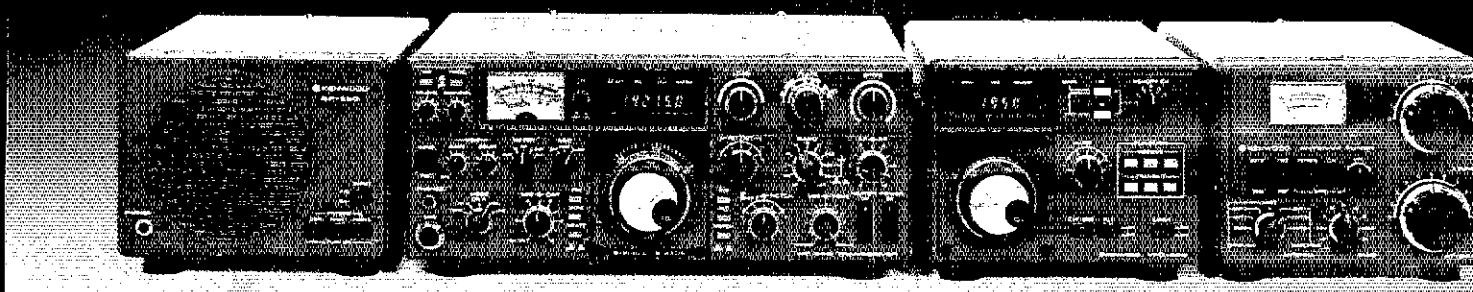
TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter (high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Built-in digital display (six digits, fluorescent tubes), analog subdial, and display hold (DH) switch.
- Noise-blanker threshold level control.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit to check transmitted audio quality.
- RIT (receiver incremental tuning) and XIT (transmitter incremental tuning).

OPTIONAL ACCESSORIES

- SP-230 external speaker selectable audio filters
- VFO-230 external digital with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/SW and power meter/antenn switch: 160-10 meters, including three new band
- YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF.
- YK-88C (500-Hz) and YK-88CN (270-Hz) CW fi for 8.83-MHz IF.

(VFOs for TS-830S, TS-13 Series, and TS-120S are compatible with all three series of transceivers.)



SP-230 TS-830S VFO-230 AT-230

TS-130S/V

"Small wonder"... processor, N/W switch, IF shift, DFC option

The compact, all solid-state HF SSB/CW mobile or fixed station TS-130 Series transceiver covers 3.5 to 29.7 MHz, including the three new bands.

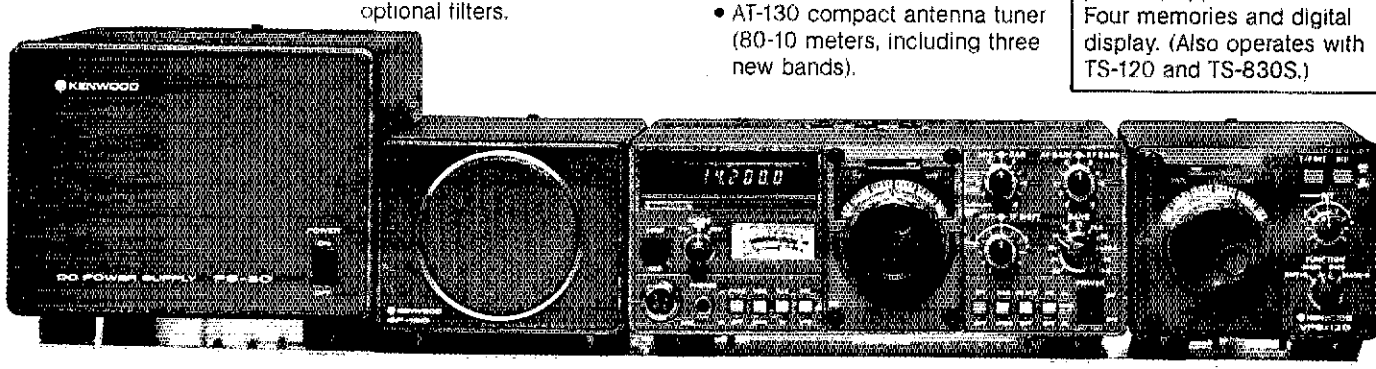
TS-130 SERIES FEATURES:

- 80-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- TS-130S runs 200 W PEP/160 W DC input on 80-15 meters and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands.
- Built-in speech processor.
- Narrow/wide filter selection on both CW (500 Hz or 270 Hz) and SSB (1.8 kHz) with optional filters.
- Automatic selection of sideband mode (LSB on 40 meters and below, and USB on 30 meters and above). SSB REVERSE switch provided.
- Built-in digital display.
- Built-in RF attenuator.
- IF shift (passband tuning).
- Effective noise blanker.

OPTIONAL ACCESSORIES:

- PS-30 base-station power supply.
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 compact antenna tuner (80-10 meters, including three new bands).
- SP-120 external speaker.
- VFO-120 remote VFO.
- MB-100 mobile mounting bracket.
- PS-20 base-station power supply for TS-130V.

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-2 Four memories and digital display. (Also operates with TS-120 and TS-830S.)



PS-30 SP-120 TS-130S VFO-120

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

TR-9000

"New 2-meter direction"...compact rig with FM/SSB/CW, scan, five memories

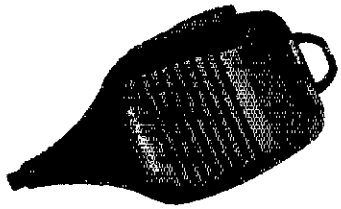
The TR-9000 combines the convenience of FM with long distance SSB and CW. It is extremely compact... perfect for mobile operation. Matching accessories are available for optimum fixed-station operation.

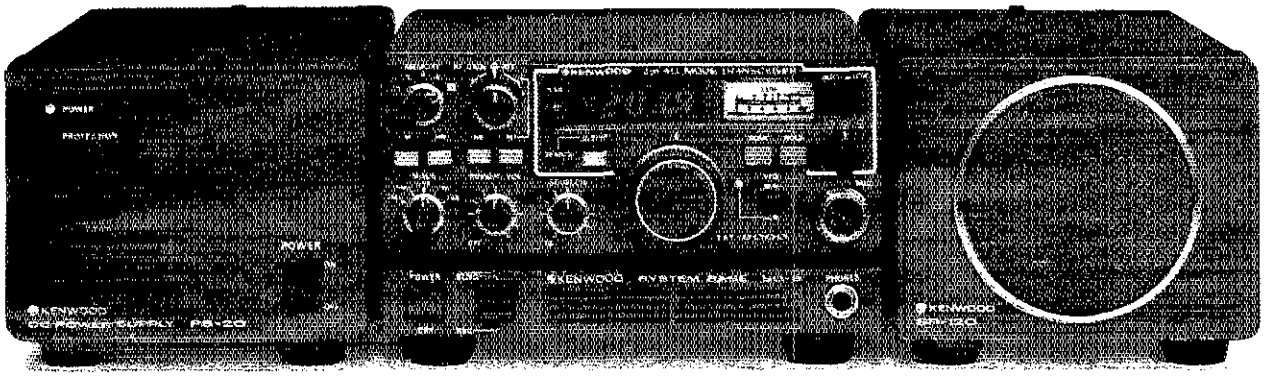
TR-9000 FEATURES:

- FM, USB, LSB, and CW.
- Only 6-11/16 inches wide, 2-21/32 inches high, 9-7/32 inches deep.
- Two digital VFOs, with selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz.
- Digital frequency display. Five, four, or three digits, depending on selected tuning step.
- Covers 143.9000-148.9999 MHz.
- Band scan... automatic busy stop and free scan.
- SSB/CW search of selectable 9.9-kHz bandwidth segments.
- Five memories... four for simplex or ±600 kHz repeater offsets and the fifth for a non-standard offset (memorizes transmit and receive frequency independently).
- UP/DOWN microphone (standard) for manual band scan.
- Noise blanker for SSB and CW.
- RIT (receiver incremental tuning) for SSB and CW.
- RF gain control.
- CW sidetone.
- Selectable RF power outputs ... 10 W (HI)/1 W (LO).
- Mobile mounting bracket with quick-release levers.
- LED indicators... ON AIR, BUSY, and VFO.

OPTIONAL ACCESSORIES:

- PS-20 fixed-station power supply.
- SP-120 fixed-station external speaker.
- BO-9 System Base... with power switch, SEND/RECEIVE switch (for CW), memory-backup power supply, and headphone jack.

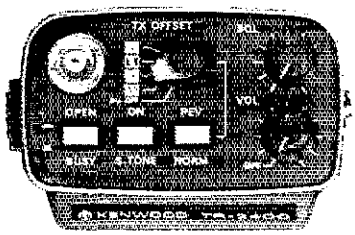




PS-20 TR-9000 BO-9 SP-120

TR-2400

"Hand-shack"...synthesized, big LCD, scan, 10 memories, DTMF (Touch-Tone®)



CONVENIENT TOP CONTROLS

The TR-2400 has the most convenient operating features desired in a 2-meter FM hand-held transceiver.

TR-2400 FEATURES:

- Large LCD digital readout. Readable in direct sunlight (virtually no current drain) and in the dark (lamp switch). Shows receive and transmit frequencies and memory channel. "Arrow" indicators show "ON AIR," "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- Keyboard selection of 144.000-147.995 MHz in 5-kHz increments. No "5-UP" switch needed.
- UP/DOWN manual scan in 5-kHz steps from 143.900 to 148.495 MHz.
- 10 memories. Retained with battery backup. "M0" memory may be used to shift transmitter to any frequency for nonstandard-split repeaters.
- Built-in autopatch DTMF (Touch-Tone®) encoder, using all 16 keyboard buttons.
- Automatic memory scan.
- Repeater or simplex operation. Transmit frequency shifts ±600 kHz or to "M0" memory frequency.
- Reverse switch. Transposes receive and transmit frequencies.
- Subtone switch (tone encoder not Kenwood-supplied).
- Two lock switches to prevent accidental frequency change and accidental transmission.
- External PTT microphone and earphone connectors.
- Rubberized antenna with BNC connector, NiCd battery pack, AC charger, PTT and mic plugs, handstrap, and earphone included.
- Extended operating time with LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output).
- High-impact case and zinc die-cast frame.
- Compact and lightweight. Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

OPTIONAL ACCESSORIES:

- ST-1 Base Stand (provides 1.5-hour-quick, trickle, and floating charges, 4-pin microphone connector, and SO-239 antenna connector).
- BC-5 DC quick charger.
- LH-1 leather case.
- BH-1 belt hook.
- *PB-24 extra NiCd battery pack.*
- ***NEW*** SMC-24 speaker/mic.

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Indiana — Bruce Woodward, W9UMH, 6208 Bramshaw Rd., Indianapolis 46220 (317-251-5606)
Wisconsin — Roy Pedersen, K9FHI, 510 Park St., Juneau 53039

Dakota Division

Minnesota — Helen Haynes, WBØHOX, 16 N.E. 7 Ave., Rochester 55901 (507-288-2437)
North Dakota — Lois A. Jorgensen, WAØRWM, Box 6, Abercrombie 58001 (701-553-8724)
South Dakota — Erwin C. Heimbuck, Jr., KØOTZ, 3212 Parkview, Rapid City 57701

Delta Division

Arkansas — Sid Pokorny, W5UAU, Rte. 2 — 1335 N. Ridge Circle, Horseshoe Bend 72512 (501-670-5698
Louisiana — James R. Giammanco, N5IB, 9451 Corsica Ave., Baton Rouge 70810 (504-766-5583)
Mississippi — E. Ed Robinson, W5XT, P. O. Box 4181, Jackson 39216 (601-982-4440)
Tennessee — Earl Leonard, KB4G, 126 Sheridan Circle, Oak Ridge 37830 (615-482-2157)

Great Lakes Division

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Michigan — James R. Seeley, WB8MTD, 14630 Clinton Rd., Springport 49284 (517-569-2411)
Ohio — Allan L. Severson, AB8P, 1275 Ethel Ave., Lakewood 44107 (216-521-1565)

Hudson Division

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N.Y.C. & Long Island — Paul A. Lindgren, WA2UWA, P. O. Box 1158, East Hampton 11937 (516-324-1542)
Northern New Jersey — Robert E. Neukomm, WA2MVQ, 404 O'Brien Ct., Wyckoff 07481 (201-891-3064)

Midwest Division

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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 — Clevis O. Laverty, W1RWG, 17 Fair St., Norway 04268 (207-743-2353)
New Hampshire — Robert Mitchell, W1SWX/W1NH, Box 137-A, Chester 03036 (603-895-3456)
Rhode Island — John Titterington, W1EOF, 45 Mountain Ave., Riverside 02915 (401-438-3619)
Vermont — Robert L. Scott, W1RNA, 9 Large St., Swanton 05488 (802-868-4944)
Western Massachusetts — Arthur Zavarella, W1KK, 1702 Main St., Agawam 01001 (413-786-9115)

Northwestern Division

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Idaho — Lemuel H. Allen, Jr., W7JMH, 1800 S. Atlantic St., Boise 83705 (208-343-9153)
Montana — Robert E. Leo, W7LR, 6790 South 3rd Rd., Bozeman 59715 (406-586-6147)
Oregon — Dale T. Justice, K7WWR, 1369 N.E. Sunrise Ln., Hillsboro 97123 (503-648-6232)
Washington — Robert L. Klepper, W7IEU, 7027 51st NE, Marysville 98270 (206-659-3005)

Pacific Division

East Bay — Bob Vallio, W6RGG, 18655 Sheffield Rd., Castro Valley, CA 94546 (415-537-6704)
Nevada — Ralph E. Covington, Sr., W7SK, P. O. Box 11874, Reno 89510 (702-322-7988)
Pacific — J. P. Corrigan, KH6DD, Box 698, Kaneohe, HI 96744
Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland, CA 95695 (916-666-1465)
San Francisco — Arthur P. Samuelson, W6VV, 440 Davis Ct. #811, San Francisco, CA 94111 (415-986-3129)
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)

Roanoke Division

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South Carolina — Richard McAbee, W4MTK, 205 Jewel St. N.W., New Ellenton 29809 (803-652-2596)
Virginia — Richard "Rick" L. Genter, K4BKX, P. O. Box 34494, Richmond 23234 (804-271-0505)
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr., Charleston 25312 (304-776-4352)

Rocky Mountain Division

Colorado — Robert W. Poirier, KØDJ, 1884 Pepperwood Dr., Colorado Springs 80910
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd., N.E., Albuquerque 87112
Utah — Royce Henningson, K7QEQ, P. O. Box 1267, Moab 84532 (801-259-5018)
Wyoming — Chester C. Stanwaity, W7SDA, 353 S. Ferris St., Powell 82435 (307-754-3624)

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Northern Florida — Billy F. Williams, Jr., N4UF, 911 Rio St. Johns Dr., Jacksonville 32211 (904-744-9501)
Southern Florida — Woodrow Huddleston, K4SDL, 219 Driftwood Ln., Largo 33540 (813-584-0984)
West Indies — Julio Negroni, KP4CV, Georgetown, No. 269, Rio Piedras, PR 00927

Southwestern Division

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Orange — Fried Heyn, WA6WZO, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (714-273-1120)
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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

Malicious Interference — Round Two

It is not often that we run two editorials on the same subject during the course of a year, but as we told you on this page this past March, Amateur Radio is facing a crisis — a crisis of malicious interference. And a crisis cannot be taken too lightly.

Last January the ARRL Board established an Ad Hoc Committee to study the malicious interference problem, and in the March editorial the committee solicited your thoughts and suggestions on the matter. Hundreds of letters were received in response — a phenomenal number to receive in response to an editorial — which indicates the importance that the members place on this issue. Most letters agreed with the editor's view that Amateur Radio does indeed face a crisis. Some offered thoughtful and useful suggestions on how to combat the crisis. And some, much to our pleasant surprise, told what they were already doing locally to battle malicious interference. More about this later.

Taking into account the members' input, the Ad Hoc Committee presented a report to the Board at the July Board meeting. The Board accepted the report and in turn passed the following motion: . . . unanimously VOTED that the President, together with the General Manager, establish an Interference Task Force which shall include at least one member of the Board of Directors, one member of the Headquarters staff, and the General Counsel or his designate, for the purpose of initiating an ongoing program of assistance to local interference committees, clubs or individuals. This task force shall (1) coordinate an educational program to include appropriate articles in *QST* and in Club and Training publications, (2) provide a reference manual and guidelines for interference committee operating procedures, and (3) provide liaison at the national level for those cases to be referred to the Federal Communications Commission for their handling. The overall objective shall be to encourage efforts by the Amateur Radio Service to continue to justify its reputation as a self-policing service by the reduction or elimination of all types of interference on amateur frequencies. The Interference Task Force shall make regular reports to the ARRL Executive Committee.

The Interference Task Force has already begun its work, and its members are: Dakota Division Director Gar Anderson, KØGA, chairman; First Vice President Carl Smith, WØBWJ; Hudson Division Vice Director George Diehl, W2IHA, ARRL General Counsel Robert M. Booth, Jr, W3PS (or his designate), and Membership Services Manager Hal Steinman, K1FHN, staff liaison.

There may be some skeptics who are saying, "Not another committee!" Please set your fears at rest. This task force has a clearly defined purpose, as stated in the above motion. Also, the Interference Task Force is charged with making regular reports to the ARRL Executive Committee (which meets at least four times a year). This is a control mechanism which will insure that the task force does not stray from its objectives.

The response to the March editorial told us that there already exist a number of local interference committees out in the field. There may be more out there. Since it is not our intention to reinvent the wheel, but to build on the good work that has preceded us, we are now querying all ARRL affiliated clubs to determine what clubs have already established some means of combatting malicious interference. We intend to build a data file of these and future interference committees (the membership of which will be treated confidentially) to facilitate the exchange of information.

Our goal is for the local interference committees to be able to resolve the vast majority of interference cases (anything less would not be in keeping with Amateur Radio's long history of self-policing). The obstinate cases, having been reviewed by the local committees, will be forwarded to the FCC for official action. Those hard-core offenders, who find some perverse pleasure in jamming the airwaves, will know that the FCC will take strong disciplinary action when necessary.

This blight of malicious interference will not disappear overnight. It will take time and patience and planning. But we are committed to seeing that it does not worsen, and that one day it does disappear. Whatever it takes, we will do it. — *Hal Steinman, K1FHN*

League Lines...

The FCC has changed its telegraphy testing procedure for all of its field offices. Code tests administered by FCC will be the completion type, requiring the applicant to fill in the blanks. The multiple-choice code test will be discontinued. All telegraphy tests will consist of a typical QSO followed by 10 questions. The passing grade is 70 per cent.

Earlier this year, Florida State University was commissioned by the ARRL Long Range Planning Committee to do a random-sample survey of the U.S. and Canadian amateur population. The final report, containing more than 500 pages of findings, is now being delivered by Florida State to the LRPC members and the members of the ARRL Board. Approximately 9000 amateurs, members and non-members alike, were asked to return survey forms, and some 63 per cent did so. If you were one, thanks! The survey has provided a wealth of information which should be helpful in guiding your League in the years ahead. We plan to share the highlights with you as soon as an in-depth study of the survey report can be completed.

ARRL director and vice director elections are shaping up in the following divisions where there are two or more candidates for an office: Central, Hudson, Northwestern, Rocky Mountain and Southwestern. At press time there were uncontested nominations for director and vice director in the following divisions: New England, Roanoke and West Gulf. Ballots were in the mail by October 1 to ARRL Full Members of record September 10, 1980, in those divisions where elections are being held. Ballots must be returned to Hq. by noon, November 20, to be counted. Eligible voters not receiving ballots by November 1 should notify Donna Frechette at Hq. More details can be found in this month's "Happenings."

The ARRL Equipment Insurance Plan is now administered by Albert H. Wohlers & Co., specialists in the association-sponsored group insurance field for over 30 years. Albert H. Wohlers & Co. has had considerable experience in administering group insurance plans for associations and will efficiently serve the insurance needs of the ARRL membership. The ARRL staff will be working closely with them in this activity. In the event you have any questions concerning your policy, please direct the inquiry to: Albert H. Wohlers & Co., Administrator, ARRL GROUP INSURANCE PLANS, 1500 Higgins Rd., Park Ridge IL 60068. The toll-free number for Albert H. Wohlers & Co. is 800-323-2106. Sorry, Illinois residents must call 312-698-2221 directly. This development ensures the professional administration of our ARRL Insurance program. There has been no change in coverage, premium rates or insurance underwriter. The only change is with respect to the Insurance Administrator.

Spread-spectrum transmissions are those where bandwidths are from 10 to 100 or more times the information rate. Although such emissions are presently not authorized in the amateur bands, the mode may offer advantages for amateur communications. For more information see the article beginning on page 15.

Feedback: In the September issue of the Instructors' Newsletter we erroneously reported that clubs could pay for expenses incurred by FCC employees in traveling to clubs or exam sites. Although this proposal is under consideration it has not yet been approved. Please do not contact your local FCC office with travel requests. Watch QST for status reports on this matter.

The ARRL hq. Technical Department is accepting applications for career positions as Assistant Technical Editor and Laboratory Technician. Interested persons with experience and an Associate Degree or higher in electronics should contact Jerry Hall, K1TD, or Doug DeMaw, W1FB, at Hq.

An opening exists at Hq. for a manager for the ARRL Training Program within the Club & Training Department. Broad experience in Amateur Radio, an Advanced Class license and experience in education and effective writing preferred. Contact Steve Place at ARRL hq.

A third party traffic agreement has been signed between Canada and Paraguay.

The FCC has proposed eliminating the commercial First Class Radiotelephone Operator License in General Docket 20817. The proposal suggests that commercial broadcast stations should not be required to employ technicians who have been examined and licensed by the Commission. Rather, they should be able to employ any qualified person. Comments are due November 14, 1980, with reply comments due December 15, 1980.

SSTV in C lour

First 2-way color SSTV transmissions across the Atlantic! Technical details on the equipment used at the European end of the path are included here.

By Jeremy Royle,* G3NOX

After many years of experimenting with fast-scan amateur television in the 436-MHz band, I visited the slow-scan station of Richard Thurlow, G3WW, to see his Robot 400 in operation on the hf bands. I was immediately impressed with the picture quality, in particular the bright fast-scan display of received and transmitted pictures. At the time, the technique of standards conversion was completely new to me.

I decided to buy a Robot 400 and to link it with my full-size image orthicon fast-scan television camera. The results in terms of picture quality were so good I immediately realized that by using the frame-storage system it would be possible to produce color pictures by sequentially loading two or more memory stores with color-separation signals.

The first stage in converting to color was to see whether my Pye 2014 image orthicon camera would produce the red, green and blue color-separation signals necessary for a full-color system using Wratten no. 47B, 58 and 25 filters. The results were good in terms of sensitivity and colorimetry, so I decided to remove the neutral-density filters from the supplementary filter turret (used in this camera for outside broadcast applications) and to install the Wratten filters on a permanent basis. A motor was also fitted so that the filters could be selected from the operating position.

To obtain the best signal-to-noise ratio with each of the red, green and blue (RGB) filters I use a Thorn Artificial Daylight fluorescent tube to illuminate the objects being televised. This type of tube, in conjunction with the filters used and the spectral response of the image orthicon tube, results in a near-perfect amplitude balance between the RGB color separation signals. Having produced the RGB signals from the camera, it is of course possible to load them one by one into a single Robot 400 and to transmit

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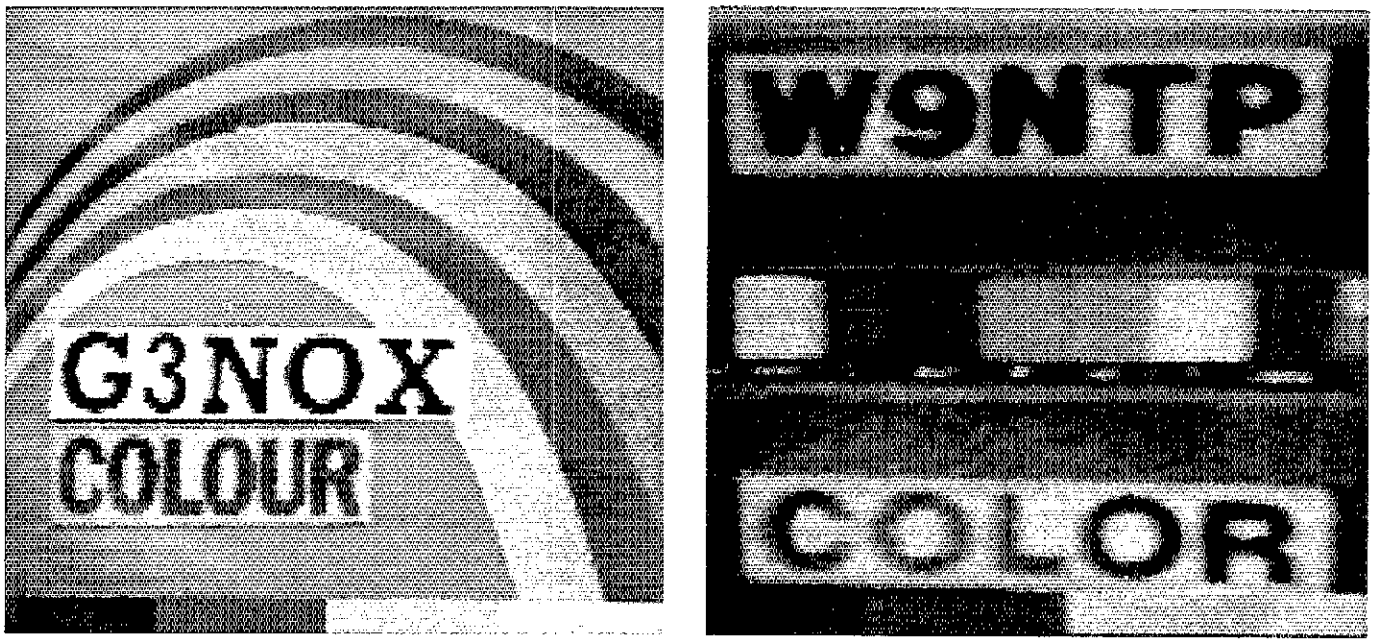


On March 15, 1980, at 1430 UTC, Jeremy Royle, G3NOX, made the first transatlantic two-way SSTV contact with Don Miller, W9NTP, a pioneer of color SSTV. Signals consisted of electronically generated red-green-blue color separations from G3NOX, transmitted on 29.150 MHz using field-sequential emissions. W9NTP transmissions consisted of only two color separations, red and green. Shown here are the transmitted color picture as photographed directly from the monitor screen at G3NOX and the W9NTP picture as received.

The author uses a Thorn Artificial Daylight fluorescent tube to illuminate the objects being televised, not visible in this photo. The original rainbow test card is visible in front of the modified image orthicon camera, as is a BBC test card for use as a flesh-tone reference.

them in turn. However, in order to obtain a color-monitor display of incoming and outgoing pictures, it is necessary to be able to store all three colors simultaneously and to feed the outputs to a color monitor via an encoder. An alternative method is to feed separate RGB signals to a monitor having individual video inputs for each color.

At this stage I discussed the problem of synchronization with Martin Emmerson, G3OGD, who has built his own standards converter. He came up with a most elegant method of synchronizing the fast-scan clocks of the three Robot 400s. The method used is shown in Fig. 1.

Before carrying out the modifications to the Robot 400s, I gave considerable thought as to how the digital links could be made in such a way that things could be quickly returned to normal if necessary. The solution to this is to mount on the rear panel of the master 400 two DIN sockets, with a further one on each of the slave units. The result is neat and in my view does not detract in any way from the value of the 400! The internal connections can be made to the main Robot 400 circuit board via "header" plugs plugged in to the U48 and U10 sockets of each 400. These can be removed and the ICs plugged in again if it is desired to revert to normal. Any modifications can result in the warranty being affected and it is up to each Robot owner to make his own decision on this before carrying out the modifications!

It will be seen from Fig. 1 that one Robot 400 becomes in effect the master and through U48 controls the fast-scan synchronization of the remaining two units. For this reason it is not necessary for the crystal oscillators in the two slaves to function. In fact, to avoid possible beat patterns, I have removed the crystals in the two slave units.

In order to ensure black-level stability and constant color balance it is also necessary to install black-level clamps to the fast-scan video inputs of each Robot 400. This can be done by means of the circuit shown in Fig. 2. Existing pulses that are available on the Robot 400 board are used. Signals can be conveniently routed through spare pins on the main edge connector. The diodes and components can be mounted on the spare terminals of the board associated with the power supply. The black-level clamps make it possible to preset the "snatch" contrast and brightness controls, resulting in more consistent pictures in black and white, as well as being essential for color.

Monitoring

Having modified the Robot 400s as shown in the circuit diagrams, we come to the question of how to monitor the color picture produced by the synchronized Robot 400s. There are two approaches: (1) Use a standard color television set as a monitor, in which case it will be necessary to encode the RGB color signals and apply them to the color set via an rf modulator, or (2) use a professional RGB color monitor by feeding the output of each 400 as a separate signal to each input of the monitor.

Although the second method is expen-

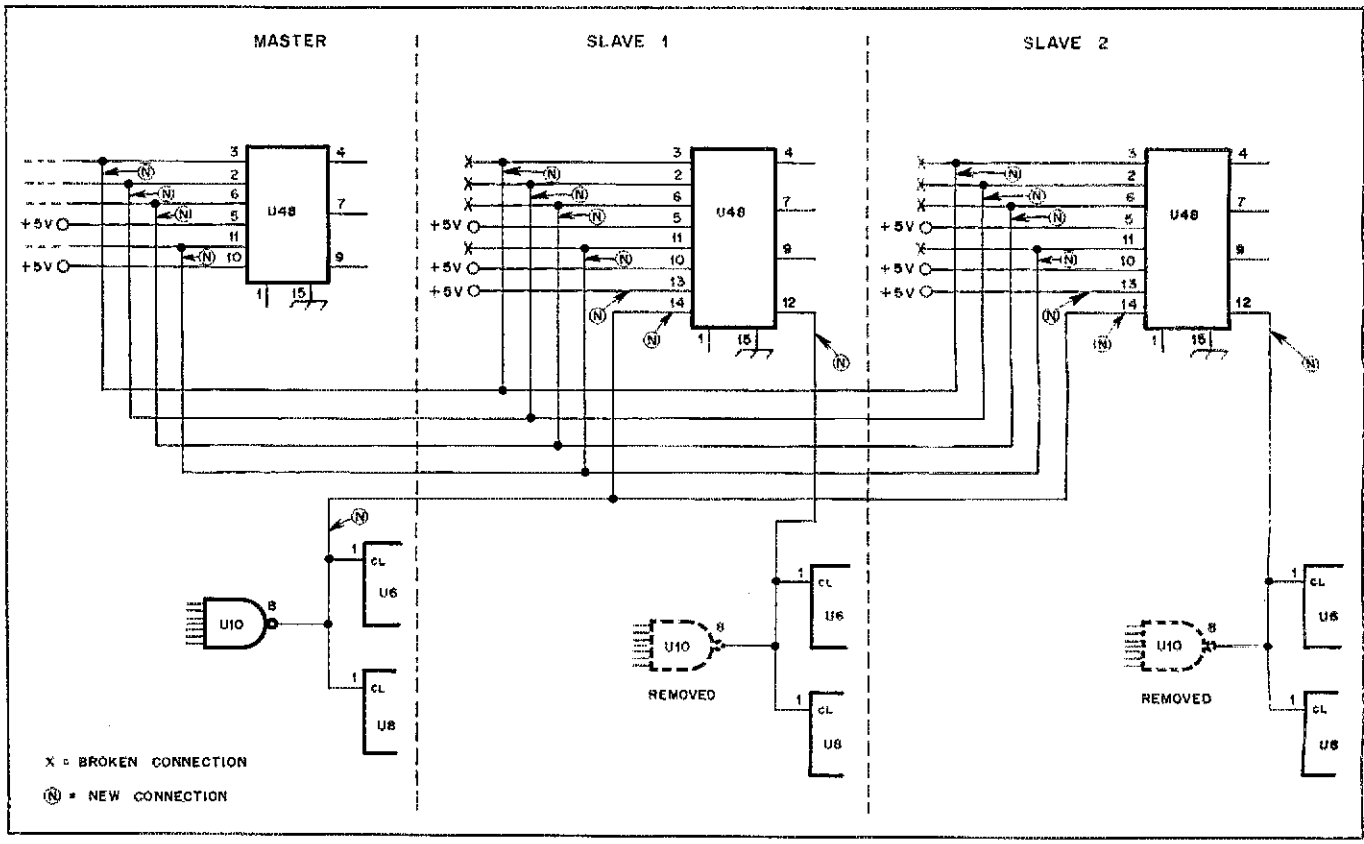


Fig. 1 — Circuit for synchronizing the fast-scan clocks of three Robot 400 scan converters. Two of the 400s thus became "slaves" to the "master." IC numbers are those of the manufacturer. See text regarding interconnections.

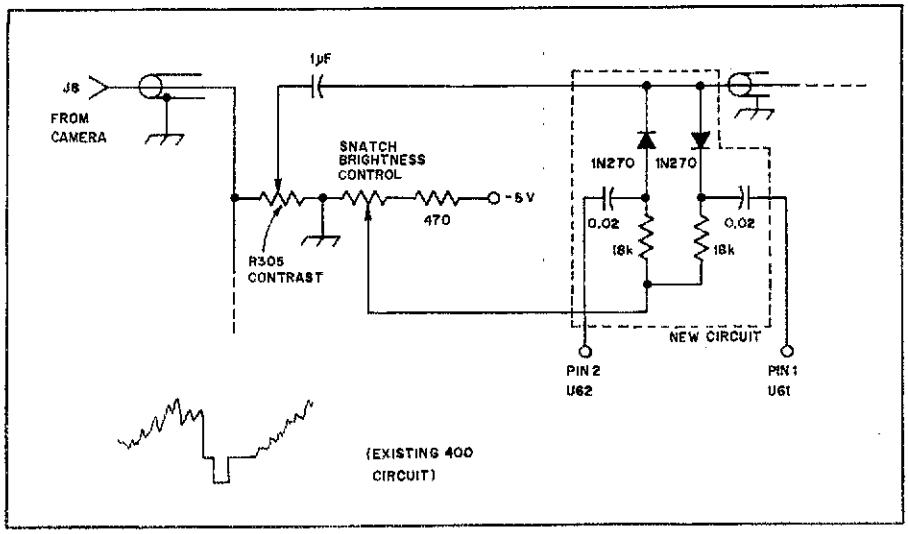


Fig. 2 — This circuit clamps the black level at the end of each scan line. Once they are adjusted, it is not necessary to readjust the controls. Only the camera iris need be set according to lighting conditions — a good procedure for black-and-white pictures, and essential for color!

G3NOX transmitted the first full-color SSTV signals on March 8, 1980, at 1145 UTC on 28.6 MHz. The color signal was received and tape recorded at K2RZ near New York, played back and received in color by G3NOX. The picture arrived at G3NOX with some interference, as shown here, after traveling a path distance of approximately 7000 miles.

The G3NOX color picture received at W9NTP on March 15, 1980. (*Photo courtesy of Don Miller, W9NTP*)

sive, the writer feels that this is really the best way, for it eliminates the problems of encoding and rf modulation, and gives the most accurate color.

Connecting the Complete System

To produce a color picture, the whole system is connected as shown in Fig. 3. The composite video and sync from the camera is fed to the video inputs of all three Robot 400s using BNC T connectors with a 75-ohm termination resistor on the last unit. Video outputs from the 400s are taken to the RGB monitor and to a 3-way switching unit which enables the black-and-white monitor to be switched to look at each of the three stored images — useful for normal black-and-white operation as well as for examining the RGB color separations.

The outputs from the transceiver, tape recorder, etc., are fed into the appropriate sockets on all three Robot 400s. In order to provide complete control of SSTV and microphone functions the three units are connected together as shown in Fig. 4. This also means that no extra switch boxes are needed to sequentially transmit the three color SSTV signals.

I have considered the possibility of making up a sequential switcher but experience with color SSTV on the hf bands has shown that at least two frames of each color are desirable to overcome QRM. This is most easily done with manual switching at both stations where human intervention can result in the best frames being held.

Setup and Color-Balancing Procedure — Transmission

Place the red filter on the camera. Adjust the iris, lighting and contrast control on the camera to give a good picture on a black-and-white monitor. If a scope is available, this should be connected to monitor the fast-scan video. This will assist in getting the correct video levels.

Next, cap the camera lens to give a black level. Switch all three Robots to the CAMERA DISPLAY position and turn all three snatch brightness controls fully counterclockwise. Set all the snatch contrast controls at the 3 o'clock position.

Now select the Robot gray-scale position on the memory-input switch and press all three snatch buttons. The color monitor should now display a neutral gray scale with no color tinting. If a color bias is apparent, the color monitor bias and gain controls should be carefully adjusted to give a completely neutral gray scale.

Select the CAMERA position on the memory switch and CAMERA on the display switch, leaving the lens capped. Adjust the snatch brightness on the red channel so that a red tint is *just not visible*. Repeat for the green and blue. The color monitor should now show a *black* level. If not, the color monitor brightness should be adjusted for the correct black level.

Uncap the lens on the camera and adjust the snatch contrast controls on each Robot to give a neutral gray picture consistent with correct contrast. Do not limit whites by setting the contrast too high. After this stage has been reached it is worth capping the lens again and repeating the preceding paragraph to ensure accurate black-level tracking.

Snatching a Color Picture

Switch to the memory display on all three Robots. Select the red filter on the camera and press the red snatch button. Repeat for green and blue and you should have a color picture. Because of lighting, camera spectral response and other factors it will probably be necessary to carry out fine adjustments of the snatch contrast controls *only* to get a true gray balance when using a gray scale in front of the camera.

I know this sounds complicated, but it is a once-and-for-all process, as the Robots are very stable. All you will have to do normally is to snatch a color picture and carry out fine adjustments. Make sure your lighting and camera exposure are correct by monitoring the camera video level on your scope against a graticule.

Setup and Color-Balancing Procedure — Reception

In order to receive accurate color pictures it is necessary to align the receive

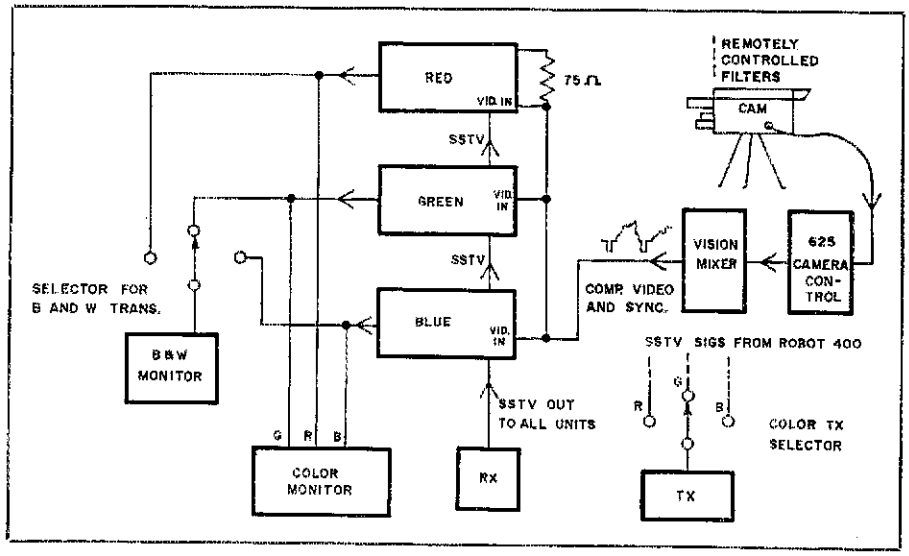


Fig. 3 — System interconnections for a complete color SSTV system using three Robot 400s.

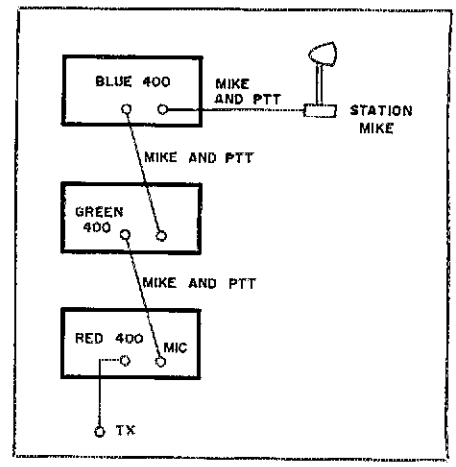


Fig. 4 — This system allows the switching of each Robot 400 to transmit in turn without making extra switching arrangements. Just use the normal Robot VOICE-VIDEO TRANSMIT switches on each unit.

brightness and receive contrast controls on each of the Robot 400s using the following procedure. Record about 5 minutes of gray scale from one of the Robot 400s after having previously checked the SSTV sync and black-and-white levels for the correct frequency, as laid down in the instruction manual.

Follow the procedure recommended for setting the receive brightness and contrast controls by comparing the taped gray scale with the local snatched gray scale. Repeat for each of the 400s. When this is done correctly, the *occasional* sampling error should be visible in the black and white ends of the scale. This indicates that no tones are being lost at either end by compression. Take your time with this setting as this is a once-and-for-all operation. *Do not* touch the receive contrast and brightness controls once this condition has been obtained.

Feed the tape-recorded gray scale into the red 400 and set the width control to just fill the screen. Adjust the width control on the green and blue 400s to obtain perfect registration of the gray scale on the color monitor.

To receive a color picture from another station switch all three Robot 400s to CONTINUE. Wait for the red frame to complete, switch to hold, wait for the green frame and switch to hold, and wait for blue frame and hold. If the transmitted signal was correct you should now have a color picture!

Operating Procedure

The standard color sequence of red, green and blue should be used for all transmissions and at least two frames of each color transmitted. This allows for a second chance at the receiving end if there is QRM or QSB. Caution: Color SSTV takes at least three times as long to transmit as black and white. Make sure you do not overheat your linear!

Avoid adjusting *any* of the controls on the 400 when using color. It is only necessary to adjust the video gain and lens aperture on the camera for correct levels.

The standard Robot Gray Scale will appear at the foot of all color pictures. This provides an excellent check on the overall alignment of the SSTV frequencies produced by the Robot 400s at the transmitting station. It also checks the correct adjustment of the receive contrast and brightness at the receiving station.

Providing that the incoming SSTV frequencies are correct, it should be possible to adjust your transceiver for "natural" speech and to receive the color SSTV picture without further adjustments. In any case the receiver tuning should not be altered during the reception of color frames or balance will be lost. If one of the color frames is lost because of QRM, it is possible to "repair" the picture by asking the sending station to send this color again.

The transmission of color SSTV is more complex than black and white. It is therefore necessary to reduce the number of operational controls to a minimum, and this has been achieved by treating all the Robot 400 controls as presets, using the procedures already detailed. On a well set-up system, all that is necessary is to set the camera iris, select the correct filter, and operate the snatch buttons.

Results

Some idea of the results that can be achieved with color SSTV are shown in the accompanying photos. However, it must be remembered that in these printed illustrations two *further* color-reproduction systems have been used — off-the-screen photography and the color printing process. The actual results on the monitor must be seen live to really appreciate the quality!

At the time of writing only about three stations in the world are known to be equipped for color SSTV. For this reason the writer has been sending color SSTV to stations equipped with audio tape recording and playback facilities connected to their transceivers and having them play back the color. The results have been very good, particularly when QRM and the Woodpecker[1] are absent!

Summary

The development of this field-sequential color SSTV system has involved some interesting problems of colorimetry, digital electronics and interfacing different types of equipment that were never intended for producing color pictures. Although this is a good example of the ham approach of using what is available to form a complete system, I appreciate that it is fairly costly — but then color in any medium usually is!

The thrill of seeing a full-color SSTV picture form on the monitor screen after its traveling many thousands of miles over a normal speech type circuit is a thrilling experience — certainly the most exciting thing the writer has done in Amateur Radio.

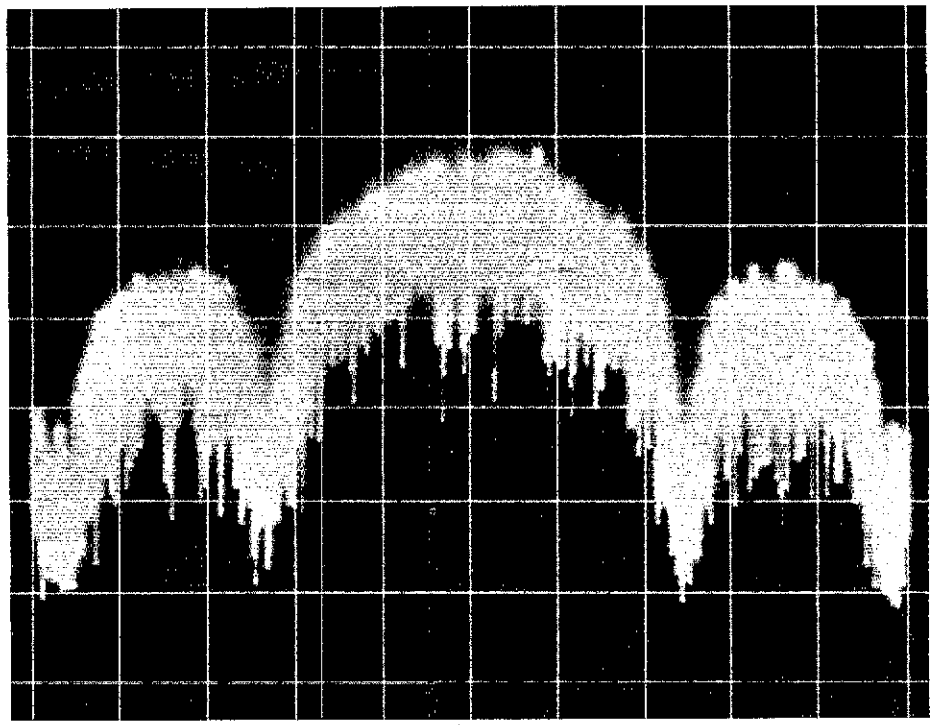
I would like to acknowledge the great assistance I have received on this project from Martin Emmerson, G3OQD, who developed the digital synchronization system and has given valuable advice to me.

[1]See "More Woodpecker Thoughts," *QST* Technical Correspondence, Jan. 1980.

Spread Spectrum and the Radio Amateur

Spread-spectrum signals are unlike any emissions presently used by radio amateurs. But we stand at the threshold of what may be a new mode for amateur communications.

By Paul L. Rinaldo,* W4RI



A modulation technique that has been in development since the late 1940s, spread spectrum (SS) has, until recently, been virtually unthinkable for use by radio amateurs for a number of reasons. First, SS occupies bandwidths far in excess of the necessary bandwidth; that would be illegal! By using a pseudo-random digital sequence to scatter energy over a wide band, there is only a small amount of energy in any one hertz; that would make it an unauthorized code. SS systems have been complex and expensive; that would be beyond the resources of radio amateurs. Much of the development has been conducted under government contract; most hams knew little or nothing about the subject. There were more than enough reasons to deter hams from even dreaming about an SS rig in their shacks.

The situation has changed greatly in recent years! SS technology has progressed to the point where affordable systems can be built for amateur and other non-governmental uses. The replacement of the Federal Communications Commission's Office of the Chief Engineer with the Office of Science and Technology (OST) carried with it the mandate to encourage the use of new technology. The FCC's OST sees the Amateur Radio Service as a test bed for new techniques. Some at the FCC feel that the long-term retention of amateur frequencies, in competition with other radio services, depends largely on continued technological advancements by amateurs. We may be entering an "experiment or expire" era.

Why the sudden interest in SS? The reasons are many. First, there is the simple technical imperative, meaning that the technology is there as a result of many years of government-sponsored development, so why not use it for civilian applications? Another reason is that a number of SS users, say in the Land Mobile Service, could be overlaid on top of an existing band already "full" of mobile users employing conventional frequency modulation. Similar overlays could be tried by amateur experimenters in the ham bands. If this is done with care, the preexisting users wouldn't even detect the presence of the SS overlay. Yet another possibility is the creation of new bands, maybe a 900-MHz band, which would use SS exclusively to accommodate

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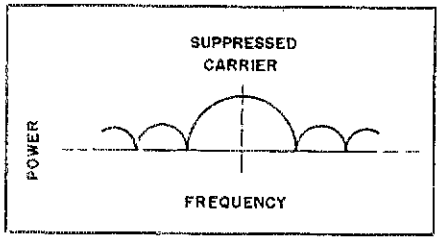


Fig. 1 — Power vs. frequency for a direct-sequence-modulated spread-spectrum signal. The envelope assumes the shape of a $\left(\frac{\sin x}{x}\right)^2$ curve. With proper modulating techniques, the carrier is suppressed.

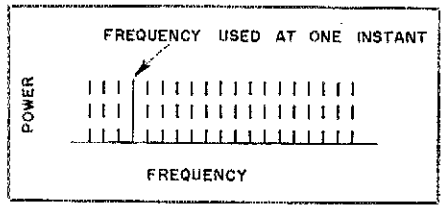


Fig. 2 — Power vs. frequency for frequency-hopping spread-spectrum signals. Emissions jump around in pseudo-random fashion to discrete frequencies.

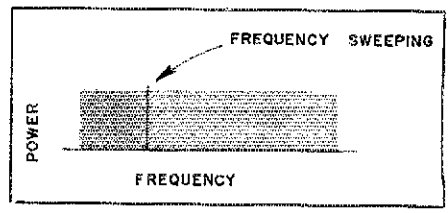


Fig. 3 — Power vs. frequency for chirp spread-spectrum signals. The carrier is repeatedly swept, continuously, from one end to the other in a given band.

thousands of users. Moreover, SS could afford these users both privacy and immunity from interference through proper code settings. In general, SS offers possibilities for more extensive sharing of frequencies while minimizing interference.

Spread-Spectrum Fundamentals

SS systems employ radio-frequency bandwidths that greatly exceed the bandwidth necessary to convey the intelligence. Bandwidths for SS systems generally run from 10 to 100 times the information rate. By spreading the power over a wide band, the amount of energy in any particular hertz or kilohertz is very much smaller than for conventional narrow-band modulation techniques. Depending upon the transmitter power level and the distance from the transmitter to the receiver, the SS signal may be below the noise level.

SS systems also use coding sequences to modulate and demodulate the transmission. Receivers with the wrong code will not demodulate the encoded SS signal and will be highly immune to interference from it. On the other hand, receivers with the right code are able to add all the spread energy in a constructive way to reproduce the intended modulation. In fact, the use of coherent correlation can yield some process gain. Changing the code to another sequence effectively creates a new "channel" on which a private conversation can take place. Many good code combinations could be made available on a single chip and selected by means of thumbwheel switches on the SS transceiver.

Types of Spread Spectrum

There are four basic types of spread spectrum: direct sequence, frequency hopping, pulse-fm and time hopping. In addition, there are hybrids consisting of combinations of two or more of the above basic types.

Direct Sequence (DS): Direct sequence SS is produced by modulation of a carrier with a digitized code stream. This type of modulation is also known by the terms pseudo-noise (PN), phase hopping (PH), direct spread, or direct code. Phase-shift keying (psk) is usually used to produce the marks and spaces, but frequency-shift keying (fsk) could also be used. The wide rf bandwidth arises from the use of a high-speed code. Of course, if the transmitter were allowed to rest on the mark frequency, there would be a steady carrier in one place whenever there is no modulation. This would produce interference to a narrow-band user on that frequency. It would also pose problems for other SS users of the same band, particularly if they did the same thing. So it is conventional for SS systems to include techniques to continue a pseudo-random code sequence even during intervals when intelligence is not being transmitted.

The power spectrum for a DS signal (as might be seen on a spectrum analyzer) is not uniform across the band, but has a main lobe and sets of sidelobes as illustrated in the title photo and in Fig. 1. The bandwidth of the main lobe as measured from null to null is two times the clock rate of the code sequence. The bandwidth of the side lobes is equal to the clock rate. To receive a DS signal, the receiver must collapse or "despread" it to the original bandwidth of the information. This is done by using a replica of the code sequence used by the transmitter.

Frequency Hopping (FH): As the name implies, frequency hopping is simply jumping to a number of different frequencies in an agreed sequence. The code sequence is usually at a slower rate than for direct sequence and is normally slower than the information rate. The hopping rate may also be determined by practical considerations, such as how long it takes for a particular frequency synthesizer to settle down on a new frequency.

Actual modulation of the frequencies uses normal narrow-band techniques such as frequency modulation. At any instant, an FH transmitter is emitting all of its power on a specific frequency slot and potentially could interfere with someone else using a narrow-band system on that frequency. However, the FH dwell time on that particular frequency is so short that most narrow-band users would not be bothered. Mutual interference between two or more FH users sharing the same band could be extremely low, depending upon the design of the code sequences. Fig. 2 illustrates the power spectrum for an FH signal.

Pulse-FM (Chirp): A chirp spread-spectrum system sweeps its carrier frequency over a wide band at a known rate. Again, conventional narrow-band modulation of the sweeping carrier is used to convey the intelligence. The receiver uses a matched, dispersive filter to compress the signal to a narrow band. Chirp systems typically do not use a code sequence to control the sweep generator. Sweep time can be largely independent of the information rate. Normally, a linear-sweep pulse is used, similar to that produced by a sweep generator. The power spectrum for a chirp system is illustrated in Fig. 3.

Time Hopping (TH): Time hopping is a form of pulse modulation using a code sequence to control the pulse. As in other pulse techniques, the transmitter is not on full time and can have a duty cycle of 50% or less. Several systems can share the same channel and function as a time-division multiple-access (TDMA) system. TH is more vulnerable to interference on its center frequency than other SS systems. Seldom seen in its pure form, TH is typically used in hybrid systems using frequency hopping as well.

Hybrids: In addition to the TH/FH hybrid system just mentioned, there are also DS/FH and DS/TH combinations. Hybrid systems are typically designed to accommodate a large number of users and to provide a higher immunity to interference. They also produce better results at practical code sequence rates governed, for example, by how fast a frequency synthesizer can be switched. Also, hybrids can produce greater spreads than those which are practical for pure SS systems.

Some Considerations

Synchronization: In the design of a spread-spectrum system, usually the toughest problem is synchronization of the code sequence at the receiver with that of the incoming signal. If sync is not attained, even just one bit off, nothing but noise can be heard. The problem becomes worse when more than two stations are trying to communicate in a net. This is because of the different propagation delays between stations; i.e., it takes a different time for a signal to travel over paths A-B, A-C, or B-C if the stations are not equidistant. These differences may be only slight but just enough to degrade the signal-to-noise ratio of the received signal.

Glossary of Spread Spectrum Terms

Chirp — Same as pulse-fm.
Code sequence — A series of 1 or 0 bits arranged in a known pattern.
Direct code — Same as direct sequence.
Direct sequence — A type of spread-spectrum modulation using a code sequence to modulate a carrier, normally using phase-shift keying.
Direct spread — Same as direct sequence.
Frequency hopping — A type of spread spectrum which employs rapid switching between a large number of discrete frequencies.
Hybrid — A spread spectrum system that combines two or more basic types of spread spectrum.
Phase hopping — Same as direct sequence.
Pseudo-noise — Same as direct sequence.
Pulse-fm — A type of spread spectrum that uses a swept carrier.
Spread spectrum — A class of modulation types that produce bandwidths far in excess of the bandwidth necessary to convey the intelligence.
Time hopping — A type of spread spectrum using a form of pulse modulation in which the pulses are controlled by a code sequence.

In addition to the time uncertainty related to propagation, there is also a frequency uncertainty in trying to keep oscillators at two or more stations from drifting.

Because the stations cannot be expected to synchronize on their own with no reference, it is normal for at least one station to transmit an initial reference for sync purposes. Upon reception, the receiving stations can generate the code sequence at a rate different from the code sequence used at the transmitter. Eventually, the two code streams will slide into phase with one another and may then be locked up. After initial synchronization, maintaining sync presents another problem which can be solved in different ways. One is to use a code sequence preamble at the beginning of each transmission. Another is to use ultra-stable clocks at all stations to ensure that the code-sequence clock frequency does not change. Numerous other schemes have been devised and implemented with varying degrees of difficulty. The exception is that chirp systems do not have this problem because the matched filter used in demodulation inherently achieves sync on each pulse transmitted.

Transmitter and Receiver Design: One difference between SS and conventional rf equipment is that SS requires transmitters and receivers that have 10 to 100 times the bandwidth of narrow-band systems. That may pose some problems at lower frequencies, but in the 420-MHz band the amateur television (ATV) experimenters already have equipment that can handle wideband signals. The transmitter design, which should be well within amateur capability, amounts to taking care in broadbanding the rf stages after modulation to maintain amplitude linearity, and in keeping the antenna system VSWR very low. Receivers must not only have wideband front ends but must have good dynamic range and linearity to handle both the desired signal and any interference. Where an i-f is used, the frequency chosen must be higher than for conventional transceivers. In practice, 70 MHz is a common SS i-f. Components (such as filters) are available for this frequency to build SS i-f modems (modulator/demodulators).

Amateur SS Experimentation

The Amateur Radio Research and Development Corporation (AMRAD) has formed a group to experiment with several different types of SS systems. Before on-the-air tests are conducted, it will be necessary to obtain a Special Temporary Authorization (STA) from the FCC. Readers wishing to participate should contact AMRAD via the author.

The continued existence of the Amateur Radio Service depends, in part, on amateurs' contributions to the state of the art through experimentation. Spread spectrum is fertile ground for amateur investigation. While SS has been developed extensively for military and other governmental applications, civil uses are virtually unexplored. Hams have the capacity to build SS systems which are practical and inexpensive. There is no guarantee that SS will prove itself worthy of regular use in civilian radio services, but the technology is ripe for Amateur Radio experimentation. QEX

[The title photo, a spectrum analyzer display of a direct-sequence spread-spectrum signal, is reprinted through the courtesy of Robert Dixon and John Wiley & Sons, Inc. The photo appears on the cover of *Spread Spectrum Systems.* — Ed.]

Selected Bibliography

Reading material on spread spectrum may be difficult to obtain for the average amateur. Below are references that can be mail ordered. Spread spectrum papers have also been published in IEEE Transactions on Communications, on Aerospace and Electronic Systems and on Vehicular Technology.

Dixon, *Spread Spectrum Systems,* 1976, Wiley-Interscience, 605 Third Ave., New York, NY 10016, $29.50.

Dixon, *Spread Spectrum Techniques,* IEEE Service Center, 445 Hoes La., Piscataway, NJ 08854, IEEE member prices $19.45 clothbound, $12.95 paperbound; nonmembers $29.95 clothbound.

Brumbaugh, et al., *Spread Spectrum Technology,* a series of papers presented at the 1980 Armed Forces Communications Electronics Association show printed in the August 1980 issue of *Signal,* available from AFCEA, Skyline Center, 5205 Leesburg Pike, Falls Church, VA 22041.

Current published searches on spread spectrum are available from the U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161 for $30 each:

Spread Spectrum Communications (99), May 79 NTIS/PS-79/0494/9.

Spread Spectrum Communications (188), May 79 (EI) NTIS/PS-79/0495/6.

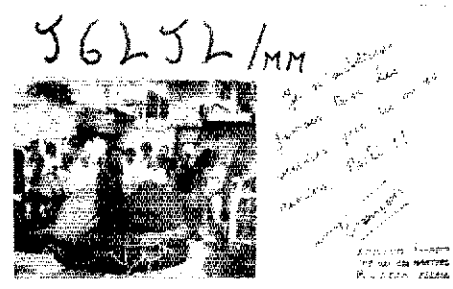
Strays

HAMS RESCUE HAM IN BERMUDA TRIANGLE

☐ Three seagoing Amateur Radio operators recently had an unusual rendezvous. Captain Emerson Hiller, KA1CYA, master of the research vessel *Knorr*, and Bill Edwards, K5CN, radio officer on the *Knorr*, brought Francois Erpicum, J6LJL/MM aboard the ship where he was a guest for almost a month.

Francois was certainly maritime mobile when he was found in the Bermuda Triangle area where he had been adrift in a life raft for four days and nights. His sailing vessel, the *Nanesse*, had been struck, holed and sunk within seconds after being hit on May 20. He was rescued just after midnight on May 24, when the watch on the *Knorr* sighted his red flare. He never learned what it was that struck his vessel. Word of his rescue was sent to the U.S. Coast Guard and over amateur frequencies.

Francois departed the *Knorr* upon its arrival in Ponta Delgada, Azores, where he was met by Belgian officials who assisted him in matters of immigration, missing passport and the like. During a continuation of his cruise, aboard another sailing vessel, he plans to write a magazine article and a book about his experiences. Keep your ears open for Francois, J6LJL/MM, from the far reaches of the Pacific. It will help if you speak French, but when last seen, Francois was picking up English quite rapidly. — *Bill Edwards, K5CN, McAllen, Texas*



The covered life raft, featured on this unique QSL card, is one reason why Francois Erpicum, J6LJL/MM was in excellent condition after four days and nights adrift in the Bermuda Triangle.

I would like to get in touch with . . .

☐ someone interested in a game of chess via OSCAR 7, mode B. Albert Weiss, K6VU, 2461 Crestview Dr. S., Salem, OR 97302.

A 15-Meter Beam for $10

Got more time and trees than money? Enjoy the challenge of making a top performer out of a "primitive" set-up? See what can be done with a little ingenuity.

By Bruce Burnham,* C6ADN

Here is a very simple, extremely lightweight 3-element stationary beam antenna for 15 meters that is easy to build and adjust, and so cheap that it's practically disposable. It also works like a charm, and is ideal for antenna tinkerers — just lower it to waist height and stroll around it, making your changes. I will admit that it looks odd, and appears too flimsy to last, but mine has been up for nearly two years now, even surviving a hurricane with only minor damage. When I designed it, my goal was to maintain communications between the Bahamas and the home QTH in Aroostook County, Maine. This little cat's cradle delivers a consistently good signal from my old Hallicrafters HT-44.

Put This on Your Pipe and Smoke It

The bill of materials is just two 16-foot (4.9 m) lengths of 1/2-in. (13 mm) PVC pipe, a ball of nylon twine, some wire and a couple of empty laundry soap bottles. You will also need two lengths of 1/4 in. (6 mm) or larger rope long enough to toss over nearby trees so you can haul this thing up into the sky. My wire elements are made of heavy aluminum stuff, sold as grounding cable for the local CB fraternity. Copper should be an improvement, but at the time I didn't have any.

It's best to stake the parts out on the ground approximately where the antenna will be raised, because once you begin putting it together, it starts to develop a "mind of its own." I considered using bamboo poles, but none were available. Besides, 32 feet of bamboo is heavy enough to offset the light, flexible design I had in mind. If you can find 'em, try 'em. When you buy the PVC pipe, get the cheapest, lightest stuff you can find; the grade I got was marked "irrigation." It will be so limber and floppy that you'll have trouble getting it home on the roof of the car, but don't worry; we'll fix that with string and ingenuity.

A 3-element beam antenna is just a dipole with a reflector element behind it and a director element in front at the proper distances to nudge your radiated signal in the direction you'd like it to go. The only problem is holding these parasitic elements out away from the driven element with lightweight, weather-resistant components. Take the two 16-foot (4.9-m) lengths of PVC and lay them down on the ground between two trees or other high points that are approximately at right angles to the direction you want to cover. Hold them down with something about 23 feet (7 m) apart at the reflector end and 21 feet (6.4 m) apart at the director end of the intended beam.

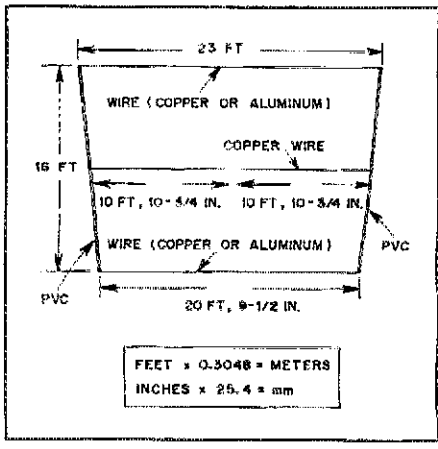


Fig. 1 — Diagram for laying out the elements of the beam.

Now calculate your dipole length based on the proposed frequency of operation, using the standard formula: length in feet equals 468 divided by the frequency in MHz. The reflector will be 5% longer than this length, the director 5% shorter. Since my sked is on 21.4 MHz, an electrical half-wavelength comes out to 21.869 feet (6.7 m).

Now drive a spike into the living-room floor [(?) — Ed.] or other convenient spot; bending a hunk of wire around the

*c/o USINS, P. O. Box R-2664, Freeport, Bahamas

nail, measure off exactly 1/4 wavelength, and mark the parallel wires with tape. Cut the wires 4 or 5 inches (100 or 125 mm) beyond the tapes to give yourself attachment and tuning length. Cut the wire at the bend and fasten each side to a center insulator. Cut your reflector 1 foot longer than the dipole assembled length, tape to tape, plus the same few inches for attachment. The director element is made the same way, only it is 1 foot shorter than the dipole (5% of 21.9 equals 1.09 foot [332 mm]). Overall dimensions are given in Fig. 1.

Next, cut six 1-inch strips from around the plastic laundry soap jugs — Era containers have a nice red color that turns passionate pink in the sun. Make them long enough to go around the tubing and leave a double tail 4 or 5 inches (100 or 125 mm) long to which the wires will be fastened (Fig. 1). Crimp these straps onto the PVC with small bolts or "pop" rivets and washers, up close so they will stay put. Place one strap an inch in from each end, and one at the midlength of each piece of pipe. Drill two holes about 3/16-in. (5-mm) dia in the last inch of each end of the spreaders, one hole vertical and one hole crosswise.

Now fasten the dipole between the centers of the two spreaders, the reflector across the end that will be the "back" of the beam, and the director across the end that will be pointing in your preferred direction when the antenna is hoisted in place.

The eight-foot spacing thus obtained between elements falls within the recommended 0.16 to 0.23 wavelength called for in the *Handbook* section on Yagi antennas. If you want to experiment with tuning the array for maximum efficiency, start with the full length of wire and trim for a peak at your frequency. You can also change the relative spacing of elements by moving the center driven element back and forth. I just slapped this together at the calculated dimensions, and it has worked so well that I haven't felt the need for any improvement.

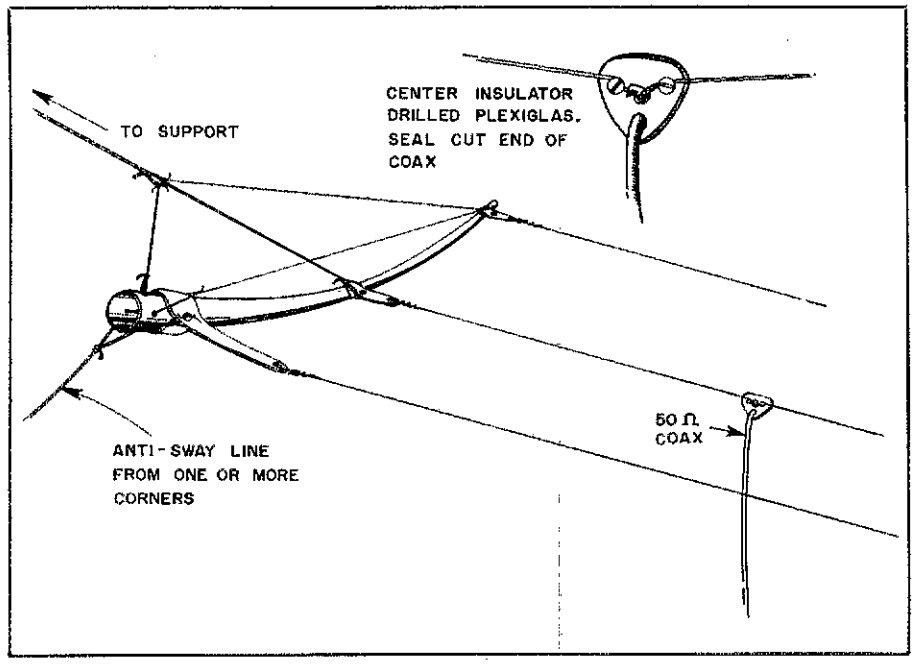


Fig. 2 — Detailed view of one side of the 15-meter beam. Notice how the bow and bridle work against each other to hold the beam rigid. An exploded view of the feed-line hook-up is shown in the inset.

Bow Plus Bridle Equals Backbone

Now is the time to put some backbone into those utterly limp lengths of PVC that had you worried until now. Assembly details are given in Fig. 2. Thread one end of some nylon twine through the transverse holes in one end of the spreaders, tie in a bowline knot and stretch the twine down to the other end of the spreader and through the same set of holes in that end. Haul up tight so the pipe forms a shallow bow about 18 in. (460 mm) deep, and tie it off so it holds that shape. Using the other set of holes, form a bridle of more twine from one end of the spreader, out to a point about 10 feet from the midpoint of the PVC, and make it fast at the other end. At the apex of the triangle formed, tie in a ring for your hoisting line. I made the rings from short sections of heavier plastic pipe. The twine used was nylon mason's chalkline. Run another cord from the ring to the pipe at the center insulator, winding the string over and around the dipole strap to hold it in place. These three cords must be equally tensioned so that when a strain is taken on the hoisting lines, the bows will stand vertically with the "bowstrings" uppermost, each held in place by the pull of the wires on one side and the bridle on the other. It's much easier to do than it sounds.

When you have treated the other spreader the same way, and made fast your coax feed line to the center insulator, toss a weighted string over your two support trees. Haul up the hoisting lines, tie into the two rings and haul away. The antenna is so light that the topmost branches will easily take the weight without damage. Raise the assembly off the ground and see how it all hangs together. By tightening or slacking on the various cords, you can make this conglomeration into a surprisingly stable array, as long as you keep a strain on the two ends.

Before final hoisting into place, tie a length of cord to one or more corners of the beam so you can lead them off at an angle for stability. The array is very light and will sway in the wind, so these lines will control it and keep it from capsizing in a strong breeze. My antenna had been up for a year when Hurricane David struck while I was off the island. The array survived 90 mi/h winds with only a broken reflector and a capsize. Twenty minutes' work repaired the damage.

Don't try to shortcut construction by eliminating the strap insulators. If you fit the wires directly to the tubing, the ends will flex in the wind and break off as the array moves about; that's what happened to my reflector. The straps act as shock absorbers as well as insulators, and they have lasted over a year here at 26° north latitude in the sun and salt air.

Since I run a rather primitive station, I can't give very precise measurements; with my old 130-watt HT-44, however, I appear to get a doubling of signal strength out, and the same on receive. Any time the band is open I get 5/9 reports from New England and Canada, and have worked Hawaii, Alaska, Europe and Africa off the sides. Not bad for an antenna at 25 feet (8 m), surrounded by tall pines, with a power line only one wavelength in front of and above it.

There must be a respectable front-to-back ratio, because signals from South America are generally lousy. The fact that the driven element hangs about 2 feet (600 mm) below the parasitics doesn't seem to hurt. The thing shows me an SWR of 1.3 to 1 at 21.3 MHz, and no more than 1.4 to 1 at the band edges, as compared to 1.1 to 1 for my dummy load (50 ohms worth of 1000-ohm, 2-watt resistors in a peanut-butter jar full of oil. . . . I *told* you this was a primitive operation.) My advice to you is to try this antenna. What have you got to lose? QST

Ladder Crystal Filter Design†

Build a high-performance hf filter at a fraction of the cost of a commercial unit — yet with virtually no constructional problems. Refer to December 1978 QST for earlier information.

By J. A. Hardcastle,* G3JIR

In previous articles on ladder crystal filters[1] experimental results were presented without any accompanying theoretical analysis, since the practical difficulties of measuring crystal parameters accurately would have made this information valueless to most radio amateurs. However, a simple measuring procedure has now been devised which, in conjunction with a set of capacitor coefficients, allows the construction of filters of predetermined bandwidth. Sets of design coefficients for filters using up to eight crystals are given and accompanied by a description of their derivation.

Frequency Response

Fig. 1 shows two frequency response curves. The first is known as the maximally flat or Butterworth response, and the second as the equi-ripple or Chebyshev response. Ideally the number of positive peaks in this latter response should equal the number of crystals, and be of equal amplitude over the whole passband. However, in practice, fewer peaks than expected are usually found, some having merged with each other. And the ripple amplitude usually increases towards the band edges because the crystals and capacitors have a finite and unequal Q; these effects are particularly marked in higher-order filters.

In applications where some passband ripple is acceptable, the Chebyshev response is preferred because it has a steeper rate of cut-off and requires a lower impedance circuit than an equivalent Butterworth filter. This latter factor can be a decided advantage in circumstances which would otherwise require impracticably small capacitors.

Filter Design Coefficients

It has been shown previously[2,3] for Butterworth filters that much of the labor can be taken out of filter design if each capacitor is assigned a coefficient, determining its relationship with its neighbors, and hence the filter frequency response. Fig. 2 gives design coefficients, for 3rd-, 4th-, 6th- and 8th-order Chebyshev filters which have been calculated from formulas published by Amstutz.[4] Actual capacitor values are derived from these coefficients by applying the formula

$$C = \frac{k \times 10^6}{2\pi fR} \qquad \text{(Eq. 1)}$$

where

k = capacitor coefficient
f = filter center frequency (MHz)
R = circuit impedance (ohms)
C = capacitance (pF)

In hf ladder networks it is advantageous to use shunt capacitors rather than series capacitors because this allows stray capacitance to be absorbed and allowed for in the physical components. Fig. 2 also shows these Type 2 filters where the input and output series capacitors have been transformed into their shunt equivalents. Unfortunately this requires an increase in circuit impedance which may not always be convenient, in which case the Type 1 filter must be used.

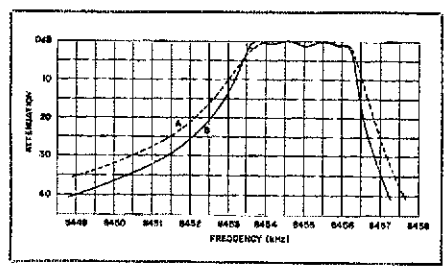


Fig. 1 — Frequency responses of two typical 4-crystal filters, (A) Butterworth, (B) Chebyshev. The Butterworth filter bandwith is actually 2369 Hz and the whole response has been scaled up to allow direct comparison with the 2762-Hz bandwidth Chebyshev filter.

Filter Bandwidth

One of the most important parts of a filter specification is its bandwidth. Dishal's procedure[5] allows this to be determined from a knowledge of the equivalent series inductance of the crystal, which, as was said previously, is a difficult parameter to measure, and the subsequent calculations are lengthy.

Previously, a disadvantage of the simplified capacitor coefficients method has been the need to make several trial filters before the required bandwidth could be attained; however, it has now been found that these initial trials can be simplified by making systematic measurements on a 2nd-order filter. These results are then applied to whichever higher-order design is required.

Initial Tests

The test filter is connected as shown in Fig. 3, and its frequency response and bandwidth measured using the filter test set described previously.[1] Choice of an initial value for capacitor C is arbitrary, but a value of 33 pF would be suitable for many crystals. The test impedance may then be calculated by transposing Eq. 1:

$$R = \frac{k \times 10^6}{2\pi fC} = \frac{0.613 \times 10^6}{2\pi \times 8.454 \times 33} = 349.7\ \Omega \qquad \text{(Eq. 2)}$$

The test-set input and output impedances are now set to this value. To set

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†Adapted from an article of the same title in *Radio Communication* (RSGB) for February 1979.

[1]References appear on page 23.

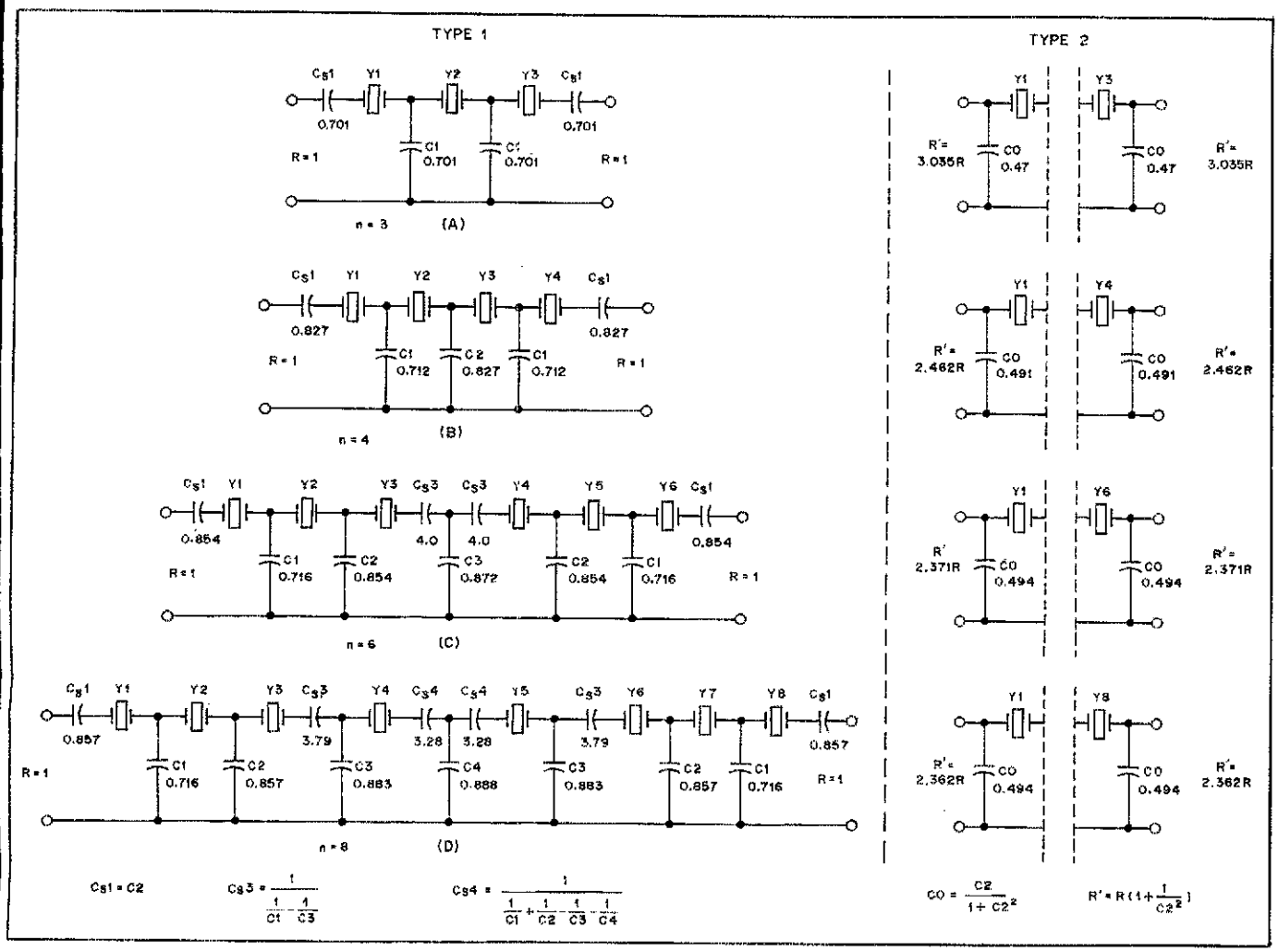

Fig. 2 — Design coefficients for Chebyshev filters.

the input impedance, measure across A-B with an ohmmeter while adjusting R3; to set the output impedance, measure across points X and Y and adjust R4. The different input and output circuits are necessitated by the particular circuit arrangements of the test set.

A typical frequency response curve obtained by this method, Fig. 4 shows a dip of very nearly the theoretical 1 dB in the center. Ideally the peaks on either side should be equal, but rarely are, because of minor differences between the two crystals. However, the most important parameter, the bandwidth, is well defined and easily measured because the response is falling rapidly at the 3 dB-down points.

Filter bandwidth has been found to be inversely proportional to the square root of the coupling capacitance, and once an initial measurement has been made a very close approximation to the correct capacitance may be calculated from:

$$C2 = C1 \times \left(\frac{BW1}{BW2}\right)^2 \qquad \text{(Eq. 3)}$$

where C1 and BW1 are the capacitance and bandwidth found in the first measurement, and BW2 is the design objective.

Eq. 2 is used again to determine the new value of impedance to be used with C2. If these components prove to give the desired bandwidth, this impedance is used to calculate the required higher order filter from the coefficients given in Fig. 2.

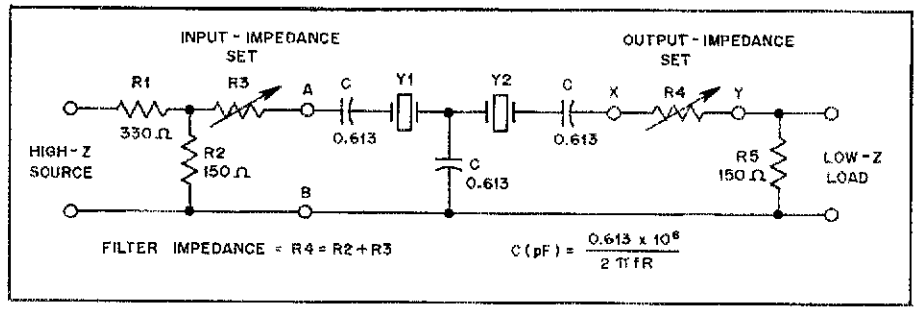

Fig. 3 — Preliminary tests to determine filter bandwidth use this circuit in conjunction with the filter test set (see text).

Design Example

A 6th-order Chebyshev filter will now be designed to illustrate the application of the procedures described so far. From Table 1 the components giving the bandwidth nearest to 2400 Hz are selected and C2 calculated.

$$C2 = C1 \times \left(\frac{BW1}{BW2}\right)^2$$

$$= 18 \times \left(\frac{2287}{2400}\right)^2 = 16.34 \text{ pF}$$

The new circuit impedance is then calculated

$$R = \frac{k \times 10^6}{2\pi fC}$$

$$= \frac{0.613 \times 10^6}{2\pi \times 8.454 \times 16.34} = 706\ \Omega$$

Using this value for R, the filter-

capacitor values can be calculated from the coefficients given in Fig. 2:

$$C1 = \frac{k1 \times 10^6}{2\pi fR}$$

$$= \frac{0.7159 \times 10^6}{2\pi \times 8.454 \times 706} = 19.1 \text{ pF}$$

Similarly C2 = 22.7 pF, C3 = 23.2 pF and C_s3 = 106.7 pF. This filter was constructed using miniature wire-ended crystals and preferred-value capacitors. The circuit is shown in Fig. 5, and the frequency response is shown in Fig. 6. Note that the 3-dB bandwidth is 2580 Hz, which is considered to be sufficiently close to the design objective for amateur purposes.

Components

Choice of crystals is largely limited to whatever is available cheaply, but it has been found that the miniature wire-ended crystals require a circuit impedance which is higher than for HC-6/U types. Although very satisfactory filters have been made using these miniature types, the high-impedance circuit is vulnerable to stray capacitance. Some individual capacitance trimming may be necessary to obtain the best performance. Therefore, when available, HC-6/U crystals are preferred.

Capacitors may be polystyrene or silver-mica types. Where very small capacitances are called for, a trimmer may be adjusted to the required value or a short piece of miniature coaxial cable may be cut to the required length.[5]

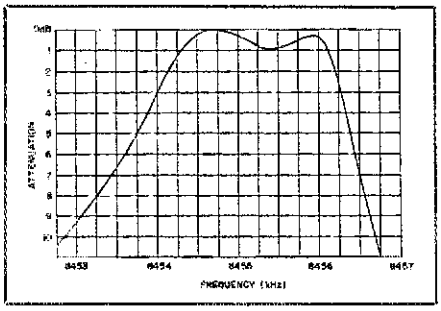

Fig. 4 — A typical test-filter response. The dip in the center of the passband is 0.9 dB and the bandwidth 2287 Hz. Ideally, the peaks would be symmetrical and the center dip 1 dB.

The Evolution of a Ladder Crystal Filter

Fig. 7 shows successive stages in the evolution of a ladder crystal filter. The initial low-pass prototype, Fig. 7A, is converted into a bandpass filter, Fig. 7B, by adding an inductor to parallel-resonate each shunt capacitor to the center frequency. Similarly each series inductor is series resonated by adding a series capacitor. The next stage of the process uses an impedance inverter, Fig. 7C and D, which converts a shunt, parallel-resonant circuit into a series, series-resonant circuit.

Although the impedance inverter uses a negative capacitor in its series arms, this is later absorbed by other, more positive capacitors, so there are no physically unrealizable capacitors in the final design. This procedure was described by Cohn[3] for use in the design of coupled resonator filters and was applied to crystal filters by Amstutz[4] by assuming that, for narrow-band filters, the series-resonant circuit within the dotted line in Fig. 7E is approximated with sufficient accuracy by a piezoelectric crystal, as shown in the filter of Fig. 7F.

Chebyshev Filter Coefficient Calculation

The Amstutz calculations may be illustrated by the following calculation of the coefficients for a 3rd-order filter.

Let the ripple amplitude be a = dB and e = 2.718 and n = number o crystals

$$\text{Calculate } m = \frac{a}{8.686}$$

$$s = e^m$$

$$t = \frac{1}{n} \operatorname{arctanh} \frac{1}{s}$$

If a = 1 dB and n = 3, then t = 0.476

The circuit impedance coefficient is now calculated from

$$R = \frac{\sinh t}{\sin\left(\frac{180}{2n}\right)} = 0.988 \qquad \text{(Eq. 4}$$

and the coupling capacitor coefficients are calculated from

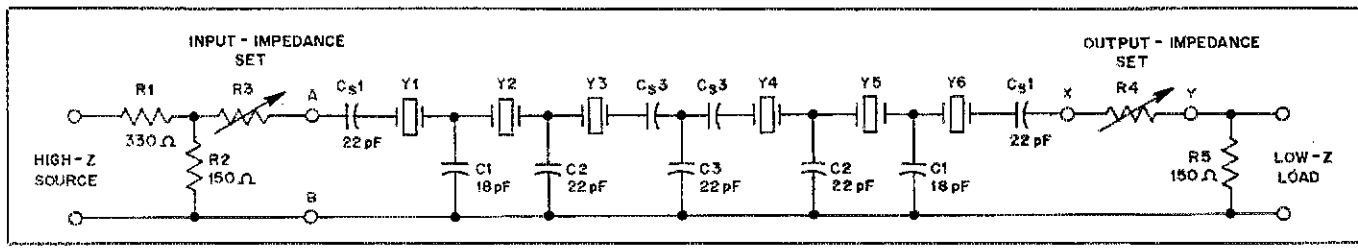

Fig. 5 — Six-pole Chebyshev filter.

Table 1

Test Measurements Made on a Pair of Crystals Using Various Capacitors (C) and Circuit Impedances (R).

R(Ω)	*C (pF)*	*f_1 (kHz)*	*f_2 (kHz)*	*Bandwidth (Hz)*	*Ripple (dB)*
769	15	8,454.198	8,456.742	2544	1.3
641	18	8,454.001	8,456.288	2287	0.9
525	22	8,453.837	8,455.912	2075	0.8
427	27	8,453.742	8,455.611	1869	0.9
350	33	8,453.660	8,455.333	1673	0.9

Note: R was calculated from Eq. 2 in each case.

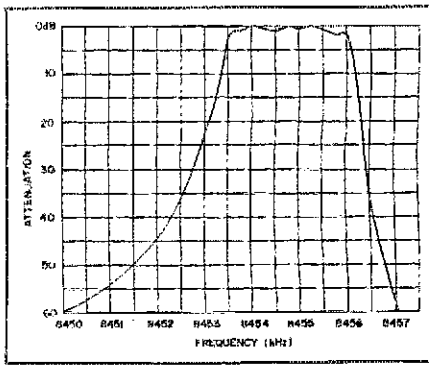

Fig. 6 — The response curve of the 6-pole Chebyshev filter. The bandwidth at −3 dB is 2581 Hz and at −60 dB is 7002 Hz. Note that there are only five peaks in the passband instead of the theoretical six.

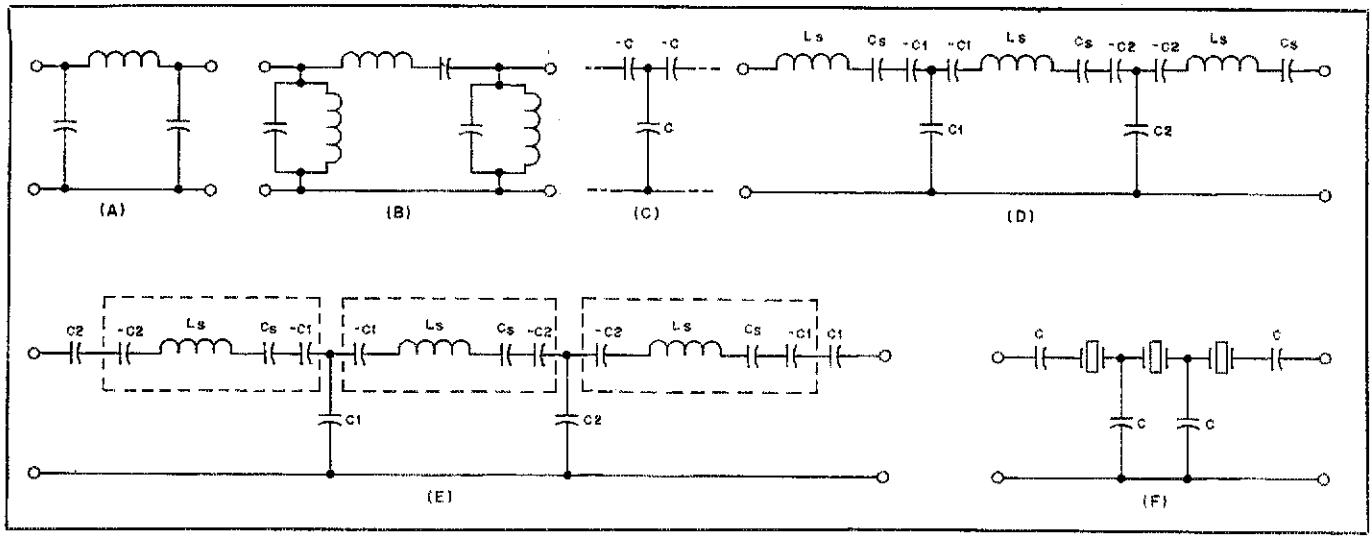

Fig. 7 — Stages in the evolution of the theoretical design of a 3-crystal filter.

$$C_b = \sqrt{\frac{\cos\left(\frac{180}{n}\right) - \cos\left(\frac{360\,b}{n}\right)}{\cosh 2t - \cos\left(\frac{360\,b}{n}\right)}} \qquad \text{(Eq. 5)}$$

For b = 1, 2, . . . (n − 1)
Hence C1 = 0.7092 and C2 = 0.7092.

The filter now appears as in Fig. 8A. This is normalized for a circuit impedance of 1 Ω by dividing the impedance by 0.988 and multiplying all the capacitors by the same amount, with the result shown in Fig. 8B.

As mentioned earlier, the series input capacitors may be replaced by shunt capacitors, C0 in Fig. 8C, and these are derived by the simple calculation shown in the diagram. In this example the impedance is increased by 3.035 by the circuit rearrangement. Colin[5] and Pochet[3] took this calculation one stage further by again normalizing for an impedance of 1 Ω, but this has not been done here in order to preserve the simple relationship between the Type 1 filter and the test filter.

Butterworth Filters

It is not necessary to give full details of the derivation of Butterworth filter coefficients because they follow a similar procedure to the previous paragraph. However, for completeness, the Amstutz formulas are given below so that anyone who wishes may confirm for themselves the coefficients published previously.

$$C_b = \sqrt{\frac{\cos\left(\frac{180}{n}\right) - \cos\left(\frac{360\,b}{n}\right)}{2}} \qquad \text{(Eq. 6)}$$

For b = 1, 2 . . . (n − 1)

$$R = \frac{1}{\sin\left(\frac{90}{n}\right)} \qquad \text{(Eq. 7)}$$

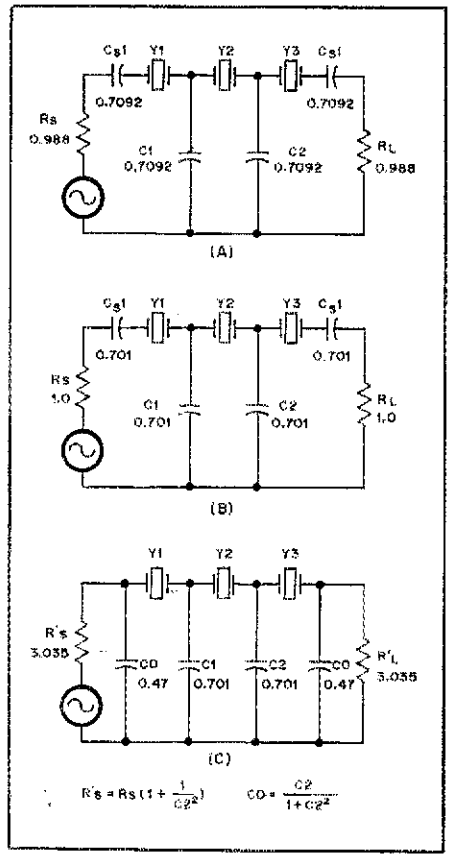

Fig. 8 — Three stages in the calculation of a set of design coefficients. At A, coefficients obtained from Eqs. 4 and 5; at B, coefficients for the Type 1 filter normalized for 1-Ω impedance. At C, coefficients for the Type 2 filter.

Design coefficients have been presented for a range of filters which should satisfy most amateur requirements. They have been tested by constructing filters using 2, 3, 4, 6 and 8 crystals, and the results of these measurements confirm that they behave in a virtually identical manner to filters made from Dishal's design. However, it must be noted that this simplified design method is limited to filters having relatively symmetrical frequency characteristics, and single-sideband filters must be designed using Dishal's more comprehensive design. Now that most of the experimental element has been removed from this simple procedure, it is hoped that more amateurs, particularly beginners, will be encouraged to construct their own filters, especially when inflation has placed commercial products almost beyond reach.

Acknowledgements

It is wished to acknowledge the many sources of information listed in the references; all have made their own contribution to an understanding of ladder crystal filters, without which the simplified method of predicting filter bandwidth could not have been developed. It is also wished to acknowledge the expert assistance of Miss A. E. Howarth for carrying out literature searches and making translations.

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[1]Hardcastle, "Some Experiments with High-Frequency Ladder Crystal Filters," *QST*, December 1978 and *Radio Communication* (RSGB), January, February and September 1977.
[2]Colin, "Formulas for the Calculation of Narrow Bandpass Filters with Identical Piezoelectric Crystals and Maximally Flat Attenuation Behavior" (in French), *Cables and Transmission*, Vol. 22, April 1968.
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[7]Cohn, "Direct Coupled Resonator Filters," *Proc. IRE*, February 1957.
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Improved RTTY Reception with the Yaesu FT-101

A few simple wiring changes will help your '101 "hear" better when copying RTTY and will "scrub" your transmitted afsk signal.

By Dr. Jesse E. Sherwood,* K4DLQ

Just about any ssb transceiver can be used for hf RTTY transmission when afsk is employed,[1] but unless the receiver section has an RTTY filter, the ssb i-f filter passband normally used is too wide to provide optimum reception. Audio filters can be an aid in such a situation, but the wide i-f passband allows nearby QRM to affect the receiver age and introduce error in the decoded information.

A Filter-Switching Technique

The Yaesu FT-101 transceiver cw-filter center frequency (3179.3 kHz) differs from the usb local-oscillator frequency (3178.5 kHz) by 800 Hz. For most hf narrow-shift RTTY operation, with the mark and space frequencies at 2125 and 2295 Hz respectively, the corresponding intermediate frequencies cannot pass through the cw filter; they fall well outside the cw filter passband. See Fig. 1. If the lsb oscillator (3181.5 kHz) is used in place of the usb oscillator, however, it will cause the corresponding RTTY intermediate frequencies to be correctly positioned for use with the cw filter: 3181.5 kHz − 3179.3 kHz = 2.2 kHz. The use of the lsb crystal frequency also provides the right mark/space relationship required for RTTY operation.[2] The modification employed here consists of rewiring the switching circuitry so the lsb local oscillator and the cw filter are switched into operation when the MODE switch is in the AM position.

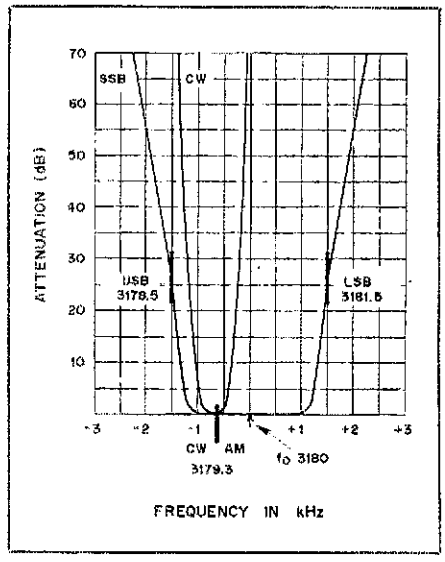

Fig. 1 — The Yaesu FT-101 ssb- and cw-filter characteristics. By means of this chart, the 2.2-kHz difference between the lsb-oscillator frequency and the "nose" of the cw filter is readily visualized.

Mode-Switch Wiring Changes

Fig. 2A shows the wiring of the FT-101 MODE switch (S2) as it appears in its original configuration. The changes required alter the switch wiring to that shown in Fig. 2B. Note also that the wiring to S5B (HEATER) is removed and a wire connected between MJ(4) pin 9 and MJ(5) pin 4. After carrying out these changes, the following operational features apply: The AM position of the MODE switch is now used for RTTY; no a-m operation is possible other than exalted carrier reception when using the USB and LSB positions. The sidetone is generated in the TUNE position, and in the CW position the sidetone is generated even with the HEATER switch in the OFF position. The latter makes it possible to use the sidetone oscillator for code practice without fear of transmitting a signal.

Summary

The improvement in RTTY reception is quite impressive; strong signals a few hundred hertz from the desired signal are easily rejected by the cw filter. During transmission, the transmitted afsk signal will pass through the cw filter. This will aid in the suppression of both the unwanted (upper) sideband and audio harmonics. No doubt similar modifications can be applied to other transceivers that use equivalent techniques. QST

*Associate Professor of Physics, Midwestern State University, Wichita Falls, TX 76308

Notes

[1][Editor's Note: This assumes the equipment is properly designed, constructed and operated. Unwanted sidebands, audio distortion and carrier must not be present to a degree which will cause interference in receiving equipment of good engineering design.]

[2][Editor's Note: For amateur RTTY operation, mark is transmitted high and space is low.]

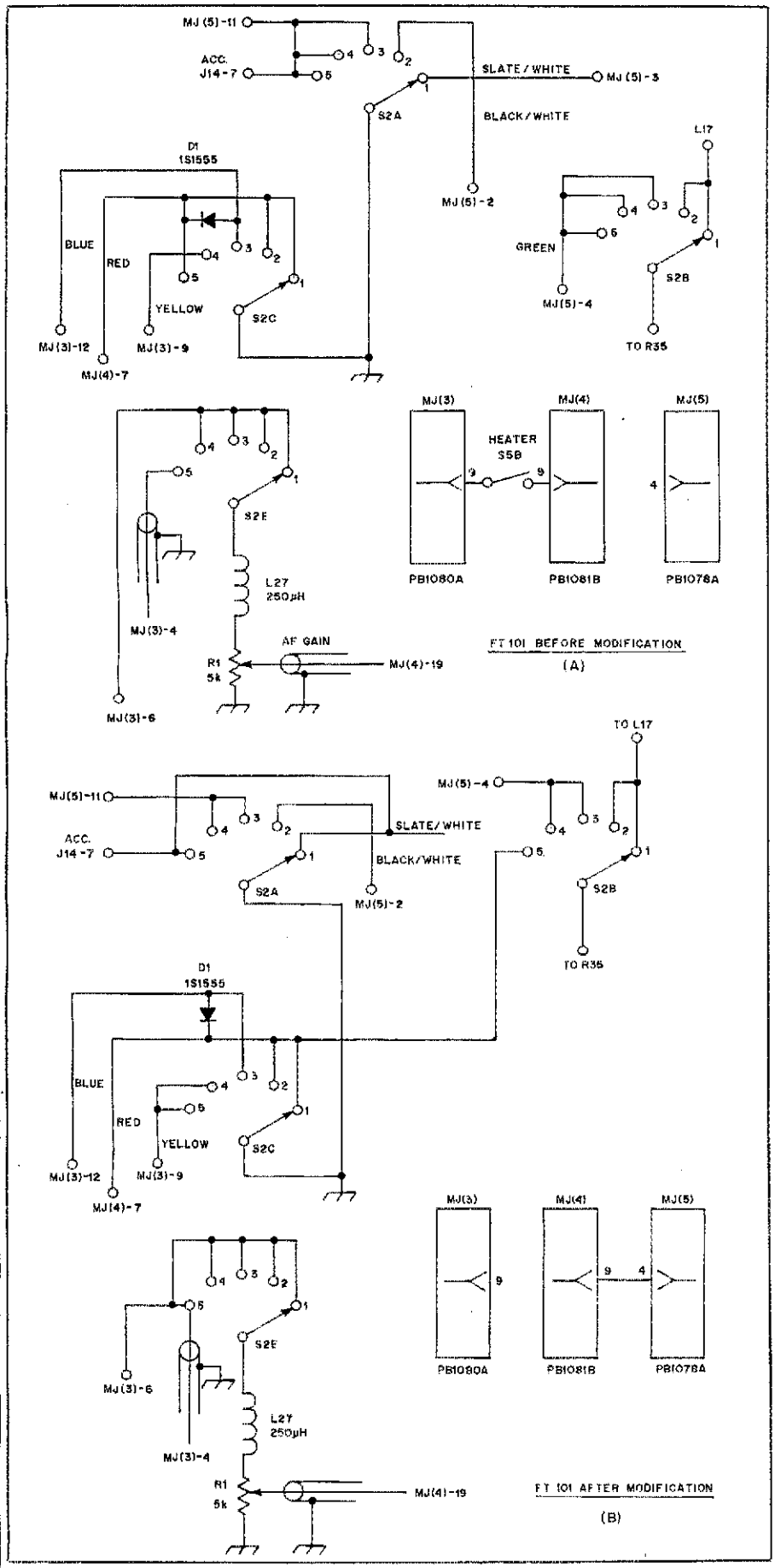

Fig. 2 — At A, the partial diagram of the FT-101 before modification. The wiring color codes may be different and L27 may not be present in some models. MODE and HEATER switch wiring modifications are shown at B. Resistances shown are in ohms; k = 1000.

Strays

EUROPEAN 10-METER FM REPEATER

☐ A European 10-meter fm repeater, DBØQK, has started operation in Mainz, Germany, 10 miles southwest of Frankfurt. The call sign is transmitted automatically every 45 seconds in the output frequency, 29.670 MHz. Operating hours are from 6 A.M. until 8 P.M. daily. The repeater is activated by a 1750-Hz tone burst on an input frequency of 29.570 kHz. Interested amateurs are invited to try the fm repeater during 10-meter band openings. — *Amateur Radio DBØQK, Postbox 4040, D-6500 Mainz, Federal German Republic*

TA PROFILES

☐ With our appreciation for his services, we introduce ARRL Technical Advisor (TA) Jefferson H. Walker Jr., W4AAD/W3JW. His field of expertise is equipment performance measurements and EMC/RFI.

First licensed in 1953, Jeff now holds an Extra Class license. His primary interests in Amateur Radio include measurement and instrumentation applications, with particular emphasis on rf (vhf — microwaves), MARS, RTTY and computer applications. He is a life member of ARRL, a member of Army MARS, AMSAT and Baltimore Apple Corporation, and past president of the Peninsula Amateur Radio Club.

Jeff received his BSEE degree from North Carolina State University. He now resides in Pasadena, Maryland and is the Project Manager/Research Engineer for the Illinois Institute of Technology Research. Besides Amateur Radio, Jeff's other hobbies are skiing, boating, scuba diving and personal computers. — *Marian Anderson, WB1FSB*

TA Jeff Walker takes a break from his busy work schedule to smile for a photograph.

Results, Great Ionospheric-Hole Experiment

What happens when a large rocket punches a hole in the ionosphere? Scores of U.S. and Canadian amateurs pooled their listening talents to find out.

KP4 Beacon Transmitter Network

By Dick Simpson,* W6JTH (ex-K1KRP); Ray Vélez,** KP4EKA and Paul Bernhardt***

Both NASA and the Department of Energy are studying the feasibility and the environmental impact of proposed Satellite Power Stations (SPS), giant arrays of solar panels placed in geostationary earth orbit. Among the host of environmental questions to be considered in such a vast project are the potential effects of the exhaust of the new generation of large rockets which would be required to transport the materials into space to construct the SPS.

Any propagation changes because of large rocket exhausts would be of interest to all users of the radio spectrum, including shortwave broadcasters, the military, other government users and, of course, radio amateurs. To determine effects on propagation, a group of amateurs set up a plan to observe and report on this type of ionospheric depletion following a rocket launch on September 20, 1979.[1] Since the rocket creating this hole was to be launched from the Kennedy Space Flight Center in Florida, propagation paths between the eastern half of the United States and the Caribbean were expected to suffer the most severe interruption. To facilitate the amateur observations, we organized a network of beacon transmitters in Puerto Rico on the 80- through 6-meter bands.

We began soliciting KP4 volunteers in mid-summer 1979. Promises of glory were tempered with warnings that operation would probably be from midnight to 6 A.M. on two or more weekday mornings in late August or September. Nevertheless, after six weeks of recruiting, we had secured the tentative assistance of a dozen island hams.

Peter Mason, N6BBP, at the Jet Propulsion Laboratory (JPL) in Pasadena and the JPL Explorer Post 509 were to construct tape-cassette-actuated keyers and tapes so that each beacon could be operated in as simple and uniform a manner as possible. The ability to start a tape containing 5-wpm Morse text describing the experiment and letting it run for 30 minutes, with blank spots at five-minute intervals for identification, would free the operator for chores such as logging, monitoring transmitted power and other tasks.

Details of the beacon network operation had been left unspecified pending W6JTH's arrival in Puerto Rico a few days before the launch; the assumption was that he could devote full time to organization during these final few days. This was not to be, however, as the transportation he had been promised in advance did not materialize. With travel restricted and with the knowledge that many residents of Puerto Rico do not subscribe to telephone service, it became obvious that the stations we could use would be restricted to those owned by hams in the north-central part of the island — the only portion of Puerto Rico we could physically visit in borrowed automobiles in reasonable amounts of time. There simply was no way to communicate with the other KP4 volunteers on short and unpredictable notice.

We obtained the bare minimum number of stations required for all-band coverage and stumbled through a prelaunch test. The experiment itself was almost anticlimactic. All stations were on the air and operated as scheduled.

Organizational Tips

We have a few comments which may help others set up similar ventures in the future. First, reliable communication among the beacon stations is highly desirable. Only a few of our stations were equipped for 2 meters, and they were too widely separated for effective groundwave communications. A network for *receiving* stations was coordinated by W1JR on 75-meter phone. For us to have interacted via that net would have been difficult since medium-power stations in the Caribbean would find the U.S. East Coast a fairly long haul. Further, most of our stations were not equipped to operate on more than one hf band at a time.

Our second suggestion is that an aggressive planning effort be made. One of our early concerns was to avoid making wrong decisions early or to change direction too often. Instead, when faced with transportation and communication limitations late in the operation, we found it very difficult to pass any instructions or decisions on to our network.

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[1]Bernhardt, Klobuchar, Villard, Simpson, Troster, Mendillo and Reisert, "The Great Ionospheric-Hole Experiment," *QST*, September 1979.

A Power-Stepping Beacon

By Dick Simpson,* W6JTH (ex-K1KRP); Cameron Pierce,** K6RU and Paul Bernhardt***

The original goal in the Great Ionospheric Hole (GIH) Experiment, as far as Amateur Radio participation was concerned, was to detect fluctuations in received power and relate those to expansion of the exhaust cloud produced during the Atlas-Centaur launch of the High Energy Astrophysical Observatory (HEAO-C).[1] One of the problems to be faced, however, was that no two amateur installations would have the same receiving characteristics; in fact, without a thorough and elaborate calibration procedure, it would be difficult even to estimate the significance of the fluctuations reported at a single station.

One solution was to transmit carefully prepared calibration signals from a beacon unit. Implicit in reception reports then would be the receiver's own characteristics, which presumably could be factored out during processing of the reports. With the cooperation and support of the Northern California DX Foundation (NCDXF), we put together a beacon unit that was used in Puerto Rico during the GIH experiment. Its design may be of interest to hams having need of relatively simple power-stepping capability for short-term tests.

Fig. 1 shows the important modules in the beacon. We used a Kenwood TS-180, but any transceiver capable of generating 100 watts of power and having good frequency stability would have sufficed. A cassette recorder fed a bridge rectifier that, in turn, drove a relay which keyed the transmitter. The wattmeter was initially used to check output power into the antenna tuner and later to monitor power delivered to the antenna. A transmitter drive control was used to lower the output power from 100 watts to 10 watts. After that, 10 dB steps of attenuation were inserted manually to reduce the power successively to 1 watt, 0.1 watt and, finally, 0.01 watt. Our prerecorded tape allowed for 10 seconds of key-down at each power level; this was actually an operator choice and could have been changed simply by recording a new tape using the transmitter's sidetone oscillator. We kept several tapes on hand to cover various situations.

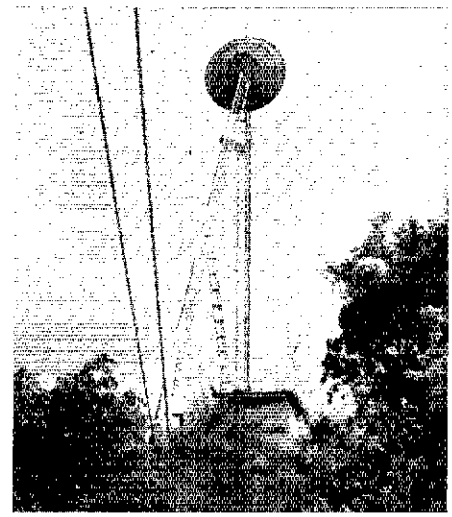
The beacon was semi-automatic. An operator was needed to start each transmit sequence and then intercede manually each time the power level was changed. Full automation could have been achieved by substituting relays, adding remotely controlled two-level drive and including control circuitry that would operate from a master clock. In our case this was not necessary and saved us the trouble of making modifications to a commercially valuable piece of equipment.

Choosing a Site

Finding a good location for a beacon is often the most difficult problem. One need not go to the Caribbean, but, if the best information is to be obtained from the transmissions, some thought should go toward the propagation path expected.

The beacon was prepared in California but was to be operated in Puerto Rico. The modules shown in Fig. 1 were assembled, along with spare parts and miscellaneous accessories, and packed into two heavy-duty suitcases.

Initially we had considered sharing the home of one of the other beacon operators in Puerto Rico. After inspection, however, it was clear that the limited space would make simultaneous operation of two independent stations difficult. Eventually we located a hilltop site overlooking the city of Arecibo and maintained by the Arecibo Observatory at one end of a microwave data link. The hilltop site offered a small shelter, commercial power, a spectacular view to the north and east, and very little else (see photo).



A small shelter at the north end of a microwave link provided space for W6YX/KP4. The 20-meter dipole was draped over the bushes and small trees (which behave rather like poison ivy or oak, as we later discovered) to the right in this photograph.

Reaching this site required a 15-minute uphill climb through hurricane-fed jungle vegetation and over limestone cliffs. We were able to winch the equipment to the top by using a fixed steel cable and trolley.

We erected a half-wave, 20-meter dipole outside the shack and aimed roughly toward the northwest to maximize the signal at most receivers. The match between the transmitter and antenna tuner was very good; between the tuner and the antenna it was slightly less satisfactory and varied some from day to day for no apparent reason. As we were

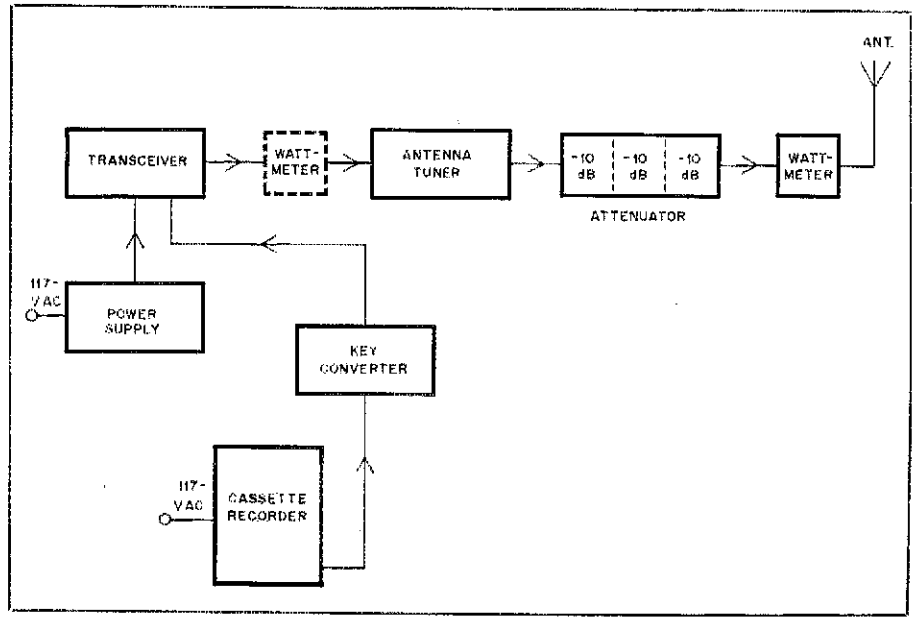


Fig. 1 — Block diagram of the W6YX/KP4 power-stepping beacon. A prerecorded message was stored on tape. When activated, the cassette recorder fed a bridge rectifier and relay (the "key converter") which keyed the transmitter. The first 10 dB of attenuation was obtained by reducing transmitter drive; thereafter 10 dB steps of attenuation were switched in via resistor networks. The wattmeter was used, first to optimize the output circuit tuning, and later to monitor forward/reflected power to the dipole antenna.

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References appear on page 28.

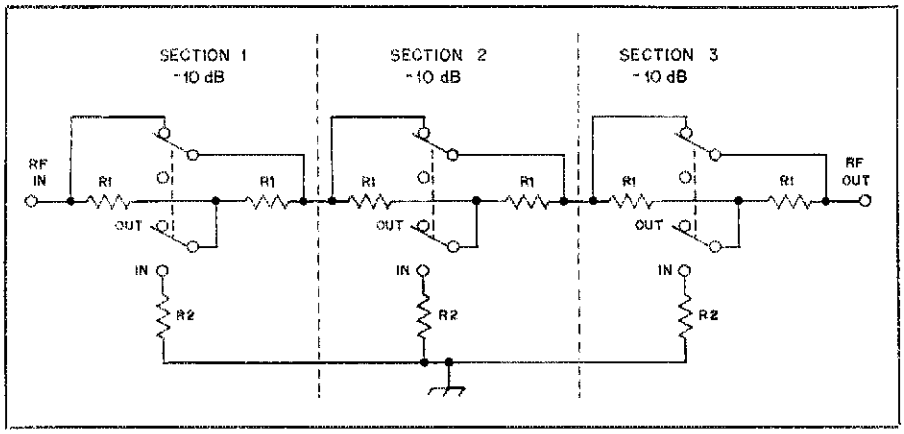

Fig. 2 — Detail of the attenuator network. R1 is 27 ohms (ten 270-ohm 5% resistors in parallel); R2 is 39 ohms (ten 390-ohm 5% resistors in parallel). One-watt resistors are used for the input arm and 2-watt resistors for the ground leg of stage 1; elsewhere 1/2-watt resistors suffice. The switches are dpdt ceramic rotaries.

more concerned with relative power during the stepping process, we put less effort into optimizing the antenna system than we might have otherwise.

A Few Small Problems

The actual experiment proceeded essentially without incident. Shortly after the rocket launch, at 0528 UTC on September 20, 1979, we suffered our only transmitter failure — a 10-minute break for which we have yet to find a cause. (Our two best candidates are that the transmitter overheat-protection circuitry was activated, or that a transient in the line voltage somehow upset the unit.) After checks for smoke, downed antennas and loose connections, we cycled the power and continued operation until local dawn without further interruption.

Because of unexpected problems in organizing the beacon transmitter network, we had failed to provide receiving operators with a good set of baseline transmissions prior to the rocket launch. To compensate partially for this, we decided to operate the power-stepping beacon the night after the experiment. Most stations reported hearing the 0.1 watt level both nights. Later we learned that several hams in the Stanford area had copied at 0.01 watt (a kilometer/watt figure of about 600,000) using beams. K6RU copied at 0.1 watt with a vertical antenna.

During the next few days we made general QSOs on 20 and, later, 15 meters. Results were interesting. We contacted what seemed to be an unusual number of QRP stations even though we were neither advertising QRP nor generally transmitting anything but 100 watts. The W6YX/KP4 call sign was very attractive — this may be truly appreciated only by a W6 operator who had not previously used an "exotic" call sign.

The NCDXF beacon now has a semipermanent beacon completed and operating on 14.1 MHz.[2] It is a more elaborate project than most hams would consider tackling. For those interested in a short-term beacon for some specific application, a design such as the one presented here could prove more feasible. The fact that an operator is required ensures flexibility should the needs of the beacon change during the test. Operator presence also guarantees that the transmissions are fully and directly controlled, as required by FCC regulations for most amateur stations.

References

[1]Bernhardt, Klobuchar, Villard, Simpson, Troster, Mendillo and Reisert, "The Great Ionospheric Hole Experiment," *QST*, September 1979.

[2]Troster, Villard, Ouimet and Pierce, "The WB6ZNL Beacon," *QST*, January 1980.

High Frequency Propagation Results

By J. A. Klobuchar,* W1BZT; Paul Bernhardt** and J. H. Reisert,*** W1JR

The amateur community has proven that the search for large-scale hf propagation changes caused by rocket exhausts in the ionosphere can be undertaken successfully by volunteer amateur observers. While satellite launches have long been routine, the particular launch we chose to observe and report on using amateur observers was special because it was one of a few where the rocket continued to burn at ionospheric heights in order to attain the desired satellite orbit. Amateurs responded enthusiastically, making this experiment a success.

Theoretical studies of hf propagation in the vicinity of an ionospheric hole show that focusing, defocusing, multipath fading and escape of radio waves could occur through the hole.[1] We wanted an experimental setup to look for all of these effects. We solicited amateur participation through announcements in *QST*, *Ham Radio* and *Ham Radio Report*, and by an article in *QST*[2] giving many of the preliminary details of the experimental plan. We asked that interested volunteer participants send for additional information. More than 220 people requested and were sent detailed information, including specialized log sheets. Each station was assigned a specific beacon frequency to monitor during the experiment. Our intent was to obtain an even geographic distribution of monitoring stations with the majority of them listening to the 14.1-MHz beacon, which was closest to the anticipated maximum useable frequency (muf) for the Puerto Rico-to-U.S. path. We expected that frequencies nearest the muf would be most affected by the ionospheric changes produced by the Atlas-Centaur launch.

The log sheets we distributed asked that observers note the average received signal level and fading rate over time intervals of one to two minutes for approximately one half hour after the launch, and over two- to five-minute intervals before and well after the launch period. We also asked for a list of receiving station equipment, including antennas used, so that we could judge, at least in a relative way, the reports received from stations located near each other.

Results-Data Received

We received quantitative reports of signal strength from 156 volunteer observers. The average quality of the reception reports was very high, with many stations recording averaged S-meter readings every few minutes. Some gave maximum and minimum readings over a one- or two-minute time interval; others commented on any changes in fading rate observed.

Reports were received from 35 states including Hawaii, and 3 Canadian provinces, including British Columbia. Fig.

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[1]References appear on page 31.

gives the location of the stations in the continental U.S. and Canada who sent in reception reports on KP4 signals. Many stations used more than one receiver so that 220 separate beacon reception reports were received, with 110 received for the 14.1-MHz beacon, the one we had hoped would show the greatest effect.

In any kind of volunteer experiment care must be taken to see that data quality is good. Besides the somewhat fortuitous power failure of W6YX/KP4, which enabled us to determine data quality of the 14.1-MHz observers, we judged the logs by the care used in recording signal strength, whether average or peak signal was indicated, the time interval and spacing over which the S-meter readings were taken, comments on fading rate, any QRM or QRN noticed and relative signal strength versus station equipment used. We used a data quality index ranging from 1 to 5, with 5 rated as outstanding and 1 rated as not useful. The 156 observers' data (rating followed by number of reports) were judged as follows: outstanding — 17; excellent — 77; useful — 22; doubtful — 19; and not useful — 21.

Some of the logs judged to be doubtful or not useful were the result of observers trying to monitor several frequencies with one receiver, resulting in not enough data being recorded on any one frequency to give a good quantitative picture of the signal-strength changes on any one beacon frequency.

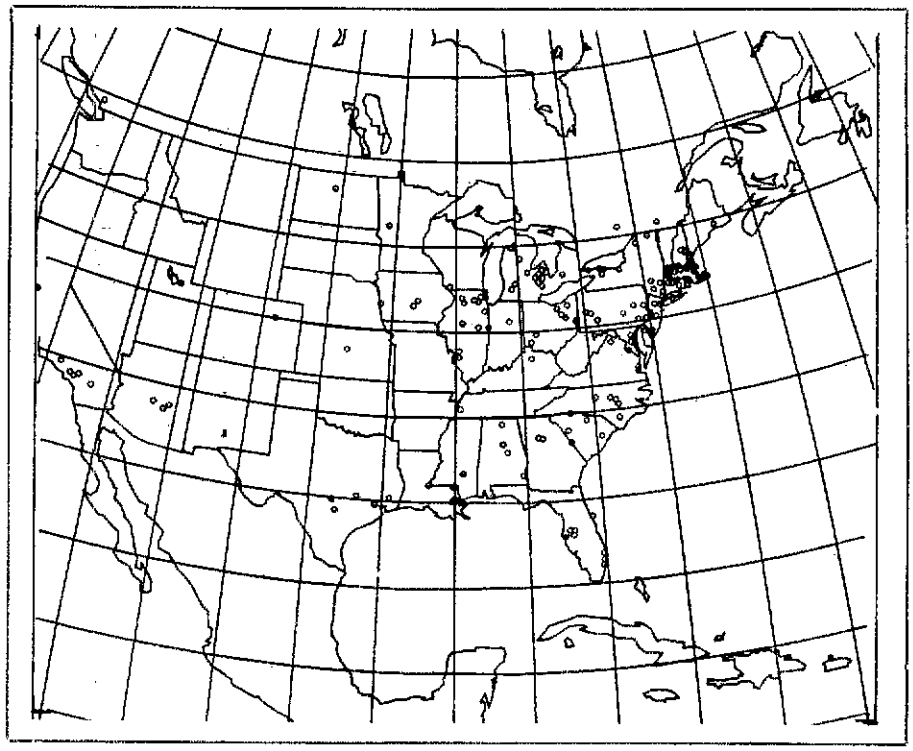


Fig. 1 — Map of observers in the continental U.S. and Canada who sent in reports of hf beacon reception.

QRP Results — 14.1-MHz Power-Stepped Beacon

The 14.1-MHz beacon generated the most interest because five different power levels were transmitted, from an output of 100 watts down to the lowest of only 10 milliwatts, in 10 dB steps. Of the 110 operators who sent in logs monitoring the 14.1-MHz beacon, 102 heard at least the highest three power levels; 74 stations heard signals down to the 100 mW level and 25 copied signals down to the 10 mW output level at least 50% of the time, even with many reports of QRM on the frequency. Who said QRP wasn't fun?

Many stations noticed that the 10 dB power steps, while noticeable on the receiver S-meters, were accompanied by normal ionospheric fading of even greater amounts at times, so that it was important to read average signal-strength values. W6YX/KP4 sent long dahs of 10 seconds' duration at each power level for observers to try to obtain average readings at each power-output level. The fading observed is the typical QSB encountered on hf propagation paths because of the received combination of energy from several rays at one time, adding randomly in amplitude, phase and polarization. The power-stepped beacon on 14.1 MHz afforded an opportunity for many stations to observe first-hand the relative fading depth and influence of different transmitted power levels on a one-hop, F2-region, hf-propagation path.

Propagation Results By Band

3.6 MHz — Strong signals were heard by at least 31 stations from KP4AAQ. No station reported any fading or signal dropouts which could reasonably be attributed to the hole in the ionosphere produced by the rocket exhaust.

7.1 MHz — With 35 stations reporting with data on this frequency there were a few reports of short fading intervals at or near the rocket launch time. We have taken the log sent by KA3DVR, Carlisle, Pennsylvania, located less than 150 miles north of the optimum ground locus for one-hop signals transmitted from Puerto Rico, and plotted the relative received signal strength versus time to give an illustration of propagation on 7.1 MHz from Puerto Rico to Pennsylvania. Fig. 2 shows the maximum and minimum signal strength readings of KP4X beacon transmissions taken by KA3DVR from approximately 0510 to 0628 UTC on September 20, 1979. Note the normal fading of 15 to 30 dB observed during much of the receiving period, buildup of signal from 0510 to 0525, followed by fairly steady average readings until 0542 and with somewhat lower received average signal strength after 0544. We know from independent measurements of the F region that the hole in ionization was produced fairly soon, at least within a few minutes of the time that the rocket reached the F region maximum at 0535 UTC, so the small drop in signal seen by

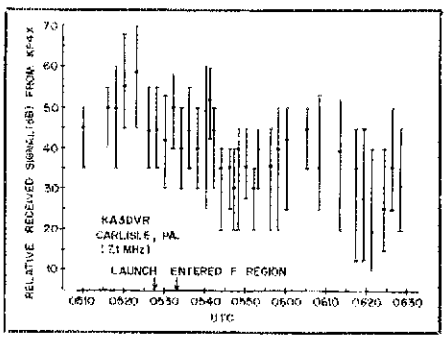


Fig. 2 — Relative signal received from KP4X by KA3DVR on 7.1 MHz in Carlisle, Pennsylvania.

KA3DVR at 0544 was probably not because of any rocket-launch exhaust effects. We concluded from this excellent data taken by KA3DVR, and from similar logs received from others for 7.1 MHz, that there were no significant effects seen on 7.1 MHz.

14.1 MHz — We have already discussed the QRP aspects of propagation on 14.1 MHz. The power-stepped beacon, while very interesting for a QRP demonstration, did not provide the expected advantage to signal-strength reception, primarily because of the approximate 50% duty cycle of the transmissions. The loss of power from 0537:21 to 0541:51 also led to some confusion. A chart recording made by WA8TRG, Sugar Creek, Ohio (Fig. 3) is a good synopsis of reception on this band. Note that the different power levels, the off-the-air times and the interference levels can be seen clearly on

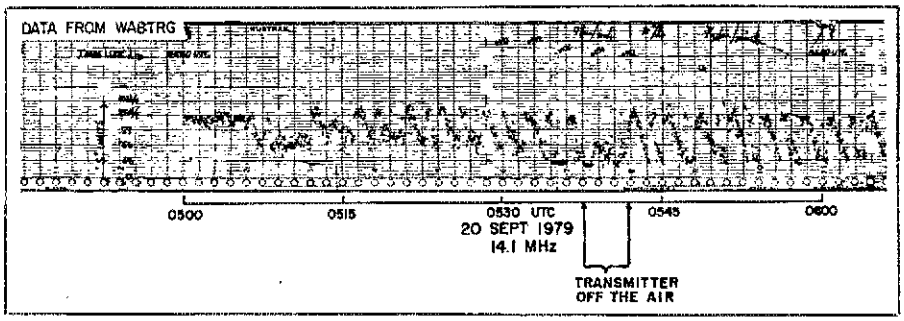


Fig. 3 — Chart recordings of signals from W6YX/KP4 on 14.1 MHz received by WA8TRG, Sugar Creek, Ohio.

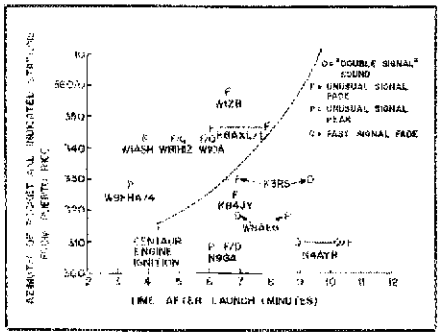


Fig. 4 — Plot of the azimuth of the rocket trajectory and various stations, as viewed from Puerto Rico, versus time after launch.

the chart recordings. Again no major band dropout was seen by anyone on 14.1 MHz, and on the recordings of WA8TRG, typical of other log information received, the received signal levels were relatively constant well past the launch time.

21.1 MHz — Reception of signals from KP4AS was a bonus. Our calculations, made well in advance of the rocket launch, had shown that the expected muf would be below 21 MHz, so we concentrated on assigning listeners to the 14.1-MHz power-stepped beacon. When we discovered, two hours before launch, that many stations were able to hear the 21.1-MHz beacon, we asked several operators, via our net held on 3.82 MHz, to listen on 21.1 MHz, anticipating that any propagation disturbance would be most severe hear the muf.

In general, as the frequency of an hf ray approaches the muf, it is refracted higher in the F region. Since we knew that most of the rocket burn would be high in the F region, we were pleased that the muf on the launch night was above 21.1 MHz. We received 28 reports of signals heard from the 21.1-MHz beacon. None showed a complete dropout of signal which could be attributed to the rocket launch. Several of the reports, however, mentioned fast fading, hollow-sounding signals or other short-term effects. We also had reports of rapid fading from some stations observing on 14.1 MHz. In an attempt to determine which of the received reports of signal fading corresponded to the rocket launch we plotted the azimuth of the rocket-launch trajectory as seen from the beacon location versus time. On the same graph we also plotted the fixed azimuth of the stations reporting the fading on 21.1 MHz versus the time of the reported fades. We restricted this short fade analysis to the 21.1-MHz beacon reports because of the intermittent nature of the 14.1-MHz transmissions and the fact that 21.1 MHz was much nearer the muf. By making a plot in this manner, we could tell whether the fade resulted from a disturbance in the ionosphere caused by the passage of the rocket, since it would occur after the rocket had passed the azimuth of the station seeing the fade. Fig. 4 shows the results, from stations reporting fades near rocket-launch time, on signal reception of the 21.1-MHz beacon. Note that, for the observed fades to have been associated with the rocket passage, we expected that their occurrence should have been near the time the rocket trajectory passed the station azimuth. While there are indeed some reports which seem to have been caused by the rocket passage at the same azimuth from the transmitting station, several of the reported fades cannot be explained in this manner.

K1KSY monitored the transmissions from Radio Nederland, located on the island of Bonaire, and heard several fades on that signal, one of which occurred soon after the rocket passed the same azimuth from Bonaire along the great-circle path to this station. He also observed a similar fade approximately four minutes before the rocket passed the same azimuth, indicating that the rocket launch was not responsible for the first fade. We conclude that the signal-strength fades seen by K1KSY, and by the stations illustrated in Fig. 4, some of which probably were the result of the rocket's passage along the same azimuth from the transmitter to the receiving station, are indistinguishable from those which occur frequently because of natural changes in the ionosphere.

One Canadian station noted a large drop in signal which lasted for many minutes, but it occurred before the rocket entered the ionosphere. The station was located near the outer edge of a one-hop F2 path and the reported dropout was likely because of a naturally occurring gradient modifying the outer edge of the propagation zone.

28.10 and 50.1 MHz — We had hoped that some stations might observe scattered signals on 28.1 (KP4EOT) or 50.1 (KP4Q) MHz from any irregularities which might have been produced near the edges of the hole. We asked observers in the southeastern U.S., and some others who specifically indicated that they wanted to listen on one of these bands, to monitor for any scattered signals. No positive reception reports were received on the 28.1-MHz beacon, but seven negative reports were received. On 50.1 MHz nine negative reception reports were received.

Some of the negative reception reports did not include reception near the launch time, however, so we may have missed an important point: to ask stations to listen carefully for a few minutes immediately after the rocket entered the ionosphere.

144 MHz — K4GFG and KP4EOR reported attempts to make contact on 144 MHz between Florida and Puerto Rico, with no success. If there were irregularities produced in the ionosphere by the rocket exhaust, they were not in evidence on the paths being monitored.

Independent Ionospheric Measurements and Conclusions

We know from observations of total electron content made along several paths from Florida, Georgia and Bermuda by personnel from Stanford University, Boston University, the Naval Research Laboratory, SRI International and the U.S. Army Electronics R and D Command that the total change in F-region electron content, of which the greatest percentage is above the F-region maximum, was large and long lived. The lowest values of total electron content persisted until sunrise. The loss in total electron content was approximately 75% of the background ionization present at the time along the rocket trajectory.

From airborne optical-all-sky camera measurements made by an Air Force Geophysics Laboratory aircraft flying under the launch trajectory, and from low-orbit satellite differential Doppler measurements taken by personnel from the Applied Research Laboratory of the University of Texas at Austin, we know that the affected region extended approximately 600 kilometers north and south of the rocket trajectory. None of the other measurements observed any irregular ionization changes which might have allowed scattered signals to propagate. The question is, then, if a region of the ionosphere approximately 1200 kilometers in horizontal extent was affected, and if the change in the middle of that region

was 75% of the total number of electrons in a vertical column, why weren't any significant effects seen in hf propagation for paths which went through that region?

We have several likely reasons that no major dropouts were seen. First, the process of hf propagation does not depend upon a point reflection from a small area in the ionosphere, but is the combination of rays bent over a fairly large region, including off-great-circle paths. If the gradients in electron density do not exist in the optimum midpoint location for ray bending, but they do exist in another location not too far removed, then hf propagation between the two points can still exist.

Second, the major changes in the ionosphere probably occurred mainly above the peak of the F region, where approximately two-thirds of the electrons normally exist. Fig. 5 shows the rocket trajectory versus downrange distance from the launch location. On the left-hand portion of the figure is plotted an assumed profile of electron density versus height. From the bottom of the ionosphere to the height of the peak the rocket covered less than 350 kilometers in horizontal distance, while from the peak to engine shutoff it covered over 1400 kilometers in downrange distance. Thus, most of the burn was above the region where hf propagation would have been affected. The majority of the hf-ray energy is reflected below one-scale height, or approximately 50 kilometers below the peak of the F region, under normal conditions. Therefore, most of the hf rays from Puerto Rico to the U.S. probably did not exceed 300 kilometers in vertical height, and the effects of rocket exhaust were well above this height for most of the rocket burn.

Can we use these results to tell NASA and DOE about any potential hf effects of proposed large rockets for lifting the components for solar-power satellites into orbit? The answer is a qualified "yes." The experiment demonstrated that the exhaust from the Atlas-Centaur burn did not have significant effects on hf propagation, probably because most of the burn was at heights above the peak of the F region. From this experiment we cannot say that proposed solar-power-satellite rockets will have an unfavorable effect on hf propagation. We can say, however, that if rocket burns in the ionosphere were limited to the size of the Atlas-Centaur burn, and were confined mainly to heights above the F-region maximum, the effects on hf communications would be negligible.

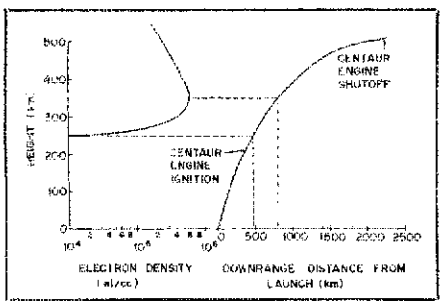


Fig. 5 — Rocket height versus downrange distance from the Kennedy Space Center. Also, on the left-hand side, is a plot of an assumed ionospheric height profile. The rocket went quickly through the height region of potential hf effects.

Suggestions for Further HF Propagation Tests

Similar experiments should be attempted during the launch of larger rockets that burn in the lower F-region. The effects on hf propagation during the day, as well as at night, would be of interest. The daytime effects would be different because of the absorbing D region at 90 km altitude and because the sun would reionize the affected region.

As suggested by K4CAV, the transmitter signals should use fsk rather than keyed-carrier transmissions. The standard cw keying speed of 13 wpm should be used by the beacon so that all observers could copy.

With fsk the carrier would be on the air 100% of the time and signal-strength readings, especially in the presence of fading, could be made easier. It would also be much easier to make chart recordings with 100% duty-cycle signals.

Better timing accuracy is required. We found that many of those who reported the signal dropout on 14.1 MHz logged times that were over two minutes in error. With the ready availability of WWV standard-time transmissions and inexpensive digital watches there is really no excuse for timing errors this large. An alternative way of ensuring that timing accuracy is standardized would be to have the beacons transmit time as part of their fsk-cw messages; then receiving stations would all presumably report the same time.

If audio-cassette tapes are to be recorded at the receiver, the agc should be turned off so that the audio output level can vary in response to input signals, rather than be held at the relatively constant levels agc is supposed to maintain.

Finally, in any future experiments using volunteers, all participants must be urged to stay on one single frequency and carefully log signals, or lack of them, rather than band-hopping to see how other beacon frequencies are doing.

Acknowledgements

Special thanks go to KP4s EKA, Q, EOT, AS, X and AAQ, who volunteered to run the beacon transmitters in Puerto Rico, and W6JTH, who operated W6YX/KP4. The keyers for the transmitters were built by members of Jet Propulsion Laboratory (JPL) Explorer Post 509 using NASA funds made available by Dr. W. Huntress of JPL. G. Stark oversaw the Post member activity. Stark and KB6JN built the units, and WD6GKE and KA6DWN recorded the tapes.

KB4LK, K8KSA, K9EID and K4CAV took chart recordings using the units we furnished them. K1CH, WA1LZA, W2ANA, KB2FS, WB2JXS, AI3C, N3RW, W4OQG, AB7Q, WA8TRG, W9IJ and VE2XL sent in unsolicited chart recordings. Audio cassette tapes were sent by K1MC, K3RS, N4CK, KA8EZM and K9EID.

We are indebted to D. B. Odom, C. Rush and R. Simpson for their assistance and suggestions in the preparation of this report. All participants who sent in quantitative information were sent a certificate of participation in "The Great Ionospheric-Hole Experiment." Many thanks for your assistance! QST

References

[1]Helms and Thompson, "Ray-Tracing Simulation of Ionospheric Trough Effects Upon Radio Waves," *Radio Science*, Vol. 8, pp. 1125-1132, December 1973.

[2]Bernhardt, Klobuchar, Villard, Simpson, Troster, Mendillo and Reisert, "The Great Ionospheric-Hole Experiment," *QST*, September 1979.

New Books

☐ *The Illustrated Dictionary of Electronics*, by Rufus P. Turner, Published by Tab Books, Blue Ridge Summit, Pennsylvania, First Printing, 1980. Softcover, 8 × 5 inches, 868 pages. Price: $14.95.

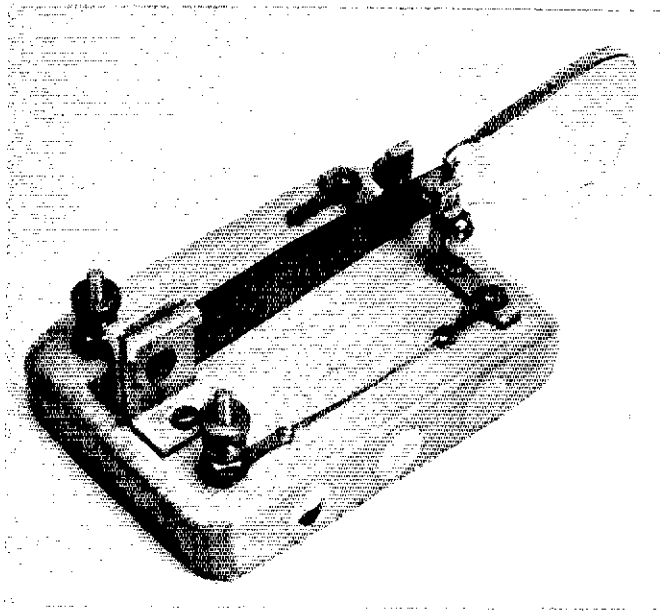
This hefty volume takes you from "A" for gain to "Z" for (believe it or not) zymurgy, and should have a place on many a ham's bookshelf; it would be especially ideal for beginners as a handy source of information. In the electronics field you'll invariably come across a term, word or abbreviation with which you're not familiar. Not every time is there a "brain to pick" for an explanation, but with this dictionary, you're probably going to find just the information you need.

A section at the rear contains tables and data that will also come in handy. In these pages you'll find the resistor color code, electronics symbols, a table of wire gauges, Ohm's Law, temperature conversions, a table of electronic abbreviations and math symbols, to name some.

Within the over 24,000 terms contained in the book is information relating to computer and other scientific areas. A number of illustrations are scattered throughout the text as an aid to understanding some of the definitions. By the way, "CMOS" will be found under "COS" and "MOS". — *Paul K. Pagel, N1FB*

• *Basic Amateur Radio*

Zero-Cost Key



Looking for a simple project to get that budding Novice started? This paddle-key can be used as a straight key now and as a paddle for an electronic keyer later.

By Antonio G. O. Gelineau,* W1HHF

It all started when a group of four high school students indicated an interest in Amateur Radio. Accepting my invitation to visit my station, they were intrigued and very enthusiastic, particularly when we were working DX on 10- and 15-meter ssb. They were fascinated watching the cw readout on the Kantronics Field Day unit. Immediately, of course, the question of cost to enter the field of Amateur Radio arose.

On their second visit, I demonstrated a crystal-controlled three-transistor 10- and 15-meter transmitter mounted on a small plastic box. I put it on the air and, to their amazement, proceeded to work stateside and DX stations on cw.

If You Ain't Got It — Make It

I emphasized the pleasure of building your own gear as much as possible and the skills developed while doing so. The first project I started the group on was making their own keys to use with code-practice oscillators. Of several different designs, the most popular was the key shown in the photograph. It could be used as a straight key at first with view of future usage in keying an electronic keyer.

To duplicate this design, all that is needed is right-angle aluminum stock, a mini-hacksaw blade (cut as shown and with the teeth removed by grinding), a piece of 3/8 in. clear plastic (cut from the side of a refrigerator food container box, for the paddle grip), six 2 oz. lead fishing sinkers (for weighting the key base) and a wood block for the base. Miscellaneous materials include hardware and auto-body mending tape. Double-backed adhesive tape may be used for holding the key to the table.

First, cut the hacksaw blade and grind away the teeth (Fig. 1). After shaping the paddle from the plastic block, a 1/2-in. slot is cut in the center of the small end to accept the end of the hacksaw blade (Fig. 2). The blade is then cemented in place with epoxy. After the epoxy has set, cover the paddle grip with the aluminum auto-body mending tape, if desired. Drill three 7/16-in. holes through the wood block and then coarse-sand it to the correct shape (Figs. 3 and 4). Complete by sanding for a smooth finish. After cutting the lead sinkers (Fig. 5), place them into the 7/16-in. holes in the wood base. Prepare a mixture of white glue and plaster of paris. Add plaster of paris to the glue until the mixture has the consistency of putty. Fill the holes with this putty and let dry (about four hours). Meanwhile, cut the right-angle stock to the size as shown in Fig. 6. Final sandings, coarse and fine, prepare the blocking for varnishing (or painting).

The hacksaw blade with plastic paddle grip is then rivited to the two 1- × 3/4- × 1/2-in. right-angle aluminum pieces. The two 1- × 1-in. right-angle pieces are drilled and tapped as shown in Fig. 7. All pieces are then assembled as shown in the photograph.

The key shown is being used for single-circuit keying only. Two-circuit keying

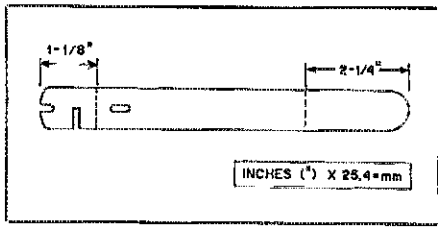


Fig. 1 — Dimensions for cutting the hacksaw blade. Grind teeth from blade.

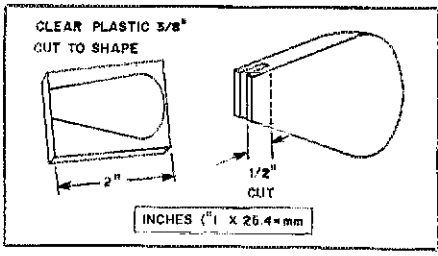


Fig. 2 — Cut paddle grip from 3/8-in. plastic as shown. Dimensions shown are representational; the precise size and shape should suit the taste of the builder.

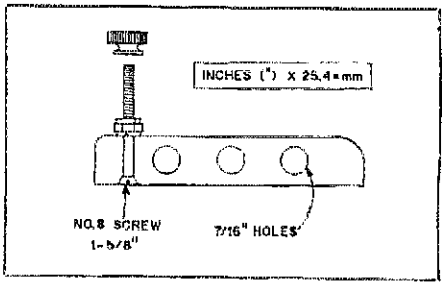


Fig. 3 — Drill three holes in the side of the block of wood as shown above.

*142 Home Ave., Burlington, VT 05401

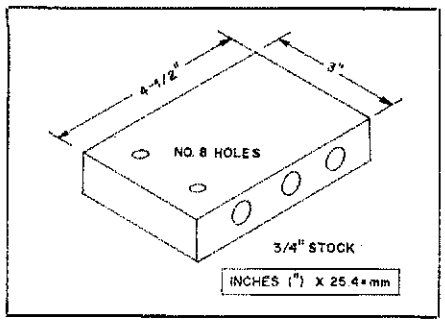


Fig. 4 — Overview of block with holes drilled.

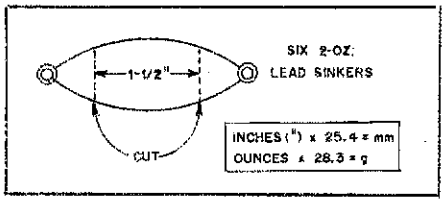


Fig. 5 — Cut the six lead sinkers as depicted above.

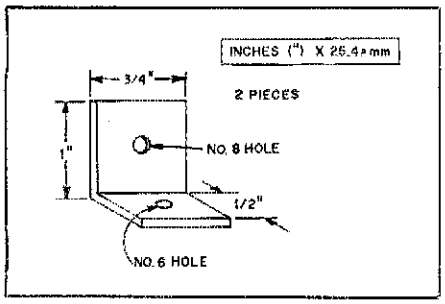


Fig. 6 — Cut and drill two pieces of right-angle stock.

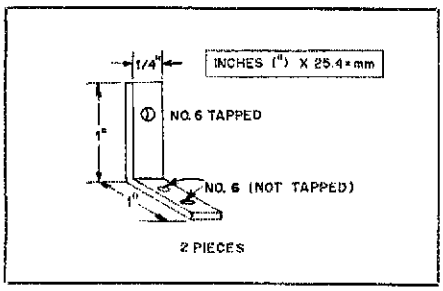


Fig. 7 — Cut and drill two additional pieces of right-angle stock as shown above.

may be obtained with the addition of a third binding post attached to the right-hand contact.

Two strips of double-backed adhesive tape are pressed to the base of the key, then trimmed to shape. After the operating position has been selected, the protective paper backing is removed. The key is placed in position and pressed for holding. The "feel" of the key is very good; it seems to please all those who have tried it. The cost is right, too — zero! QST

Strays

MOUNT ST. HELENS UPDATE

☐ Scientific research on Mount St. Helens continues, with area amateurs assisting scientists studying the mountain. Forest Service safety requirements for work in areas near the mountain require two-way radio communication in the field and a continuously manned base station near a telephone.

David Lievsay, K7UUH, and Roger McCoy, W7DAV, members of the Tektronix Employees Amateur Radio Club (TERAC), act as middlemen in helping researchers find amateurs to accompany scientific parties to the mountain and to man nearby base stations. If the Forest Service wants to evacuate the area, it telephones the base station. The base station operator tells the amateur with the field party to get the party moving out of the area.

The amateurs have been helping for a long time and are now trying to convince the Geological Survey and Forest Service to provide radio equipment to the researchers who have permission to enter the restricted areas near the mountain. As long as there is a need, however, Amateur Radio operators will be there to lend a hand.

Members of TERAC began providing communications assistance in the Mount St. Helens area before the May 18 eruption. (See July 1980 *QST*, page 28.) Amateurs continued their volunteer efforts during the mountain's major eruptions in May and June. (See August 1980 *QST*, page 47.) — *Information courtesy ARRL Northwest Division PIA John H. Brown, W7CKZ, Olympia, Washington*

KH6 QRP DXPEDITION

☐ The Big Island ARC will make its first QRP DXpedition to South Point, on the island of Hawaii, from 1800 UTC, November 29 until 2400 UTC, November 30. South Point is the southern-most area of the 50 states. A special QSL card will be sent to all stations worked during the expedition. Frequencies will be 7115, 21,115 and 28,115 kHz cw and 7225, 21,375 and 28,750 kHz ssb. — *Russell Roberts, KH6JRM, Honokaa, Hawaii*

I would like to get in touch with . . .

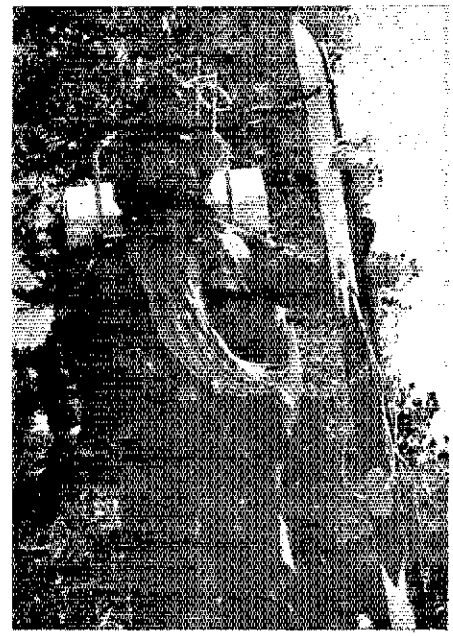
☐ anyone who can help me set up a traffic net for 15 U.S. military personnel stationed with me in Israel. Major Richard Osimo, K1CRR/4X, USMOG — UNTSO (OGL), APO NY 09672.

TA PROFILES

☐ Introducing ARRL Technical Advisor (TA) Richard A. "Dick" Simpson, W6JTH, with our thanks for his services. His professional area of expertise is EME/radio propagation.

Dick received his Novice class license in 1959 and now holds an Advanced class license. QRP and Field Day are his principal interests in Amateur Radio. He also enjoys backpacking, cross-country skiing and writing. Residing in Palo Alto, California, he is a member of the Palo Alto Amateur Radio Association and the Stanford Amateur Radio Club.

Dick received his BS degree from the Massachusetts Institute of Technology, and his MS and PhD from Stanford University. He is the Senior Research Associate in the Radioscience Laboratory of Stanford University. — *Marian Anderson, WB1FSB*



TA W6JTH equipped for QRP mountaineering to summit of Mount Langley for Field Day 1975. (July 1976 *QST*, p. 54).

FIRST ATV COMMUNICATION?

☐ We claim to have carried on the first live two-way amateur television communication on June 5, 1954, with TV cameras and transmitters of our own design and construction. Are there any challengers? — *John C. Davis, W4ATO and Asa F. Tift, W4PGK, Albany Georgia*

SDI — Dangerous Crippler of Radio Amateurs

SDI? Smoke Detector Interference, the latest ham "crippler" from those wonderful people who brought you TVI, etc.

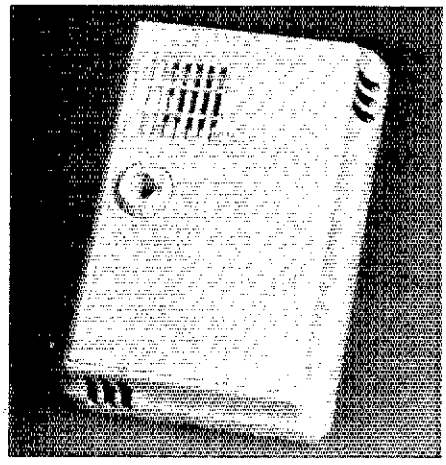
By Pete O'Dell,* AE8Q

For a ham, moving from one's own house to an apartment building is never fun. In our case, insult was added to injury when we found that rf was getting into the ac-powered smoke detector in our apartment. As soon as it was convenient, I added a few feet to the length of the long-wire antenna (the lease clearly prohibits outside antennas); no more interference to *our* smoke detector. Before we had a chance to open a bottle of bubbly, there was a knock at the door. Our neighbor wanted to know if we were having trouble with our smoke detector; hers was going off intermittently and she was thinking of calling the maintenance personnel.

Every once in a while in this type of situation you run across a rare individual like our neighbor — someone who is even-tempered, patient and understanding! I told her that I would stay off the air until I could figure out how to fix the detector. I also mentioned that I would be happy if she did *not* contact the maintenance staff. No problem, she said.

I removed the detector from our apartment and found that it had three wires extending from a sealed case. Two of the wires were connected to the ac mains; the other one (yellow) was left dangling. There was a tag on the unit that indicated it had been manufactured in a distant town in Connecticut.

The next morning I placed a call to the plant. It wasn't that they were uncooperative; they just didn't seem to know what could be done for smoke detectors that "falsed" in the presence of rf; I had the feeling that mine was not the first complaint they had received about this sort of thing. After I had been bounced around from one to another of their employees, someone suggested that I call their engineer who had designed the unit. I was given a telephone number — a local call from Newington! My luck must be changing. It was; from bad to worse.



External view of the smoke detector. The red LED is mounted inside the rotatable cylinder marked TEST-RESET. Rotating the cylinder to the TEST position moves a slit so that light from the LED shines directly into the photocell. The screened openings in the sides permit air (smoke) to flow through the internal chamber of the smoke detector.

The engineer was quite sympathetic, but not terribly helpful. It seems that there had been some problems with these alarms falsing before. Certain problems had been taken care of, but he had no idea of what to do about rf. I asked if bypassing the ac lines might help. He thought that it might. He told me that the yellow wire was for paralleling two or more units.

He also told me that it was against company policy to provide any technical information about the functioning of the circuit. He suggested that I *return* it to the company where it would be replaced if it were defective. Did the company know what to do about rf getting into their circuits? No. What good would it do to replace one poorly designed unit with another? The last question was never asked out loud; I just thanked him for his time and hung up.

I tried bypassing the ac lines going into the sealed unit. At home that night I made arrangements to switch the altered alarm for the one installed in my neighbor's apartment. After making the switch, we made a short test — if anything, it was worse. I then tried blocking the rf by wrapping the leads from the detector through toroids to make an rf choke. That didn't help either. I thanked my neighbor and told her that I would get back in touch with the engineer who had designed the thing to see if he had some more ideas.

The next day I called the engineer again and got essentially the same run-around. He suggested that I return the unit to the factory to be replaced. I asked if he would supply me with a schematic. Absolutely not! It would void the warranty if anyone other than a factory employee opened the unit. Did anyone at the factory know how to prevent it from falsing in the presence of rf? No. Again, I politely refrained from asking the obvious question.

Cracking the Egg

After I hung up with the engineer, it took me about an hour to circuit-trace the detector and draw the schematic (Fig. 1). There are probably some minor mistakes in it, but there is enough information here for solving the problem at hand. (After all, I was looking to "fix" a design flaw, not design an alarm from scratch.) The two photocells are offset by 90 degrees. The white LED shines directly into one of the photocells. The other is recessed into a tube so that only light coming from straight ahead will reach it. Everything is painted flat black inside. Presumably, when smoke enters the chamber, light is reflected off the smoke, turning on the second photocell, which in turn causes the

*Basic Radio Editor

CMOS op amp to change states and turn on the triac.

As I looked over the diagram, it was impossible to pinpoint the culprit. Obviously it was going to be a trial-and-error procedure. Although our neighbor had been delightful about this whole thing, it might strain the relationship a bit to run in and out of her apartment each time I tried something different. A little reflection suggested that I could duplicate the situation (more or less) in the lab. The setup diagramed in Fig. 2 was the final result. A touch of the finger indicated that rf was present in abundance.

Since I had the most trouble while operating on the 40-meter band, we chose it as the test frequency. Before making any modifications to the smoke detector, we placed it on top of the Transmatch. I keyed the transmitter and slowly brought the power up. With the wattmeter indicating about 15 watts going into the Transmatch, the smoke detector falsed. I then began the modifications. I added 0.01-μF disc-ceramic capacitors to the circuit anywhere that I thought there might be trouble. After each addition, I checked the detector to see if rf still plagued it. For the first four additions, nothing changed. Then I added a 0.01-μF disc (C1) between the inverting input (pin 2) of U1 and ground. The first thing I noticed was that the smoke detector falsed for a couple of seconds when it was first plugged back into the ac line. I turned on the transceiver and brought the power up. The unit no longer falsed! Removing the other capacitors did not cause the problem to return.

I installed the alarm in my neighbor's apartment. I explained that if the power failed for a few minutes that the alarm would false when the power came back on. A couple of months later I woke up in the middle of the night during a severe electrical storm. I was wondering if she would appreciate it if the power failed for a few minutes then came back on. Surely her four-year-old son and six-week-old daughter would not sleep through that. I decided that it was time to do some more work on the alarm. Back to the test set-up again, but with my smoke detector.

Perhaps a smaller capacitor across the inverting input would handle the rf and yet not false during the initial power-up. After discussing the idea with other Hq. staff members, I decided to try a 0.001 μF disc capacitor in place of the 0.01 μF disc. Tests confirmed that this was a workable solution to the problem. The unit functioned normally as a smoke detector, rf did not bother it, and it did not false on the initial application of ac. Results were the same when the value change was made to my neighbor's detector.

At this point I decided to call the engineer back again. I told him I had the cure to the problem, and he was *most* interested in finding out what it was. We chatted for a few minutes. I offered to help him out with any rf problems that his company might have with the design of any additional consumer-type items. He then informed me that his company had people who were quite good with rf-type problems and that they needed no assistance whatsoever. Again, I refrained from asking any of the obvious questions.

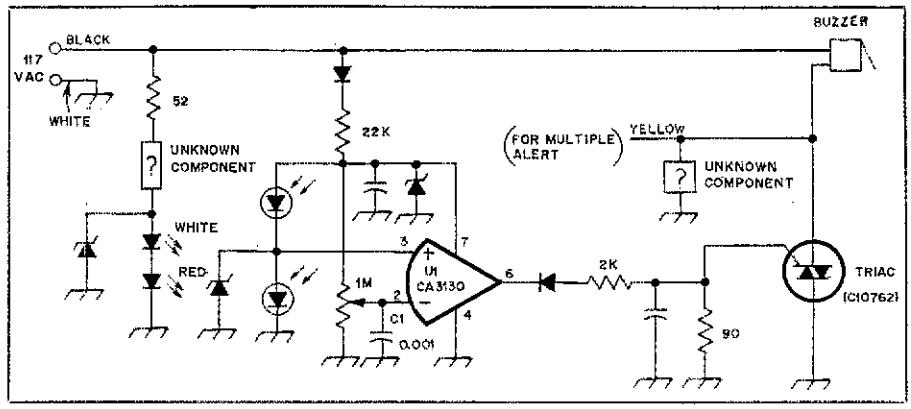


Fig. 1 — Schematic diagram of smoke detector as circuit-traced by the author. Although it is probably not precise, there is enough accuracy and detail here to provide an amateur with sufficient information to RFI-proof the unit. C1 is the ceramic disc capacitor that was empirically determined to be the solution to the falsing problem.

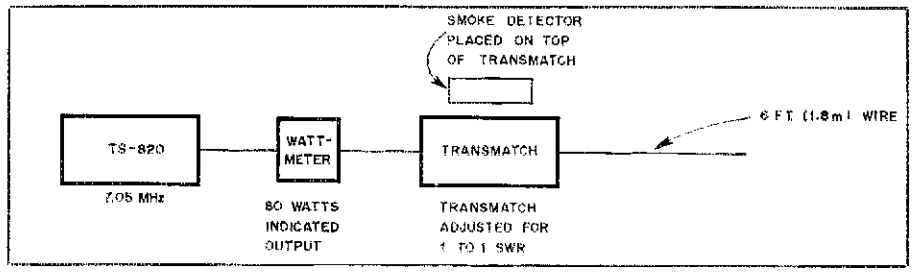
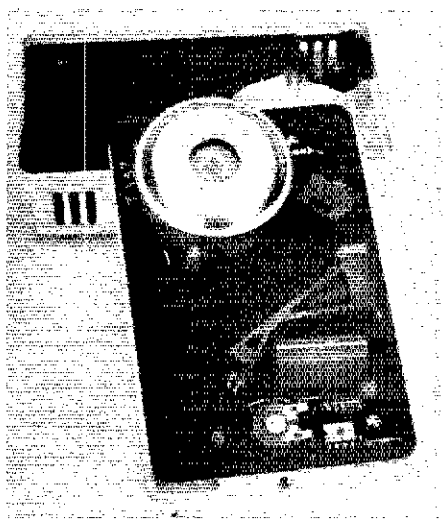


Fig. 2 — This is the experimental setup that the author used for testing various "cures" for the smoke detector interference. In general, similar pieces of equipment and procedures could be used to troubleshoot any device suffering from RFI.



Smoke detector with case removed. The red LED is located just below and slightly to the left of the buzzer (upper left corner). Unobstructed, the LED shines directly into the offset photocell. Within the chamber, all surfaces are painted flat black. The added capacitors were mounted on the other side of the circuit board.

Lessons to Be Learned

1) Most hams already have all the equipment necessary for testing and RFI-proofing electronic devices.

2) A detailed and highly accurate schematic diagram is not an absolute necessity. You can probably draw one of your own that will suffice for this kind of work.

3) Some companies seem to be incapable of assisting with RFI problems. Any of several factors may be at fault here ranging from lack of engineering competence to a callous decision of the front office to "stonewall it." If you get nowhere with them, then go ahead on your own — but it wouldn't hurt to let the FCC, Consumer Product Safety Commission and other government agencies know about your difficulty in dealing with the companies.

We live in a world of increasing dependency on electronic devices. We also live in a world that is increasingly making use of the rf spectrum. Until it becomes cheaper for companies to build equipment right to start with, you can expect that sooner or later you are going to have some problems with interference. You may decide to forego civil relations with your neighbors or you may let this ugly disease cripple your operating enjoyment. But there is a better approach, and that is to take the bull by the horns and solve the problem. *Non illegitimi carborundum!*

The Tower Alternative

Puzzled about installing a tower for your new tribander antenna? A rooftop tripod could solve the problem and save you a few dollars plus yard space.

By Laurence Wolfert,* WA2FDB

Pick up any Amateur Radio magazine and you will find ads galore for freestanding towers. Also, with alarming regularity, there are articles describing a new crank-up, stack-up or tilt-over model, or else articles with someone's experience and advice on installing one. But what does the amateur do who wants to put up a Yagi but his XYL says, "I don't want that oversized erector set in the middle of my backyard!" Obviously, he puts a tripod tower on the roof of the house.

Articles about tripod towers are rarely written, possibly because amateurs who use them are in a minority or because some of these same people think that tripods are so simple to erect that writing an article about their installation is hardly warranted. You might ask what justification, therefore, I might have for this article. Clearly, my reasoning is that there are amateurs who need information to help them decide on the other tower alternatives. I'm dedicating this to them. Those who choose to install a tripod atop a roof very likely will have the same concern I did for the roof and supporting structure. I just moved into my first house and have no desire to cause the roof to come apart or create leaks (time alone will be kind enough to do that for me!).

The Hardware

Once the decision was made to install the tripod tower, I began a search for the make and model I wanted. One consideration was to keep my TH-3JR at an effective height, but not to where it would be an eyesore. With the peak of my roof up around 26 feet (8 meters), I felt a 10-foot (3-m) tower would be adequate. With a Ham-II rotator 18 inches (460 mm) above the tower and the antenna 15 inches (380 mm) above the rotator, the antenna would be approximately 36 feet (11 m) above ground. The reason for keeping a minimum height above the tower was to maintain maximum support and minimize both torque and wind sway.

I chose a brand of tripod that had a built-in ladder between two of the tripod legs. This eliminated the need for a separate ladder and the need for an additional person to hold it down on the sloped roof when installing the mast and attached paraphernalia. The model also came 90% assembled which, to the lazier people like me, is always a persuasive selling point!

*59 Bosko Dr., East Brunswick, NJ 08816

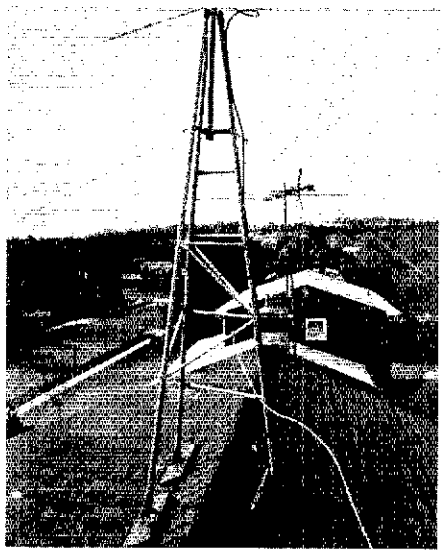


Fig. 1 — This tripod tower supports a rotary beam antenna. Besides saving yard space, a roof-mounted tower can be more economical than a ground-mounted tower. A ground lead fastened to the lower part of the frame is for lightning protection. The rotator control cable and the coaxial line are dressed along two of the legs. *(photo courtesy Jane Wolfert)*

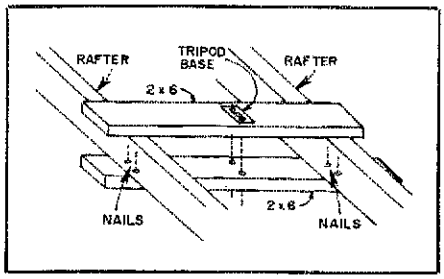


Fig. 2 — This cutaway view illustrates how the tripod tower is secured to the roof rafters. The leg to be secured to the cross piece is placed on the outside of the roof. Another crossmember is fastened to the underside of the rafters. Bolts, inserted through the roof and the two cross pieces, hold the inner crossmember in place because of pressure applied. The author nailed the inner cross piece to the rafter for added strength.

The Instructions

Assembly is simple. The instructions are clear. Parts are color coded. However, the instructions for mounting on the roof are a totally different matter. They are brief at best. I found they left me far from comfortable concerning this part of the installation.

The instructions suggest two possible means of anchoring the tower: (1) Anchor the legs to the cross beams in the roof with the lag bolts provided, or (2) anchor the legs to a section of 2 × 6 secured between the rafters.

The first recommendation offers a reasonably secure foundation for the tower if you find the exact center of each beam and that these centers correspond to the distance between the legs of the tripod. My first concern was that the width of each beam was only 1-5/8 inch (41 mm). That doesn't give much leeway to make mistakes. Unless the lag bolt is fairly well centered, the bolt will not be securely anchored. Compound this with the concern that the beams may not be exactly 16 inches (406 mm) apart. Mine weren't. Oh, the distances were close, like 15-5/8 inches (397 mm) between one pair and 16-1/2 inches (419 mm) between the adjoining pair. To complicate the matter further, the two legs of the tripod that would share the same side of the roof were not exactly 32 inches (813 mm) apart as they were supposed to be. All this added up to a risky proposition that would

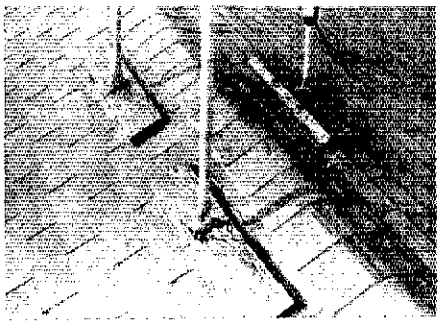


Fig. 3 — Three lengths of 2 × 6 wood mounted on the outside of the roof and reinforced under the roof by three identical lengths provide a durable means for anchoring the tripod. Liberal coatings of tar guard against weathering and leaks.

aerate my roof but not secure my tower effectively.

The second method was far simpler to implement, yet I doubted the reliability. The idea of this alternative is to nail lengths of 2 × 6 between the attic beams and against the roof. Then anchor the legs between the rafters by securing them to the cross members. I concluded that the only advantage this approach offered was the support of the few nails that would hold the cross pieces to the beams. While this method of installation might be adequate for a while, just how secure the anchorage would remain with repeated weathering and swaying from wind seemed questionable.

Solution

After much thought about how to provide a sturdy, immovable anchor for the tower, I elected to nail the 2 × 6s to the underside of the rafters. Bolts could be extended from the leg mounts through the roof and the 2 × 6s. To avoid exerting too much pressure on that area of the roof between the rafters, I decided to place another set of 2 × 6s on top of the roof (a mirror image of the ones within the attic). Installation details and the final results are shown in Figs. 1 through 4.

Once the course of action was mapped out, I anxiously proceeded to collect the required hardware that included nails, roof tar, wood and long bolts. The bolts, which had to be 10 inches (254 mm) long, became a disconcerting obstacle. Supply stores in my area carried bolts only up to 6 inches (152 mm) long. My frustration level surpassed that encountered while trying to get through the pileup for a 3V8 station!

Searching all available bins, however, turned my dismay into a feeling of cheer. I came across a solid threaded metal rod 6 feet (1.8 m) long. No one seemed to know exactly what the purpose of the rod was. All I knew was that a 1/4-inch nut fit it perfectly. "Must be made for putting up a tripod tower," I mused. "Look out all you DX stations, I'm coming." Thereupon, I grabbed the rod, along with an ample supply of nuts and washers, paid the cashier, and was on my way.

Installation

I measured the turning radius of the antenna to ensure freedom from obstructions such as trees, the TV antenna and chimney. Fortunately there was plenty of clearance between these and the proposed location of the tripod.

Once the approximate location on the roof is selected, choosing the pair of rafters for anchoring the tower is next in order. A vent pipe protruding through the roof serves as a good reference point for measurements. I determined the distance from the vent pipe in my attic to the nearest rafters, then transferred these measurements to the roof. I then chalked the location on the shingles. The approximate location of the other rafters is easily determined by marking lines in 16-inch (406-mm) increments from these initial lines. Because there is a space of over 14 inches (356 mm) on the 2- × 6-inch barewood cross pieces in which to place the bolts, being off as much as an inch (25 mm) would not be catastrophic as would be the case if the lag bolts were to be screwed into the rafters.

Drilling Through The Roof and Cross Pieces

Having marked the approximate leg placement positions on the roof, I then proceeded to cut the cross members into 2-foot (0.61-m) sections. This would give me a leeway of 4 inches (102 mm) on each side to span the beams if, in fact, I was off center. A 24-inch (0.61-m) piece to span a 16-inch (406-mm) width should leave 8 inches (203 mm) or 4 inches (102 mm) on either side.

I paired the six pieces and placed them each under a different leg. Using the holes in the metal feet as guides, I drilled through the wooden pairs in unison to guarantee a perfect spacing of the three critical pieces for accepting the bolts. Although the legs were made to accept three bolts each, I used only two per leg. I felt that the spacing was too close and that drilling through the roof in that fashion would weaken the roof more than supply extra strength for support.

Each of the six pieces was marked "top" and "bottom," and each pair was labeled A, B and C, respectively. Half of each set went into the attic for later use. The other half was brought up to the roof along with the tower. A small screw, inserted in the middle hole of each metal foot, held the 2 × 6s in place. Moving the tower onto the rough chalk marks previously made on the roof became the next step, followed by suspending a plumb line from the top of the tower to indicate when the precise position over the peak of the roof had been reached.

The first hole drilled also served to check how near it came to the center of the beam span. Fortunately, it was right

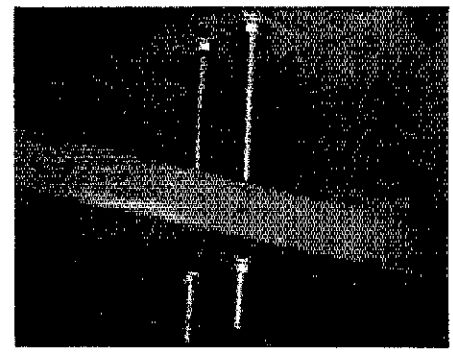


Fig. 4 — The strengthened anchoring for the tripod. Bolts are placed through a 2 × 6 on the underside of the roof and through the 2 × 6 on the top of the roof, as shown in Fig. 3.

on target. The other five holes then were quickly made. The borders of the 2 × 6s were outlined in chalk on the roof so that the tower could be moved aside for application of a coat of tar to the roof for a watertight seal.

With the tower off to one side, we tarred outlines of the three 2 × 6s, being careful to leave a 1/8-inch (3-mm) clear border around the newly drilled holes. That ensured the free passage of the bolts through the roof. We tarred the rest of the outline thickly.

The two needed bolts were made by cutting the threaded rod into two 12-inch (305-mm) lengths. Two nuts, placed near the top of each bolt and turned against one another for maximum pressure, and a washer for each bolt formed the "head."

The Home Stretch

With the six bolts placed in the metal feet and cross pieces, we then lifted the tower above the receiving holes. Each bolt was then inserted through the roof and tightened. The tower seemed immovable, but of course it lacked all the heavy equipment (rotator, mast and antenna) to make that judgment final. The lower 2 × 6s were next nailed onto the beams they spanned.

Back on the roof, we tarred around the legs and wooden supports, including the bolts. The rest of the installation followed rather routinely — mast, rotator, support pole and antenna. We took one further precaution. Much like the OM who wears a belt and suspenders, we secured the tower with four guy wires anchored to the frame of the house.

Epilogue

I wish to give special thanks to my brother, Rich, WB2EYI, who not only gave me valuable advice but also the use of his back during the installation. I am happy to report that there has been no damage from the winds. The attic remains dry, even my XYL hasn't complained. Everything worked out as anticipated until my neighbor came up to me the other day and asked, "Hear anything from Mars yet?"

Converting Power-Line Transformers for Transmitter Service

A surplus or junked power-line transformer can be converted easily into a superb plate transformer for a homemade kilowatt linear amplifier. Here's how!

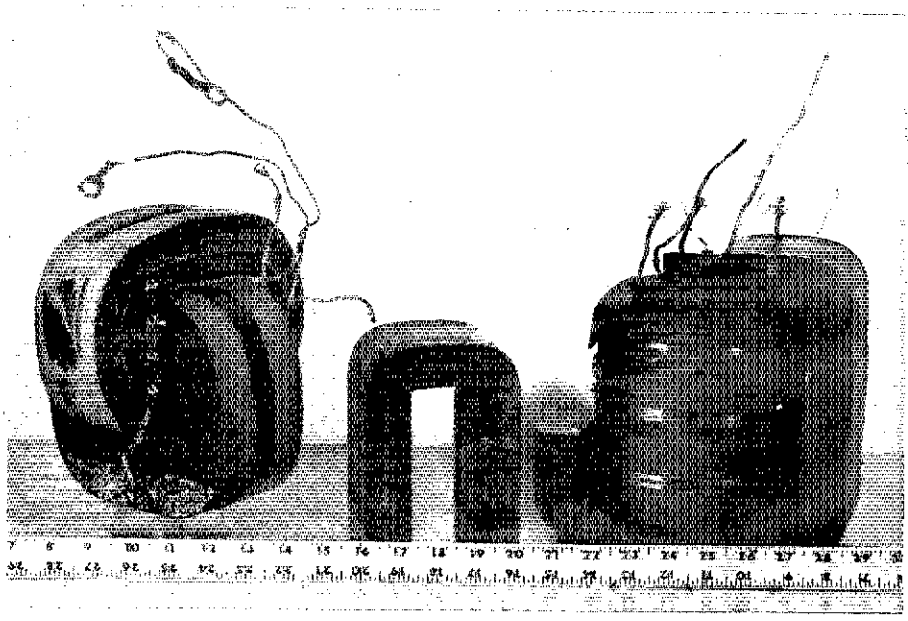
By James Seawright,* AE2Q

The urge to build a high-power linear amplifier led me on a search for suitable components. Clearly, a substantial part of the cost would be the "tab" for a plate transformer. Would I be fortunate enough to find one I could afford?

I remembered two excellent transformer articles in *QST* in 1967 and 1970 written by Lew McCoy, W1ICP.[1] These articles, containing much valuable information, stirred thoughts of winding or rewinding my own transformer. Lew described inexpensive transformers that could be paralleled and used with voltage doublers to reach the kilowatt level. Alternatively, junk transformers with a large enough core could be rewound completely. I made many trips to surplus dealers but failed to turn up either type of transformer.

Lou Cates, a long-time friend and surplus dealer on Canal Street in New York, suggested the use of a power-line distribution transformer. As he described it, a single-phase transformer, intended for step-down from 2400 V to 117/235 V can be removed from its tank, drained of oil,[2] dried out in an oven and connected backwards. He'd heard of amateurs who had tried this idea with complete satisfaction.

Inasmuch as there are not many pole transformers in Manhattan, I waited for my annual trip to visit my parents in rural Mississippi before continuing my quest. I was rewarded by finding a plentiful supply of used distribution transformers which could be converted easily. Many were available for as little as $3 per kVA. Fig. 1 shows a typical transformer of this type.



Windings and cores of a 1.5-kVA transformer (left) and a 3.0-kVA transformer (right). In most cases the windings can be separated easily for rewinding. The outer low-voltage windings have been removed. Counting the layers and the number of turns per layer is not difficult.

Finding the "Raw" Material

Most of the transformers I found provided a stepdown from 7620 to 117/235 volts. These transformers, available in various sizes, are rated from hundreds of kVA down to 1.5 kVA. The latter are ideal for use by amateurs.

As the chief engineer of a large rural electric-utility company explained to me, a transformer which has been in service for 10 or more years is weather-beaten and rusty, requiring a complete overhaul before being put back into service. While the larger size transformers are worth restoring, the smaller ones are sold for scrap, even though in many cases they are in good working order.

The engineering office of the local utility is a good place to begin the search for a used transformer. If the company is unwilling or unable to sell or give you a transformer, they may tell you who buys their scrap units. In my hometown, two

*155 Wooster St., New York, NY 10012

[1]References appear on page 42.

small companies overhaul such transformers. This enabled me to obtain 1.5-kVA units for $4.50 each and 3.0-kVA transformers for $6 each. These were in working order. Fortunately, they had already been removed from the tanks, drained and dried out.

If a transformer is out of the tank when you are choosing one, carefully examine it for evidence of overheating or other damage. The low-voltage winding must be in good condition, but the state of the high-voltage winding is of less consequence since it will be rewound anyway.

Other materials needed for rewinding the transformer are the wire, insulating paper and insulating varnish. Although I used magnet wire I had on hand, I realized later that I could have rewound a new lower-voltage (but higher current) winding on a 1.5-kVA transformer with the no. 24 B & S gauge wire from a 3.0-kVA transformer. Electrical-grade kraft paper usually insulates transformer windings, along with various thicknesses of fiberboard. I obtained kraft paper through the company which sold me the transformer.[3] Useful thicknesses are 0.005 inch (0.13 mm) and 0.010 inch (0.25 mm). For fiberboard, the thickness should be 1/16 inch (1.6 mm)

Impregnation

Usually, commercially made transformers are wound dry, then impregnated with either an insulating varnish or wax. The home-style approach to transformer winding is to impregnate one layer at a time. Therefore, we must choose material that lends itself to this method. This requires extra precautions to exclude moisture. A small amount of moisture can lead quickly to insulation breakdown.

William Liscusi of General Electric's Insulating Materials Division pointed out that hand coating each layer calls for an impregnating substance that will finish polymerizing or set in the absence of air. That led me to choose polyurethane. While this substance is not the best from the heat-resistance standpoint (good to 125° C), it is adequate for our purpose and will begin to set as each layer is applied. I purchased a good grade of satin finish polyurethane floor varnish because it has a better "tooth" than the glossy type and provides a better bond between coats. Less than a quart is required.

Disassembling the Old Transformer

If the transformer is still in the tank, the oil must be drained. The task is messy and you have to be careful how you dispose of the oil, which is a very unpleasant pollutant.[4]

The core and windings will be held in a frame of steel channels wedged into the bottom of the tank. To get the core and winding out, it may be necessary to remove the low-voltage terminals from the tank, as well as the circuit breaker or disconnect switch if either is present. Once the windings and the core are out of the tank, let them drain for several days. When draining is complete, remove the frame holding the core and windings. Dry the core and windings in the oven at 80° C for several hours. The title photo is an example of how the core and windings should appear.

Cores are made by winding a strip of grain-oriented silicon steel around a mandrel and then bonding it into a solid mass. This is then cut into two C-shaped half cores. The mating faces are ground precisely flat. These two halves can then be reassembled through the windings and strapped together with steel bands. This style of core construction simplifies rewinding. Avoid any transformer that does not have this form of construction.

Pry the core strap open or cut it close to the clamp with tin snips. Save it for reassembly. Give the joint between the core halves a sharp rap with a mallet to break the film of varnish that may be present. Remove the core sections from the coil. It may be necessary first to drive out the shims of fiberboard which have been

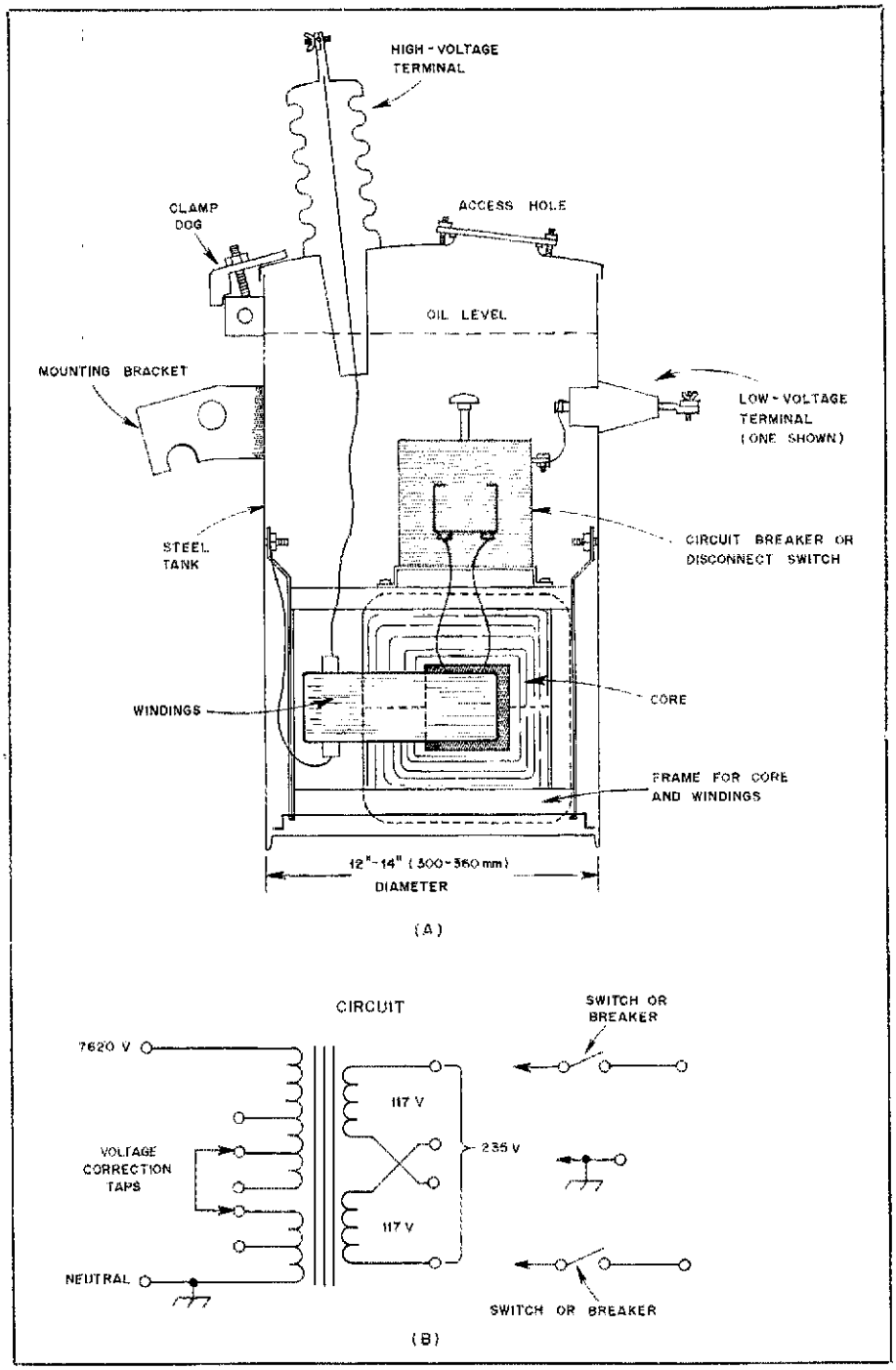


Fig. 1 — A typical small power-line transformer. The inner construction is shown at A. Part B illustrates the transformer circuit. See reference no. 7 for information about delta and Y or star configurations.

used to wedge the core tightly inside the winding coil. Save these shims, especially the sleeve of fiberboard that surrounds the high-voltage winding at the point where it passes through the core. Put the core sections aside for now, keeping them carefully paired just as they were in the transformer. Protect the mating surface from damage such as denting or nicking.

In most cases the windings can be separated easily since they were originally wound separately, then nested together. Corrugated fiberboard or wooden strips are wedged in between the high- and low-voltage windings. Carefully drive these wedges out to release the windings from each other. My 1.5-kVA transformer had eight layers of 19 turns each of heavy rectangular copper strip (152 turns in all) for the low-voltage winding.

Rather than cutting through the high-voltage windings with a hacksaw, I judiciously elected to unwind it. This gave me about a mile and a half of no. 27 wire. Most importantly, I was able to learn exactly how the insulating layers were overlapped, how joints and tapes in the wire were dealt with and, of course, the number of turns. Having a close estimate of the number of turns required for the new winding is essential.

There were 4560 turns in all for the high-voltage coil, showing that the core flux was sufficient to yield 1.66 volts for each turn. Another way to estimate the turns needed is to count the turns in the low-voltage winding. By using the turns ratio, as explained in *The Radio Amateur's Handbook* (available from the ARRL for $10), you can determine the number of turns required for the secondary.

Designing the New Winding

The starting point in designing a new winding is to specify a voltage and current level.[5] I wanted 1800-volts rms in order to yield a peak dc voltage of 2500 V with a full-wave bridge. An output of 2-kW PEP would call for a peak current of 800 mA. But as is often pointed out, the lower average power of speech-modulated signals will ease the average current demand considerably.[6]

Once the size of wire and a close estimate of the number of turns have been determined, the next step is to see if the winding will fit into the space available. Fortunately power-line transformers have enough space in the core "window" to accommodate just about any winding need for an amateur transmitter. To develop 1800 volts would require about 1100 turns, allowing a little extra for voltage drop in the secondary. A first choice of wire size might be no. 22 B & S gauge. (Data for no. 22 wire taken from the copper wire table in *The Radio Amateur's Handbook* is shown in Table 1.) The current-carrying capacity of this wire is based on 700 circular mils (cross-sectional area) per ampere. This is a good design figure for small transformers, but for a unit as big as 1.5 kVA, you should allow more wire area since the heat must follow a longer path to get out of the windings. Since our real average-current demand will be less than 500 mA, this should be a good start. An examination of the old transformer will give us the window dimensions. In my case, the high-voltage winding was 2-1/2 inches (64 mm) wide, had a radial depth of 1 inch (25 mm) and an average circumference of 17 inches (430 mm).

Insulation

Requirements for insulation are the next items for consideration. Transformer windings usually consist of layers wound in alternate directions across the width of the winding. (All turns are wound in the same direction around the core.) Thus, the first turn of one layer will be directly underneath the last turn of the next layer, and the maximum voltage between layers will be present at this point. This voltage will depend on how many turns are present in both layers and on the volts-per-turn factor. Books on transformer design give a typical insulation thickness of 50 volts per mil (a mil is 0.001 inch or 0.025 mm) for impregnated kraft paper. We also have to consider turn-to-turn insulation, but as this will be less than 2 volts, we can safely leave this to the enamel or Formvar coating on the wire.

We must, of course, be very careful to avoid kinks and scrapes during the winding process, for a shorted turn would be a serious matter. Heavy currents would flow, overheating the winding and causing an open circuit or further breakdown. The new winding has to be insulated not only from the low-voltage winding inside it, but also from the core it will pass through. In the first case, we must build up the fiber center of the high-voltage winding to a thickness sufficient to withstand the entire secondary voltage with considerable safety factor. In the case of the winding-to-core insulation, the easiest way is to allow a generous margin at each edge of each layer where there will be no turns. On the outside of the finished winding there will also have to be a layer of insulation thick enough to resist the full secondary voltage.

How the manufacturer dealt with these problems was revealed by the details of the original winding. Paper between the layers was 0.005 inch (0.13 mm) thick. Additionally, there was an extra 0.005-inch strip, half the width of each layer, placed between the starting side of one layer and the finishing side of the next. The margin was 1/4 inch (6 mm) on each edge. The inner end of the original winding was grounded to the transformer tank. Because in normal operation this part is at ground potential, there was no extra thickness of insulation apart from the fiber spool itself. However, at the outside of the winding there were many layers of extra paper. The fiber sleeve mentioned earlier (fully 1/8 inch or 3 mm) served to provide additional insulation between the winding and the core.

More Than Normal Paper Thickness

Concerned as I was about the possible shortcomings of varnishing each layer by hand, I decided to install more than a normal thickness of paper between the layers. I made one layer 0.010 inch (0.25 mm) thick, full width with an additional 0.005-inch (0.13 mm) layer between the high-potential edges of adjacent layers. I provided a 1/4-inch (6-mm) margin that left two inches (50 mm) of width for each layer. At 37 turns per inch (from the wire table) or approximately 1.5 turns per mm, I would have 74 turns per layer. Thus, between two layers, the maximum voltage difference would be 250 V. At 1.66 volts per turn, 148 turns should produce approximately 250 V. With 0.015 inch (0.38 mm) of paper, this would be less than 20 volts per mil. Since the wire thickness was 0.025 inch (0.64 mm) the insulation

Polychlorinated Biphenyls (PCBs)

Regulations established in 1979 prohibit the manufacture of transformers containing oil with PCBs, chemicals which may be hazardous to one's health. Prior to that time such transformer oil was mainly placed in very large transformers and in transformers to be located in buildings where fire would have serious consequences. To a much lesser degree PCB-containing oil was used in pole transformers. Nevertheless, amateurs are advised for safety reasons to treat transformer oil as though it were contaminated. Avoid getting it on hands and body, or in the mouth. Wash hands thoroughly before eating. Detailed information on PCB use and disposal is available from the Environmental Protection Agency, Washington DC 20460. — *Stu Leland, W1JEC*

Table 1

Copper Wire Data (Enamel or Formvar Covered Wire)

Size	Diameter	Turns per Unit Length	Length per Unit Weight	Resistance	Current Capacity
No. 22	0.0253 inch 0.643 mm	37 per inch 1.46 per mm	514.2 feet/lb 71.3 m/kg	16.46 Ω/1000 feet 5.40 Ω/100 m	918 mA

thickness of 0.015 inch would make each layer 0.040 inch (1 mm). At 74 turns per layer, 1100 turns would call for slightly less than 15 layers, and at 0.040 inch per layer would add up to 0.6 inch (15.2 mm) total. I could then use 0.2 inch (5 mm) both on the inside and outside of the winding which, at 20 volts per mil, would be enough for 4000 V.

Seeing How the Trade-Offs Work

By going through this procedure a couple of times for different sets of specifications, it will quickly be seen how the trade-offs will work. Using no. 24 wire, for example, will reduce the average current capability but more layers can be added to give a higher voltage. The increased voltage per layer, because of the the greater number of turns, might call for more insulation but already we are allowing a huge safety margin. Remember that the original transformer was designed for 1.5 kVA in continuous operation 24 hours per day, with only 55° C temperature rise. Even though we will be giving up the advantage of oil cooling, we should be able to draw a kilowatt for amateur service without the slightest problem.

There are two final points about design to keep in mind. The circumference of the winding will tell you how many feet of wire will be needed (in my case around 1800 feet or about 4 pounds — 1.8 kg — of no. 22 wire). The resistance, from the ohms-per-1000-feet figure of the wire table, will allow you to predict the regulation or voltage drop under load.

To wind the new coil, you will need a fixture similar to the one shown in Fig. 2, a simple device made from scrap wood and Masonite. Stay away from lathes, drill presses or other motor-driven contraptions unless you are sure you know what you are doing. Kinks and tangles are almost inevitable if you don't have a lot of experience. The winding is best done *slowly*, one *layer per day*. This makes the task considerably more pleasant and allows time for each layer to dry properly.

See Fig. 3. Begin by precutting the kraft paper to proper width and in convenient lengths. The paper should be dried by placing it in an oven (set for 80° C) for an hour or so.

I kept thinned and unthinned polyurethane in separate cans. The thinned varnish served to saturate the paper while the unthinned liquid was reserved for coating each layer after it was wound. This work is best done with rubber gloves.

Scotch electrical tape will hold surprisingly well on wet or sticky polyurethane, keeping ends of paper strips in place or holding the last turn of wire in the layer. Peel it off, however, before each new layer is added.

During the initial paper winding, the joints may be butted together, but when insulating the layers of wire windings, joints must be lapped and they must fall at the ends of the long oval of the winding. Otherwise you will have extra thickness where you don't want it. You must also remember to start and finish the winding and bring out any taps at the ends and at positions outside the core. Bring the high-voltage ends and taps out on the side of the winding opposite where the low-voltage lead is dressed. The layers of wire are wound fairly tight, the turns being placed side by side with no gaps (close-wound). If the first few turns are smooth and tight, the layer will wind quickly and neatly.

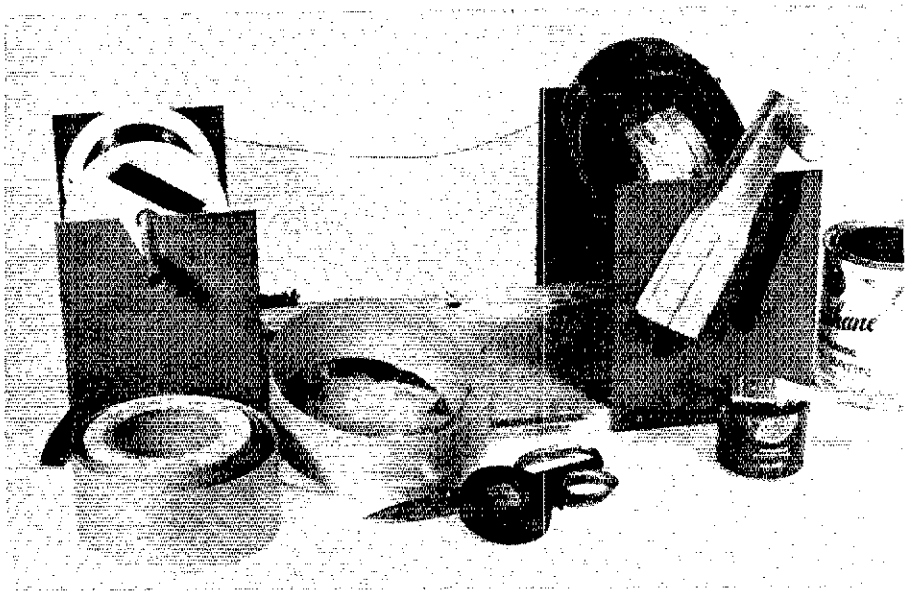


Fig. 2 — This winding jig can be made from odds and ends likely to be found in nearly any home workshop. Shown is a coil being wound on the original fiber spool which is supported by the low-voltage winding. The latter winding is mounted on a crank driven wooden mandrel. A fairly close fit is needed to avoid distortion caused by tension of the new winding.

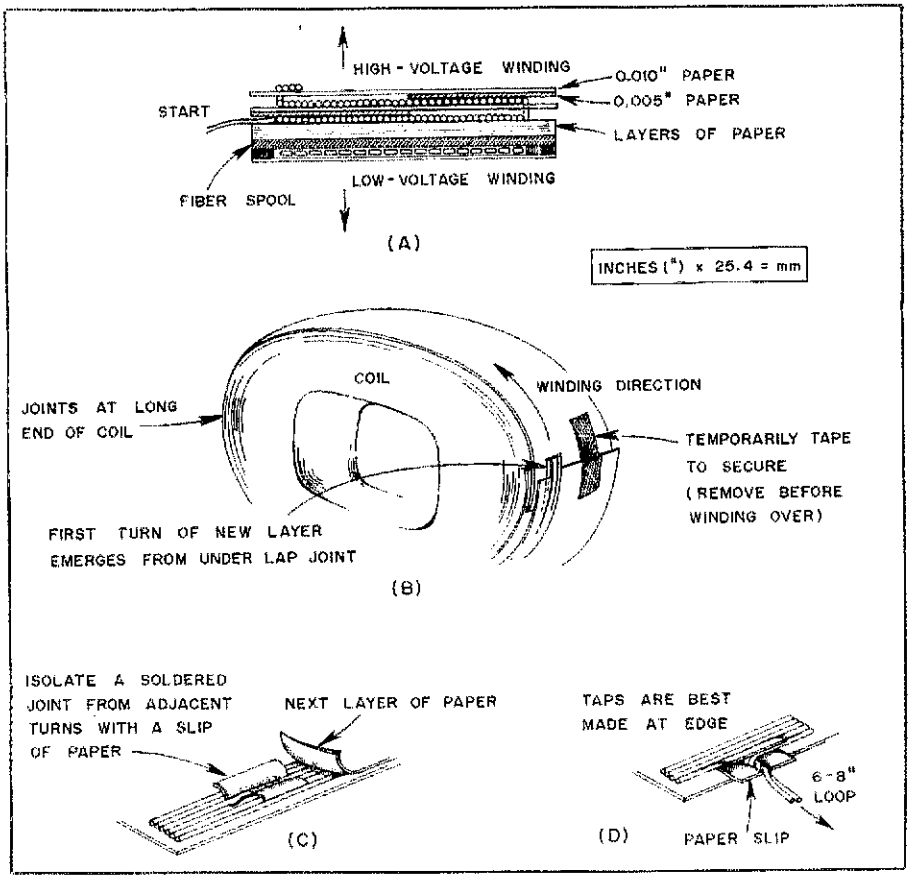


Fig. 3 — Details of the new winding. At A is a cross-sectional view of the winding. B shows how the insulating paper is installed. A soldered joint can be isolated as indicated in C. D illustrates the method of providing taps on the winding. Each layer takes about a half hour to install.

Fig. 4 — A rewound transformer ready to use. The pencil in the photograph gives an idea of the size of the transformer.

Once the winding is finished, including the last 0.2 inch (5 mm) of paper thickness, give it a few extra days to dry. Then bake it for 12 hours at 80° C.

Reassembling the Transformer

Try the core sections to make sure they fit properly. Clean mating surfaces *scrupulously* with solvent. Once the core has been reassembled through the coil, the strap can be threaded through the coil. Bend the strap ends 90° and drill a hole for a bolt to tighten the strap, clamping the core firmly together.

The fiberboard shims can now be reinstated to wedge the core tightly in place. Slip the insulating sleeve around the high-voltage winding to add an additional 1/8 inch (3 mm) of insulation. Apply two coats of Glyptal to improve the appearance of the transformer and seal the windings against moisture. The reassembled transformer is shown in Fig. 4. Under no circumstance attempt to mount the transformer by the metal strap through the core. That could form a shorted turn!

Danger — High Voltage!

Until now, the transformer has been an inert collection of various materials. But once you connect it to a source of power, it becomes *lethal*!

Begin testing with the help of a 3-ampere variable-voltage transformer such as a Variac. Use one or both windings of the primary. A voltage divider consisting of four 1-MΩ, 2-watt resistors in series will permit the use of a VOM or VTVM for measuring the secondary voltage. Even with a VTVM, the readings will be low by a few percent as a result of the loading effect of the meter on the voltage divider. Connect the meter across *one* of the 1-MΩ resistors. *With the power off,* place the string of four resistors across the secondary of your rewound transformer. Set the meter for the 1000-volt ac range. Next, connect your transformer to the Variac and the Variac to the ac line. Bring the primary voltage up slowly. Watch the meter for an indication of the presence of the secondary voltage.

As the voltage on the primary of my transformer reached 120, the magnetizing current was a very satisfactory 1/2 ampere and the secondary voltage (4 times the meter reading) registered as predicted. The core had to be readjusted slightly and additional fiberboard shims wedged into place to reduce the angry buzz of the laminations to a barely perceptible hum.

The point of saturation was apparently reached and core losses increased when the primary voltage was pushed to 145 V, causing a no-load current of 3 amperes. Although the voltage had risen 20% above normal, the insulation did not break down, thus passing the overvoltage test. Under various load-current levels the transformer performed exactly as it should. At 840 watts, the primary current was 7-1/2 amperes with the efficiency above 90%. Best of all, after more than an hour, the transformer remained barely lukewarm.

When the transformer is to be under load, be sure both primary windings are connected in parallel (properly phased) for 117 V or in series for 235 V. Alternatively, the primary windings may also be connected in series for use with any two phases of a 208-V, three-phase service. In the latter case, however, the output voltage will be reduced. The power supply chapter in *The Radio Amateur's Handbook* explains these arrangements.

I fully realize the technique described here is a very rough-and-ready one. But I hope to have shown that a high-power plate transformer can be fashioned from little-known but commonly and inexpensively available things, with a bit of ham ingenuity and labor being the only additional requirement. QST

References

[1]McCoy, "Use $urplus and $ave," *QST*, October 1967, pp. 18-21. Also, "How to Wind Your Own Power Transformer," *QST*, February 1970, pp. 26-29. [Similar information is contained in a more recent article, "Rewinding Transformers," by O'Dell and Shriner, October 1980 *QST* — *Ed.*]

[2]See sidebar story.

[3]*QST* readers unable to obtain a junked transformer or insulating paper locally may write to Mr. Charles Bowman Jr., Bowman and Bowman, Box 518, Greenwood, MS, 38930. Bowman and Bowman can furnish drained and dried cores and windings. Small quantities of insulating kraft paper are also available. Mr. Bowman has made this special arrangement strictly as a favor to *QST* readers and the author.

[4]See sidebar story.

[5]*Reference Data for Radio Engineers*, Chapter 13, Howard W. Sams & Co., Inc. (a complete step-by-step design procedure for transformers).

[6]Orr, *Radio Handbook*, twenty-first edition, Howard W. Sams & Co., Inc., pp. 23.22 ff. (a good discussion of intermittent voice service rating of transformers).

[7]Nilson and Hornung, *Practical Radio Communication*, second edition, 1943, section 6.13.

Strays

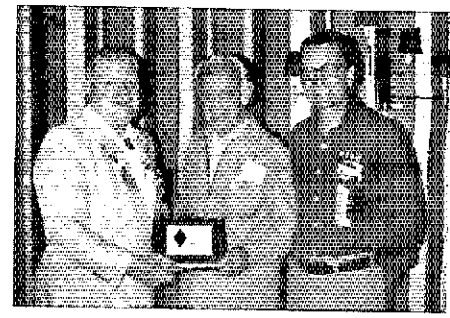
MOVING? UPGRADING?

☐ 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.

ANYONE FOR FAX?

☐ JA2OL and a group of Japanese amateurs report that they are active on facsimile near 14.245 MHz using standards somewhat similar to those used for slow-scan television. FAX transmission presently is not allowed in the U.S. below 50.1 MHz, but a one-way receiving test would be possible now. August *QST*, page 57, describes an FCC proposal, supported by ARRL, to permit FAX in the hf phone bands.

Interested? Write Hisataka Sumioku, JA2OL, 1560 Kamiokamoto, Takayama City, Gifu, Japan. — *Dave Sumner, K1ZZ*



Wayne Cooper, AG4R (center), of Miami, Florida, receives the ARRL 50-year member plaque from ARRL President Harry J. Dannals, W2HD (left) and ARRL Southeastern Division Director Frank M. Butler, W4RH, at the 1980 Miami Hamboree.

QST congratulates . . .

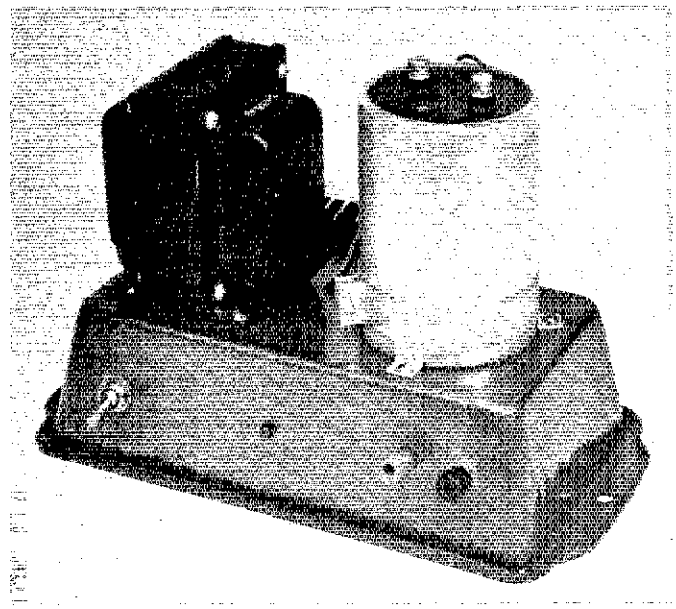
☐ A. H. "Bud" Waite, W2ZK, formerly of Massachusetts and New Jersey, now of Venice, Florida, who was the guest of honor at the annual banquet of the International Antarctican Society, held recently in Washington, DC.

☐ Charles E. Darrow, K8GZQ, of N. Olmsted, Ohio, who as been appointed to the new post of Product Marketing Administrator with The Antenna Specialists Company, Cleveland Ohio.

• *Basic Amateur Radio*

5-A Loafer

Loafing around? Short on dough? Luck panned out? Need a 12-V, 5-A power supply? This one is inexpensive, quick and easy to breadboard.



By Peter O'Dell,* AE8Q and Robert D. Shriner,** WAØUZO

Long ago, in a state far away from Connecticut, coauthor O'Dell lived happily with his wife, Sally. Even though Sally was an active, licensed amateur, the biggest problem they faced centered around ham radio. Every time that Pete enthusiastically started another building project, he got the same *encouraging* words from Sally, "The things you build usually work, but they are *always ugly!* Why can't you build something pretty like they show in *QST*?" In spite of such fundamental differences of perspective, their marriage endures. But what of the poor home-construction enthusiast married to someone who doesn't like the hobby? One complaint that we receive regularly is that projects coming out of the ARRL lab are *too pretty*. This month's Basic Amateur Radio article is for those of you who have suffered untold abuse when your masterpieces have been invidiously compared to photographs from *QST*.

Please note that we have included photographs of technically sound, high-performance, *ugly* equipment built by ARRL staffers. Even though you may not be interested in duplicating this month's circuit (a 12-V, 5-A power supply), you probably will want to save the photographs for future use — self defense! (The authors tried in vain to persuade the editor to make available 8 × 10 glossy copies of these photographs.)

Is Ugly Better?

Although most of the staffers and others connected with ARRL headquarters tend to place a high value on "building neat," one of the TAs (Technical Advisors) who designs very sophisticated equipment insists that "ugly is better." (Name, address and call withheld by request.) A couple of other TAs build ugly equipment, but make no claims as to the technical merit of ugliness. Then there are those of us (O'Dell included) who admire works of beauty, but who have learned to survive without benefit of artistic talent.

Where most home construction is concerned, beauty (or the lack thereof) is largely irrelevant to the functioning of equipment. Frequently, "neat construction techniques" come with experience; this process is often referred to as learning the "tricks of the trade." The balance of this article will deal with various "tricks" of power supply building. Shriner and DeMaw recently presented an introductory theoretical discussion of power supplies,[1] so theory will be kept to a minimum.

Classy Chassis?

Regardless of whether you build "pretty" or "ugly," you may have been faced with the double-edged problem of the chassis — cost and availability. Those living near a large urban area can probably find any size chassis they want at a commercial electronics distributor. But of course, the price may be a little high. Those not living near a large distributor have an even more fundamental problem — where to find the chassis regardless of price.

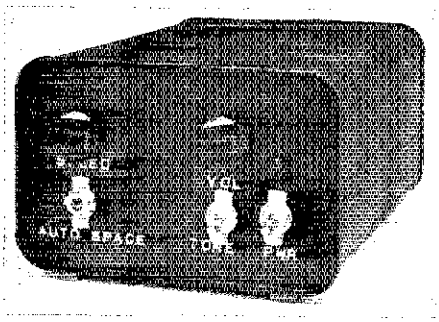
In the early days of radio, experimenters built equipment on chunks of wood (frequently breadboards; hence the term, breadboarding). Few people these days would consider constructing a circuit on wood, but the kitchen does offer an often-overlooked source of inexpensive chassis material — bread pans! Depending on the size, shape and store where purchased, the price of a bread pan can range from under one dollar to several dollars. Commercial chassis of similar size start at around four dollars and go up. Although slightly cheaper, breadpans have as their main advantage widespread availability. From a structural strength, durability and aesthetic point of view, a regular chassis is probably superior. But amateurs have long been famous for making do by pressing ordinary items into extraordinary service.

Another advantage to using the bread pan for the chassis is the ease with which the soft metal can be worked. You need only a few simple hand tools and a common electric drill to do the metal work. Aluminum bread pans are somewhat easier to work with than those made of steel.

The photograph of the Accu-Keyer enclosure illustrates another common item that has been pressed into service. The cabinet was originally a one-gallon (3.875 liter) can. After the contents were used, the can was washed thoroughly inside and out. The top of the can with the spout and handle was cut away with a can opener. The keyer was built on a "slightly used" chassis. Holes were then measured

*Basic Radio Editor
**Box 969, Pueblo, CO 81002

[1]References appear on page 46.



Accu-Keyer mounted inside a cabinet made from a discarded one-gallon can. If you think this is ugly, you should see the "slightly used" chassis on the inside.

and drilled in the bottom of the can for the controls. The bottom of the can became the front panel! A few light coats of spray paint, tape labels and rubber feet added the finishing touches. This cabinet was made six years ago by coauthor O'Dell using nothing more than a drill and a few simple hand tools. It is highly unlikely that anyone looking closely (or not so closely) would ever mistake this for a commercial cabinet; however, it is certainly more appealing than the "slightly used" chassis on the inside. And it was a lot *less expensive* than a "store-bought" cabinet!

Diodes Are a Drop in the Bucket

This month's workshop project is a 5-A, 12-V power supply. The preferred circuit is built around a monolithic three-terminal regulator chip that is rated at 5 A. Unlike the lower current power supply of this series, this supply has a fixed output voltage. Some of you may feel a need for a high current, variable-voltage supply. If that is your need, we suggest you buy a copy of the 1981 *Radio Amateur's Handbook* (available from ARRL for $10) which has new plans for an excellent variable-voltage, high-current supply.

Some of you may be saying to yourself that you do not really need a *variable* voltage supply, but that 12 V is not quite enough for the purpose you have in mind. For instance, some 2-meter fm rigs are designed for optimum performance at 13.8 V; their output is somewhat degraded when run at 12 V. Here is where some of the tricks of the trade can come to your rescue. The ground terminal of this regulator (as well as that of the common 1 A, three-terminal variety) is used for an internal reference and has relatively little current flowing through it. If this leg is raised above ground potential, the regulator chip will continue to supply a regulated output, but that output will be equal to the voltage of the regulator chip plus the amount by which pin 3 is raised above ground. E.g., suppose that pin 3 is raised 1.8 V above ground; the regulated output voltage will now be 13.8 V (12 V plus 1.8 V).

Another way of saying that we want to raise the potential between pin 3 and ground is to say that we want to create a voltage drop. One thing that comes to mind is placing a resistor in series with pin 3. What value? We can experiment with either a bunch of resistors or a potentiometer; we have to experiment because the voltage drop will depend on the amount of current flowing (Ohm's Law). It is not all that difficult to do with a voltmeter and a couple of potentiometers or a good supply of resistors. Being somewhat on the lazy side, the authors looked for another way. Why not use

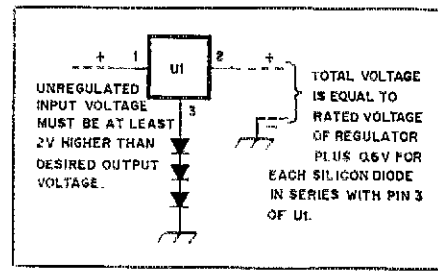


Fig. 1 — Method for altering output voltage of 3-terminal voltage regulator. Although the voltage drop across the diodes does vary slightly with temperature and current density, it can be considered constant for our purposes.

something that has a constant (more or less) voltage drop, regardless of the amount of current flowing through it?

What common, garden-variety device has a constant (more or less) voltage drop? The semiconductor diode. (An explanation of the "hows and whys" can be found in the first section of ARRL's *Solid State Basics* available from ARRL for $5). Suffice it to say here that germanium diodes have a "constant" forward voltage drop of something on the order of 0.2 V and silicon diodes have a "constant" forward voltage drop of something on the order of 0.6 V. If this all sounds just a little vague, relax, because that is the intention. The purist will tell you that the voltage drop across a diode changes with both temperature and current density, which it does. But the changes will be measured in terms of millivolts for semiconductor diodes, while the changes for resistors will be measured in volts. For our purposes it is quite safe to figure on a constant voltage drop of 0.6 V, as long as

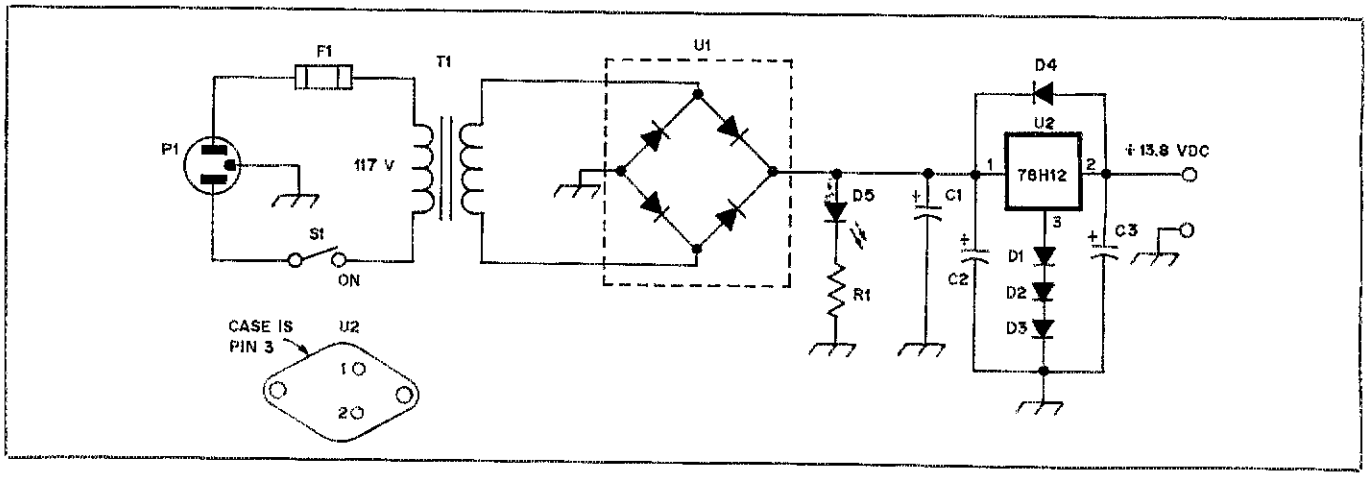


Fig. 2 — Schematic diagram of power supply using a single IC regulator. Capacitors are electrolytic and polarized. R1 is a carbon composition, 1/2-watt. Suggested sources for components are parts dealers at flea markets or those advertising in electronics magazines. Some parts (including the 78H12) are available from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002. Part numbers inside parentheses are Radio Shack parts suitable for use in this circuit.

C1 — See text.
C2, C3 — 3.3 μF, 35 V tantalum or equivalent (272-1408).
D1-D4, incl. — 1N4000 series or equivalent (276-1101).
D5 — LED (276-1622).
F1 — 2 A, fast-acting fuse (270-1275).
P1 — 3-conductor plug and cord; 2-conductor cord (suicide cord) should be avoided.
R1 — See text.
S1 — Spst switch (275-602).
T1 — See text.
U1 — 25-A, full-wave-bridge rectifier, 50 PIV minimum, 100 PIV or greater recommended.
U2 — 5-A, 12-V regulator.
Miscellaneous — fuse holder, heat sink, heat-sink compound, output terminals, grommets, hardware.

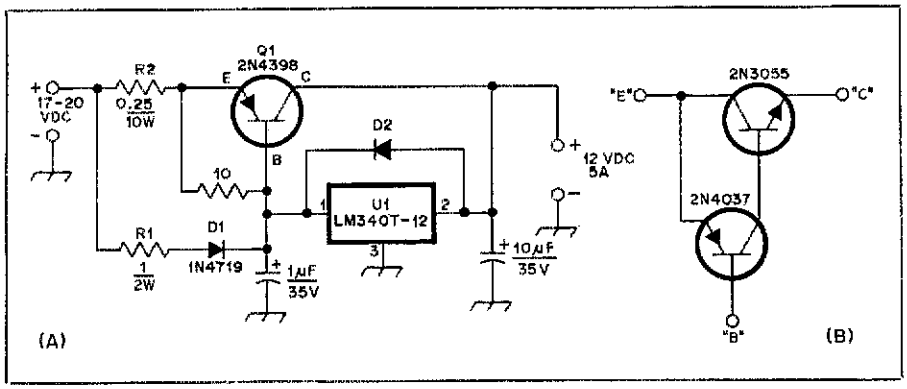


Fig. 3 — An alternative regulator circuit is shown at A. Unlike some regulator circuits using pass transistors, this circuit retains the current-limiting action of the 3-terminal regulator chip. Q1 should be rated to handle two to three times the maximum current to be drawn from the supply. Resistances are in ohms. Resistors are carbon composition, 1/2-watt or greater except where marked otherwise. Capacitors are tantalum. The circuit at B is used to fabricate a pnp pass transistor from an npn pass transistor.

the current capabilities of the diodes are large with respect to the amount of current actually flowing.

Fig. 1 shows a positive-voltage, three-teminal regulator chip with three diodes connected to the reference pin. This system will also work for a negative regulator if the polarities are reversed. The positive output terminal (pin 2) becomes common and both connections shown as chassis common become the negative output bus. The regulated output voltage will be the sum of the voltage drops across the diodes (D1, D2 and D3) plus the nominal voltage of the regulator chip. One word of caution: If the diodes are reversed, the output of the regulator will be approximately equal to the input; i.e., if there is 17 V at the output of the filter section (and the input of the regulator), that is the approximate voltage that will appear at the output of the regulator. Therefore, it is wise to check the connections, check the voltage, and check the connections again while construction is in progress.

Ugly is Only Skin Deep

The bottom view of the power supply reveals that there are only a few components mounted inside the chassis. The circuit (Fig. 2) is a simple straightforward design of few components, but most of those are large and bulky.

With the TO-3 style case, pin 3 of the regulator is the housing itself. Thus, to raise pin 3 above ground, you must isolate it electrically from the heat sink (or isolate the heat sink from ground). A mica washer, nylon bushings and screws (metal or nylon), along with a good heat-sink compound, can be used to insulate the device from the heat sink while allowing the heat to be conducted away safely. Radio Shack sells mounting hardware kits (276-1371) and heat-sink compound (276-1372), so most builders should have little trouble locating these items. If the mounting hardware kit is not available, however, you can make do with Teflon tape in place of the mica washer and nylon (only) screws. The Teflon tape can be obtained at most hardware stores; it is used to seal threaded-pipe joints.

The transformer that was rewound last month[2] provides 17 V at better than 5 A on the secondary. Any 117-V-primary transformer having a secondary that will provide at least 17 V at 5 A will work, as long as the 35-V maximum input-voltage limit of the regulator chip is not exceeded. But keep in mind that increases in input voltage translate into increases in power (heat) dissipation.

U1 is a monolithic bridge rectifier. Even though we are building a 5-A supply, we have specified a 25-A bridge. There are a couple of valid reasons for using a higher rating than necessary. At the instant that the supply is turned on, C1 (a very large capacitor) has no charge and looks like a dead short. Until C1 is partially charged, the current will go somewhat above 5 A. Even though this is only for an instant, it might be enough to damage the bridge, if it were not "hefty." Another drawback has to do with the voltage drop of a diode (U1 is four diodes in one package) as the current density approaches the diode rating. This was mentioned above and is quite a bit deeper water than we want to go wading through now. If you want more detailed information on the theory of power supplies see ARRL's *Understanding Amateur Radio* (available from ARRL for $5) or the 1981 edition of *The Radio Amateur's Handbook*.

D5 is an LED that serves as a power-on indicator. A neon lamp and dropping resistor wired in parallel with the primary of T1 would have served the same function. The diode was from a grab-bag source, so it was necessary to experimentally determine the value of the current-limiting resistor. A 1-kΩ potentiometer was used in place of the fixed resistor. The potentiometer was adjusted until the LED shone at the desired brightness. The resistance of the potentiometer was then measured for that setting and a fixed-value resistor of comparable value was selected.

C1 is a *large* capacitor. The one used in the prototype built in the ARRL Lab is 18,000 μF at 35 V. There is nothing sacred about the 18,000 μF value. If you have one in your junk box that is rated between 15,000 and 25,000 μF it will probably work — as will two rated at 10,000 μF wired in parallel.

O'Dell once built a comparable power supply that specified 2000 μF for a similarly used capacitor (there was an error in the schematic; it should have read *20,000* μF). Flipping the power switch produced a hum unmatched since the last general warm-up exercise at the National Convention of Barber Shop Quartets. O'Dell began adding 2000-μF capacitors in parallel until the hum disappeared. Paralleling small-value capacitors to produce a large value is effective, but it is not cost effective!

The critical factor for C1 is the voltage rating. When C1 is fully charged, the peak voltage will rise to something over 20 V, depending upon the transformer used. Although it is probably okay to use 35-V capacitors, you will be safer using 50-V (or higher) devices.

The regulator circuit is the same as that of Fig. 1 discussed earlier, except that two capacitors have been added (C2 and C3). Both capacitors should be placed as near the regulator chip as possible; 3 inches away should be maximum. C2 helps stabilize the voltage regulator while C3 serves to suppress transients. Without these two capacitors, there is a good chance that your regulator will not produce a pure dc voltage. D4, the diode strapped across the input and output of the regulator chip, U2, is there to protect the chip from reverse voltage breakdown. Most heat sinks have enough space so that the entire regulator circuit can be built on the heat sink and then assembled to the chassis as a unit.

Alternative Regulator Circuit

The 5-A regulator chips are not found quite so easily as the 1-A variety, although we have listed one known source. The circuit using the 5-A chip is the preferred one, but we are including an alternative which features a 1-A chip with a pass transistor "wrapped around" it. The circuit in Fig. 3 is adapted from one presented by DeMaw and Hayward in ARRL's *Solid State Design* (available from ARRL for $7).

We will not attempt a detailed explanation of the inner workings of the circuit; however, a few salient features are worth pointing out. The voltage drop across R1 and R2 will be equal; therefore, the current in each branch will be inversely proportional to the resistances. In other words, four times as much current will

Ugly is only skin deep! Most of the components for the power supply are mounted on the outside of the bread pan chassis. Note that the heat sink is a relatively large one. Additionally, it is mounted with the fins in a vertical position during normal operation, to facilitate cooling. Because of the conservative design approach, this power supply "loafs" along at its 5-A rated output.

flow through Q1 as through U1. This means that the regulator circuit retains the current-limiting characteristic of the chip. Q1 is a pnp power transistor capable of handling the 5-A current. Since npn power transistors sometimes seem to be more abundant than pnps, we have included a gimmick for turning an npn into a pseudo-pnp. The circuit of Fig. 3B may be used in place of Q1.

Another important characteristic of voltage-regulator chips that usually disappears when a pass transistor is used is thermal shutdown. Most regulator chips have circuitry built in that sense a dangerous rise in temperature. When that happens, the chip automatically reduces output until the temperature falls to a safer level. This is something else that we can "gimmick," although not as accurately as the current-limiting action. If we install the regulator chip and the pass transistor on separate heat sinks, and if we make the heat sink for the pass transistor about four times the size of the one for the regulator, then we will retain some semblance of thermal shutdown.

Should we desire a voltage slightly higher than the nominal output voltage of U1, we can use the same techniques as described earlier. The circuit in Fig. 3 just replaces the regulator portion of the power supply. You will still need the rectifier and filter.

Making Do and Making Better

Either way you build this supply, it should "loaf" along at the 5-A level. There is a beauty and an elegance in building something right, whether it looks like something store-bought or not. Much of the "building right" knowledge comes from experience. Where do you get experience? The journey of a thousand miles begins with the first step.

References

[1]DeMaw and Shriner, "A Simple Utility Power Supply," *QST*, November 1979, p. 22.
[2]O'Dell and Shriner, "Rewinding Transformers," *QST*, October 1980, p. 34.

Amateur Radio at Iditarod, 1980

The Iditarod Trail Race is a 1049-mile dogsled race that begins at Nancy Lake, north of Anchorage, Alaska, and finishes in Nome. The race was established to commemorate a 1925 race against time when Leonard Seppala carried diphtheria vaccine to Nome, where a diphtheria epidemic had broken out.

Amateur Radio had been used extensively in past races, but this year the Iditarod Committee decided to place total responsibility for communications in the hands of Amateur Radio operators. A team of Anchorage hams, headed by Tom Moore, KL7Q, spent eight months preparing and organizing a communications plan. Their plan would not only provide race progress information to Anchorage and Nome race headquarters, but would also provide emergency communications, search-and-rescue coordination and personal third-party traffic handling for the dogsled drivers (mushers) and race-support people on the trail.

We felt that the communications effort should serve two purposes. The first was to cover the race and pass information as quickly as possible. A second and more important purpose was to provide an exercise in extended communications under emergency conditions.

The Alaska Division of Emergency Services donated the use of their communications center in downtown Anchorage. They agreed that the Iditarod would be a good RACES exercise to demonstrate Amateur Radio's ability to provide sustained communications from remote areas of the state. Area amateurs augmented the equipment already at the communication center's RACES position so that the station would have simultaneous capability on 75, 40, and 20 meters as well as vhf links to checkpoints within 140 miles of Anchorage.

Amateurs manned 29 checkpoints along the race route. There were also four shifts of four hours each to be filled at communications headquarters in Anchorage and Nome. Volunteers from Anchorage ARC, Matanuska ARA, Fairbanks and Nome manned the checkpoints.

Part of our program was getting hams out to their checkpoints in the bush. At the same time we kept Nome and Anchorage updated with race information, delivered traffic and kept tabs on who was doing what and where. Many of the hams going out on the trail had their own planes. The "Ham Air Force" consisted of five light aircraft. They spent the better part of their time ferrying other hams to the various checkpoints along the race route.

It was most important to keep our message traffic in order. We opted to pass traffic using standard ARRL message blanks. Each operator had a pad of these blanks and wrote out all traffic before sending it on to Anchorage where it was copied in message form for relay, via RTTY, to the Iditarod race headquarters.

Our communications plan was developed in close cooperation with the Iditarod Race Committee, the Alaska State Troopers, the Rescue Coordination Center (RCC) at Elmendorf Air Force Base and other official agencies. Each of the amateur operators received a pre-race briefing on emergency procedures and weather observation in the event such information was needed.

In one instance the advance planning saved a great deal of anguish and helped to quell rumors. A light plane carrying three members of a Spanish television film crew crashed about 800 miles uptrail from Anchorage. When word of the crash reached his checkpoint, Dave Goodyear, KL7JKC, set the emergency plan in motion. Both Nome and Anchorage were notified of the accident. Nome headquarters alerted the State Troopers, who immediately dispatched a helicopter to the scene. Anchorage coordinated traffic to RCC and Anchorage race headquarters.

At the time of the crash the identification of the plane was not known. It was known, however, that at least three other Iditarod planes were in the area. Identification became a priority matter. When the tail number of the downed aircraft was brought to KL7JKC he quickly transmitted it to Anchorage. Because the number closely resembled that of one of the other planes, a priority search was initiated to locate all the other planes in the area. Within 10 minutes of the original request, all other aircraft were located.

As the evening wore on, more information was relayed from the trail to Anchorage and Nome as to the location of the crash site and the victims who had been brought in. Weather conditions and other information were passed to the State Trooper helicopter, RCC, the Federal Aviation Administration and the National Transportation Safety Board were kept up-to-date on events as they occurred. The amateurs involved performed perfectly. They passed accurate information quickly and efficiently.

At 5 P.M. on March 15 Joe May, of Trapper Creek, crossed the finish line in Nome, setting a new Iditarod record of 14 days, 4 hours. The last musher crossed the finish line 11 days later. Only then were the last of the hams brought back to Anchorage for a party, debriefing and congratulations on a communications effort that once again showed that Amateur Radio is a vital communications service unsurpassed in efficiency of operation, ingenuity and willingness to assist wherever needed. — *Chip Lee, KL7IUI, Anchorage, Alaska*

Product Review

Conducted By Paul K. Pagel,* N1FB

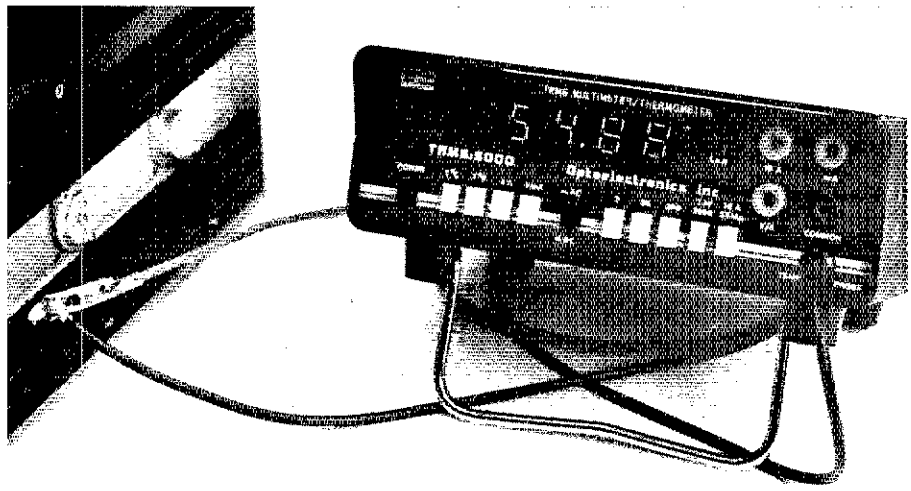
Optoelectronics TRMS:5000 DMM/Thermometer

The TRMS:5000 is a digital VOM and thermometer having 4-1/2 digits of resolution. The "half" means that the most significant digit can only be a "one" or a "zero," and if it's a zero, it's blanked. It can measure voltages up to 1-kV dc or ac (pk-pk), currents up to 10 A, resistances up to 20 mΩ, and temperatures from −50 to +150° C (−67 to 200° F). The '5000 is a laboratory-grade instrument and is guaranteed to hold calibration for one year.

The letters in the model designation mean "true root-mean-square." Typical VOMs have rectifier circuits to convert ac to dc for measurement and display. These circuits usually produce a dc voltage equal to the *average* ac amplitude. For a pure sine wave, rms and average are the same thing. In other waveforms, that's not the case. The ratio of the peak voltage to the rms voltage is called the *crest factor*. A sine wave has a crest factor of $\sqrt{2}$. The TRMS:5000 displays the true rms voltage of waveforms having crest factors up to three.

An abbreviated table of specifications appears with this review, but if you're not familiar with DMMs, the specs can be confusing. Several factors affect the accuracy of the meter, including errors in the voltage reference source, the A/D converter, the time base and the attenuator network. An accuracy specification (such as ±0.04% + one count) accounts for all of the possible sources of error. If the meter reads 1.5000 V, the actual voltage could be as low as 1.4993 or as high as 1.5007. The *resolution* (100 μV) exceeds the accuracy of the measurement. If somebody offers you a meter having 1 microvolt resolution, don't get excited, because unless it has comparable accuracy, the last few digits are worthless. The last digit of the TRMS:5000 is useful for monitoring relative voltage changes. A meter having one more meaningful digit would cost at least twice as much as the TRMS:5000 because it would need a temperature-controlled reference element and a TCXO or crystal oven in the counter time base.

Successful use of test equipment requires an understanding of its limitations. For current measurements, Optoelectronics specifies a *burden* of 2 volts, meaning the TRMS:5000 may introduce 2 volts of potential drop in a series circuit. You couldn't use a 10-A range to monitor the current drain of your mobile transceiver, because the voltage drop would radically alter the ouput impedance match and cause the transceiver to draw less current and possibly malfunction. A better way to employ the TRMS:5000 in this application would be to install a calibrated brass shunt in the power lead and monitor the voltage across it. A couple of volts won't make much difference when measuring the plate current of a tube type of transmitter, but you can run into trouble here too if you're not careful. The "common" measurement terminal is floating with respect to the chassis.



A tilt-up bail brings the TRMS:5000 readout to a convenient level during use. In this photograph, the unit is being used to measure the heat sink temperature of a 25-A power supply. The display indicates 54.88° C.

Optoelectronics TRMS:5000

Abbreviated Manufacturer's Claimed Specifications

Dc voltage

Range	*Accuracy*
2 V	± (0.04% + 1 count)
up to 1000 V	± (0.04% + 2 counts)

Ac voltage (45 Hz - 10 kHz)

Range	*Accuracy*
all up to 1000 V	± (0.35% + 15 counts)

Crest Factor: 3
Useful frequency range: 45 Hz to 250 kHz

Current

Frequency Range	*Accuracy*
Dc	± (0.6% + 2 counts)
45 Hz to 10 kHz	± (1% + 2 counts)
10 kHz to 40 kHz	± (1.5% + 2 counts)

Temperature

Range	*Resolution*	*Accuracy*
−50 to +150° C	0.01°	±0.5°
−67 to +199° F	0.01°	±0.9°

General

Maximum input voltage: 1040 V pk-pk
Input impedance: 10 MΩ in parallel with 80 pF
Temperature and time range for rated accuracy: 18 to 28° C for one year.
Power requirements: 9 to 12 V dc @ 300 mA (wall-plug supply comes with meter)
Dimensions: 3-1/4 × 7-1/4 × 6-3/4 inches (83 × 184 × 171 mm) (H × W × D)
Weight: 2 lb (0.9 kg)
Price class: $300
rechargeable battery option: $25
Supplier: Optoelectronics, Inc., 5821 N.E. 14 Ave., Ft. Lauderdale, FL 33334, Tel. 1-800-327-5912.

You can ground the chassis for noise reduction purposes, but the common terminal can withstand only 600 V with respect to the chassis. If you measure current in a high-voltage lead, enclose the meter in a plastic bag and power it with batteries.

Resistance measurements on the 20-MΩ range call for some patience, because the settling time is about 10 seconds. Readings taken on the lower ranges stabilize in two seconds or less. A rear-panel switch selects resistance probe potentials of 0.5 and 1.5 volts. The high-voltage position provides the greatest accuracy, but the low-voltage feature is useful for in-circuit measurements without forward-biasing silicon semiconductor junctions. A front-panel LED alerts the operator to the low-voltage condition.

The thermometer function is fairly simple but not completely goof proof. The case of the temperature transducer can survive 200 volts with respect to the voltmeter common. To use the probe over its full rated temperature range, you should replace the cable with a Teflon one. The owner's manual advises avoiding strong acids when using the temperature probe. I assume this means don't dunk it in your pc-board etching tank.

Checkout

What about the meter's electromagnetic compatibility — how will it get along in your ham shack? The time base for the A/D converter and counter begins with a 3.84-MHz crystal oscillator. (They could have picked a better frequency!) The signal radiation isn't strong though, and grounding the DMM chassis to my transceiver made the signal drop into the noise. My real concern was the 555 timer operating at 20 kHz for the negative power supply. I searched for 20-kHz markers throughout the hf bands but didn't hear any. I

*Assistant Technical Editor

did hear some white noise, but that too disappeared when I connected the DMM chassis to the transceiver. The meter wasn't disturbed by 50 watts of rf on all hf bands.

A DMM can't replace your old, trusty analog VOM in every application, but it can certainly increase the number and accuracy of the electrical measurements you make. If you acquire an Optoelectronics TRMS:5000, you will have a professional instrument with which to advance the state of the amateur art. — *George Woodward, W1RN*

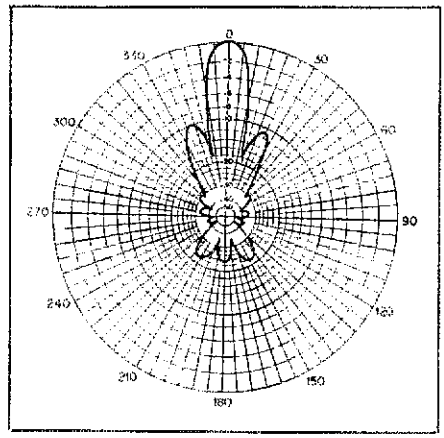
[Editor's Note: The instrument submitted for review was in kit form. Shortly before the review was originally scheduled to appear in this column, we were informed that, because of several engineering and other changes, the kit version was being discontinued. Optoelectronics has offered buyers who reference this *QST* review a discount price of $270 for the factory assembled TRMS:5000, complete with a one year parts and labor guarantee.]

CUSHCRAFT 32-19 "BOOMER" AND 324-QK STACKING KIT

☐ Moonbounce, or EME (earth-moon-earth) communication, requires a transmitting, receiving and antenna setup which can bridge a round-trip distance of about 450,000 miles (725,000 km) and also make up for the losses caused by the moon's surface being a very imperfect reflector. Also, as I was about to discover, it requires a great deal of patience.

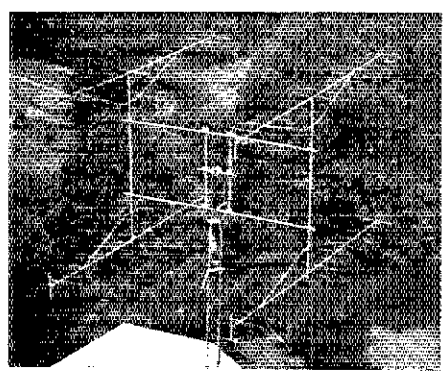
Cushcraft supplied four 19-element antennas and a 324-QK stacking kit, which consists of an "H" frame of 2-inch (51-mm) and 1-7/8-inch (47.6-mm) aluminum tubing and an RG-8/U coaxial cable harness and power divider for combining and phasing the four antennas. The frame spaces the antennas 14 ft (4.25 m) horizontally and 12 ft (3.66 m) vertically. Materials are furnished for weatherproofing the cable connectors, which is a very nice touch. The cables are all precut and terminated in male uhf connectors. Each antenna weighs about 12 pounds (5.5 kg). The hardware is all stainless steel, and all of the elements (with the exception of the driven element) are 3/16-inch (4.76 mm) solid aluminum rod. On the driven element, which is made from 1/2-inch (12.7 mm) aluminum tubing, a T match replaces the old gamma match used on earlier Cushcraft designs. The boom of each antenna is 3.2 λ long, or 22 feet (6.7 meters), and is made from 1-1/8-inch (28.6-mm) and 1-inch (25.4-mm) dia tubing. Fifteen directors, the driven element, and one reflector are spaced evenly along this boom, and two more reflectors are mounted above and below the boom at the rear of the antenna. A boom brace is provided to keep the boom from sagging. Presence of the brace means you cannot mount the antenna for vertical polarization, but Cushcraft has other models for the fm operator. The 32-19 is not intended to be used above 146 MHz.

Assembling the first antenna took more than two hours, but by the time the third and fourth were being put together our time was down to 1-1/4 hours unassisted and 45 minutes with two of us working together. That was the easy part; the difficult part was getting the whole assembly to the top of the 70-foot guyed tower. After that, we had a 90-pound (45.4 kg) aluminum array, occupying almost 5000 cubic feet (140 m³) of air space, to wrestle into place on the elevation rotator which was already bolted to the mast. (As supplied, the "H" frame is designed for mounting on a vertical pipe with a diameter of up to 2 inches (50.8 mm). Some additional tubing and brackets are needed to mount it on an elevation rotator.) Most moonbouncers have the good sense to mount their antennas less than 20 feet (6 m) off the ground; now I know why!



This diagram shows the radiation pattern at 144.15 MHz of the array of four Cushcraft 32-19 "Boomers" as installed at K1ZZ. For this test, a signal was fed into a 3-element Yagi mounted at the same height as the center of the array (72 feet, or 22 meters), and about 30 wavelengths away. Then a laboratory 1-dB step attenuator was used to maintain a constant S-meter reading on a receiver connected to the array under test as the array was rotated. The pattern shown is reasonably representative of the array's performance, but tests performed under different conditions might yield slightly different results. Numbers around the perimeter indicate degrees; the concentric scale represents dB relative to the peak of the major lobe. See July 1980 *QST*, page 26, for an explanation of this method of depicting antenna patterns.

By the time everything was tightened down it was getting dark, the ARRL International EME Contest was about to start, and we had not had time to hook up the W1VD-designed low-noise preamp and transmit-receive relay system which was to be mounted at the top of the tower. (You'll have to wait for the 1981 *Handbook* for details on that!) So, we spent the couple of hours before moonset listening with the preamp down in the shack at the wrong end of about 2 dB of feed-line loss. Even with that handicap, we were elated to hear W7FN in Washington and a couple of other stations which could not be positively identified because of fading. About the only problem we had with the antenna was that it was not perfectly balanced mechanically; the elevation rotator could go up but had a tough time coming back down to the horizon. This was remedied by adding a counterweight on the front of the array.



This view of the four Cushcraft 32-19 "Boomers" as installed at K1ZZ was taken from the 90-foot level of another tower on the property. Two 6-foot (1.8 m) lengths of 2-inch (50.8 mm) aluminum tubing (not supplied with the 324-QK stacking kit) are used to mount the array on the elevation rotator. *(W1VD photo)*

From the first, we were hearing signals very well — once the preamp was put at the antenna where it belonged, part-time listening over the two contest weekends yielded positive identification of a dozen stations, and partial calls on a number of others which we could have deciphered had we known who was active on the band. However, with more than 500 watts at the antenna we had heard our own echoes just once and had made no QSOs, though we had answered some CQs during the contest. The problem was *fading*, caused by changes in polarization as the signal passed through the ionosphere (Faraday rotation). Somewhat disappointed, we checked in with the 2-meter EME group that meets on 14.345 MHz at 1700 UTC on weekends. The welcome we received could not have been warmer. Conditions aren't very good at the moment, we were told; the fact that you're hearing *anything* means the system is working. A couple of people who obviously did not need Connecticut volunteered to run schedules, and on the third try we had a solid exchange with VE7BQH in the log and on tape, followed almost immediately by W7FN. Then K4PKV (who also uses four Boomers) asked for a sked on the fourth of July, and we celebrated the day with another QSO — our first with a station using an antenna as "small" as ours. EME provides "the ultimate antenna test range" — and, obviously, our tests with the Boomer show that it works!

Not too many people are going to make an investment like this just to try 2-meter moonbounce, so we wanted to see how well the antenna would work in normal terrestrial operation. We were a bit skeptical because of the narrow beamwidth: As you can see from Fig. 1, if the antenna is pointed more than 5° off the mark, you're well down the side of the major lobe. From Hartford, this means that if the array is pointed toward northern New Jersey you don't hear much from southern New Jersey, and vice versa. This makes round-table QSOs a bit tricky! On the other hand, for weak-signal DXing there is no substitute for antenna gain, and there's not way to *get* gain without compressing the main lobe. We didn't have time for a full effort in the June VHF QSO Party, but two hours of multiplier hunting on cw late Saturday afternoon yielded 21 sections. And K8NXI in Ohio popped through with his 100 watts the following morning. The only other New England station he worked on 2 meters in the contest was W2SZ/1, a station with a 3400-foot (1036-m) height advantage! The disappointment of the weekend was missing what should have been an easy North Carolina multiplier, probably because the antenna was seldom pointed that far south.

For most of us, one or two Yagis is all that's manageable for 144 MHz. We haven't tried the Boomer in that configuration, but for a four-bay array to work this well, each antenna must be an effective performer by itself. Of course, the mechanical problems of installing and rotating a smaller array would be much less, and the expense of the H frame would be eliminated. As supplied, the T match is set up

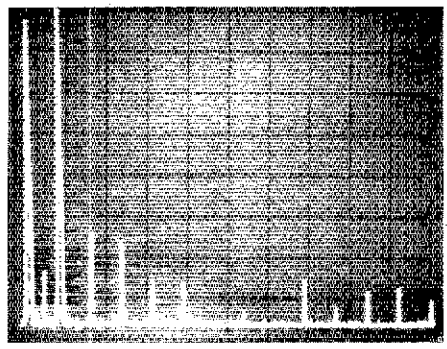
for 50-ohm unbalanced feed, but it could be readjusted for 75-ohm feed if there were some reason for doing so. Incidentally, as installed the antenna met the manufacturer's SWR claims of 1.2:1 or less, and it was essentially flat across the 2-MHz bandwidth.

The 32-19 Boomer is a high-performance antenna made with high-quality hardware which, if properly installed, should give years of effective service. You don't need to work moonbounce to appreciate its performance, but the fact that four of them make an effective EME system should remove any doubts as to its capabilities!

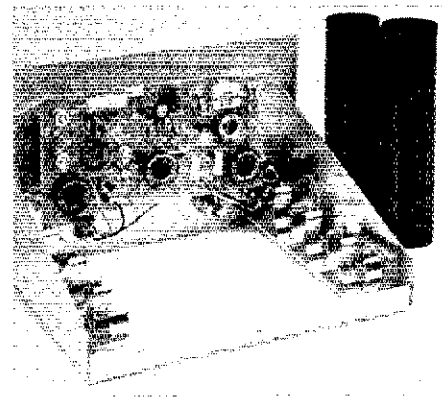
Retail price class of the individual antennas is $100, and of the stacking kit, $440. Manufacturer: Cushcraft Corporation, P. O. Box 4680, Manchester, NH 03108. — *David Sumner, K1ZZ*

TEDCO MODEL 1

☐ Tedco's Model 1 is a QRP cw-only transceiver that operates within the Novice portion of the 80-meter band. The unit covers the frequency range of 3685 to 3755 kHz. As may be seen in the photograph, the entire transceiver, with the exception of the battery supply, is contained on a single glass-epoxy pc board. The unit is housed in a wooden enclosure covered with wood-grained vinyl. Nine D-cell batteries (not supplied) are divided among three cardboard tubes and placed in the three rows of battery clips provided on the chassis rear. The instruction manual is lengthy and includes a complete circuit description, initial checkout procedures, operational hints, and maintenance and troubleshooting information.



Spectral output of the Tedco Model 1. Vertical divisions are 10 dB; horizontal divisions are 5 MHz each. Indicated power output is 1 watt at a frequency of 3750 kHz. The second harmonic is approximately 54 dB down from the fundamental. The Model 1 complies with current FCC specifications regarding spectral purity.



The inside of the Tedco Model 1. The complete transceiver is on the single pc board. To the right of the unit are the tubes into which the batteries are placed and set inside the chassis battery clips.

Tedco Model 1

Manufacturer's Claimed Specifications	*Measured in ARRL lab*
Rf power output: 0.5 watt.	1 watt into 50-ohm load.
Harmonics: More than 30 dB down.	More than 54 dB down.
Frequency drift: Less than 30 ppm/° C	Less than 30 ppm at room temperature.
Chirp: Less than 10 Hz.	30 Hz.
Receiver sensitivity at 50 ohms: Less than 1 μV for 10 dB S + N/N	≤1 μV @ 50 ohms.

Size: 5 × 9 × 8 inches (127 × 229 × 203 mm) HWD.
Weight: 1 pound.
Price class: $80.
Manufacturer: Tedco, 9 Canonicus Ave., Newport, RI 02840.

The Receiver Section

The receiver is a direct-conversion type employing a total of six transistors: Two operate as a common-base differential-pair rf amplifier, two are in a similar configuration as a product detector and the last two comprise the audio amplifier stages. A simple L-C audio filter is centered at a frequency of 750 Hz. A BEAT SELECT control (RIT) permits tuning the receiver independently ±750 Hz from the transmitted (center) frequency. The tuning of this control is quite smooth.

Headphone operation is dictated because of the low audio power output (5 mW) available. Monaural 'phones with each earpiece presenting an 8-ohm impedance are recommended to be used with a 1/4-inch (2.5 mm), three-conductor plug (not provided). If a two-conductor plug is used, it is inserted only part way into the jack. This is inconvenient, however, as the plug will not fit snugly into the jack, and movement of the headphone cord causes the plug to lose contact. The result: no audio. After a while, this can become quite aggravating. The T-R switching is arranged so that the built-in sidetone signal will be heard in the headphones during transmitter keying.

The Transmitter Section

A single FET is used in the master-oscillator circuit, which operates as both the VFO for the transmitter and the BFO for the receiver. One pole of the toggle switch used for the T-R switch selects either one of two capacitors to ensure that the receive and transmit frequencies are the same when the receiver BEAT SELECT control is set at zero (mid-position).

Following the VFO is a single IC (CA3020A) which furnishes both the buffer and final amplifier stages for the transmitter. The output transistors of the IC will deliver 1/2 watt of output power. A single transistor is used to generate a 750-Hz sidetone signal during keying.

The antenna output coupling is geared toward balanced loads with a 300-ohm impedance; the operator is cautioned against creating an unbalanced condition. (Such a restriction appears to be an inconvenience to most station operations since the use of low-impedance unbalanced coaxial lines is quite prevalent today. There is a way to accommodate the use of coax, however, which will be explained later.) Components to construct a peak-reading rf voltmeter are included with the transceiver to aid in transmitter tune-up.

Operation

Tedco advises not to use an ac-operated power supply with the Model 1 because of the susceptibility of the unit to hum pickup. This was verified at my station. When an attempt was made to use such a supply, the audible hum in the headphones masked most of the incoming signals and made operating intolerable. Attempting to connect everything to one common station ground resulted in ground loops which made conditions even worse. Battery operation eliminated the hum problem entirely.

Since my station is geared to the use of 50-ohm coaxial cable, it was necessary to change the 300-ohm balanced output to 50-ohm unbalanced. This was accomplished by unwinding 6 turns of the output link from the toroid and using a 1:1 balun. (This procedure does add another lossy element to the picture, however — an undesirable circumstance when QRP operation is contemplated.) There is no antenna-connection jack at the rear of the cabinet: The antenna connecting leads must pass through the rear of the cabinet to thumbscrew terminals on the pc board; the key-lead connections have to be similarly made.

It was noted that hand capacitance affected the VFO frequency slightly. Attaching a station ground to the chassis reduced this effect. Main-dial accuracy is quite good, well within 1 kHz. The transmitter will transmit with the T-R switch in the receive position, but this is immediately noticeable since there is no sidetone audible and keying clicks (because of receiver overload) are evidenced in the headphones.

Observations

Operating in the Novice portion of the 80-meter band on a weekend evening with this amount of power and a direct-conversion receiver is quite a challenge. Although this unit is intended for the Novice operator, I'd definitely not recommend it for the *beginning* Novice — he or she usually has enough things to think about during the first 100 or so QSOs without having to resort to as-yet-unlearned QRP operating skills. Skilled, "bare bones" QRP operators might like the challenge. — *Paul K. Pagel, N1FB*

HEATH SA-2040 ANTENNA TUNER

☐ It took approximately eight hours to bring the SA-2040 from shipping carton to finished product. Before assembly began, a number of corrections had to be transferred from the errata sheet and pages had to be added to the manual. From that point on, the whole process flowed smoothly. Nary a nut or bolt was missing from the kit; in fact, a few extra parts were included. Even an extra capacitor-mounting insulator is supplied in case you fail to heed the

frequent warnings about tightening the hardware and manage to break an insulator in the process. The two capacitors and some of the roller coils require assembly.

The front-panel mask has a self-adhesive backing and is made of a material called "matte clear vinylite." It really dressed up the tuner and has provisions for adding the station call letters and control-position information, which may be jotted down on an erasable logging scale. The decor is black and gray, not the usual Heath green you've been used to seeing.

Large knobs on the capacitor and inductor shafts, along with well-lubricated bearing surfaces and tension adjustments on the capacitors and inductor make control tuning quite smooth. A three-digit turns counter is coupled to the rotary inductor and driven by a pair of right-angle nylon gears attached to the controlling shafts. The rotary inductor is factory wound on a fiberglass form, and the interconnecting strapping between the major components is silver plated. Two cores, fiberglass tape and Teflon-covered wire are supplied to construct a 4:1 balun. Large feed-through insulators are provided for balanced-wire and single-wire outputs in addition to SO-239 coaxial input and output connectors. No internal bypass switching is provided.

Putting It To Use

Heath frequently stresses (in bold print) the use of control settings which use the most capacitance of both capacitors; this delivers the best harmonic attenuation. With certain antenna systems, one may find several different control combinations which produce a matched condition. However, one or more of these settings may provide little harmonic attenuation. Approximate control positions for each band (80 through 10 meters) are given in the manual for use as a starting point.

Heath's advertised specifications state that the '2040 has a "wide range" of output impedance-matching capabilities. During some initial testing, two "soft spots" showed up. Arcing occurred between the capacitor plates when attempting to match a load on 80 meters at the high-power level. The arcing was traced to improper rotor and stator plate alignment, not a fault of the tuner. After readjustment, no arcing occurred during a similar test. (The load, as was later discovered, was not within the range of impedances Heath had in mind.)

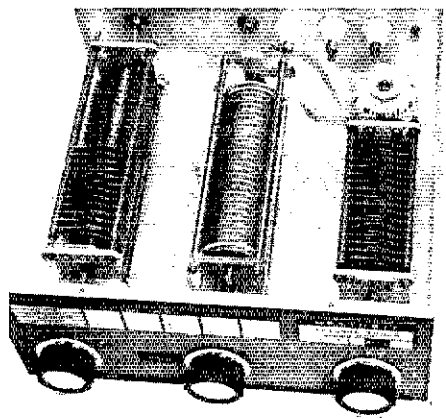
During a check of balun operation on 10 meters, the unused coaxial-output-connector insultion melted and burned briefly with a visible flame during a prolonged key-down, high-power test. Heath was notified of the situation. Simultaneously, I requested more-specific information about the impedance-matching range of the tuner. The persons to whom I spoke were quite helpful. It was learned that a similar coaxial connector failure had occurred during a field testing of another unit by one of the Heath employees and that the coaxial connectors to be supplied with later production units would have Teflon insulation. Units still in stock are supplied with the other type of connector, however, so it would behoove the prospective owner of a '2040 to check the output connector and replace it if necessary with the Teflon-insulated type as a precaution.

The detailed specifications for the SA-2040 provided by Heath are shown in the accompanying table. Lab tests showed that the Heath specifications are met. On 80 meters, insertion loss measured 0.24 dB with a 50-ohm resistive load, and the balanced-line output showed 0.6 dB of imbalance with a 250-ohm load at the terminals.

Depending upon the amount of reactance encountered with the antenna system in use and the transmitter output power level, the matching ranges of the '2040 may be exceeded without harm to the unit. Large mismatches should be avoided in any case, as they tend to increase losses within the matching network. — *Paul K. Pagel, N1FB*

Heath SA-2040 Antenna Tuner

SA-2040 Manufacturer's Claimed Specifications	*ARRL Lab Results*
Frequency range: 3 to 30 MHz.	All specifications met or exceeded (see text).
Power-handling capability: Full legal limit.	
Input impedance: 50 ohms (at matched conditions).	
Impedance transformation, 4:1 balanced line output: 100 to 1000 ohms; unbalanced output: a maximum SWR of 10:1, or impedance-matching range of 50 to 500 ohms; single-wire output: 6:1 SWR, using an odd-multiple 1/4 wavelength of wire.	
Size: 5-5/8 × 14-13/16 × 13-15/16 inches (143 × 556 × 354 mm) HWD.	
Price class: $150.	
Manufacturer: Heath Company, Benton Harbor, MI 49022.	



The interior of the Heath SA-2040 is neat and uncluttered. A heavy-duty ceramic insulator is used to support the balun, visible at the rear of the chassis.

DATAK TITLES

Have you ever wondered how the fellows in the ARRL lab manage to make the *Handbook* and *QST* projects look so good? Wish you could do it at home in your own workshop? You can! A simple paint job using spray paint goes a long way toward producing a professional-looking job. The final touch, labeling the controls and switches, is a cinch — if you use dry-transfer labels and titles. While a number of different manufacturers are marketing dry-transfer letters, Datak Corporation has a line of letter sets and titles especially suited to Amateur Radio and other electronic projects.

After using Datak dry transfers on several new projects for the 1981 ARRL *Handbook*, I find Datak's "Titles for Electronic Equipment" (cat. no. 9581 and 9591), "Meter, Dial and Switch Marking Set" (cat. no. 968) and the 1/8-inch (3.2-mm) alphabet sets to be the most useful for general work. Alphabet sets are also available in 1/4- and 1/2-inch (6.4- and 12.7-mm) sizes in white, black and gold.

Using the dry-transfer letters is easy if you work carefully. They must be aligned properly the first time. Once they have been pressed in place, moving them is impossible. They are best applied after painting but before any controls or switches are mounted. I place a sheet of paper over the panel, taped to the unpainted edges. This protects the paint and serves as an alignment guide. With the letter in position, rubbing it lightly will transfer it to the panel. When all the labels have been applied, burnishing them by placing a sheet of paper over them and rubbing the surface will fix them firmly in place.

In addition to the letter and title sets, Datak has a wide variety of other useful products, such as dry-transfer, etch-resist patterns and tapes, as well as etchant for making printed-circuit boards.

The process for making a board with these products is simple. A copper-clad board is first carefully cleaned, then the required patterns for transistors and ICs are applied directly to the copper surface. This is done in the same manner that letters are applied to a panel. Inter-connections are formed by applying etch-resist tape between the pads. When the circuit layout is complete, the board is placed in the etchant bath. Half an hour later, the finished board, ready for drilling, is removed. The only difficulty I have had with this method of making circuit boards is a slight under-cutting of the etch-resist tape. Careful application of the tape will minimize the problem.

All of these products are described in the Datak catalog in addition to many other marking sets, drafting aids and materials for making your next workshop project look as good as it works. Datak products are available at many electronic parts suppliers and through most major mail-order supply houses. Price range for the title and letter sets: $1.50 to $6. Datak Corporation, 65 71st St., Guttenberg, NJ 07093. — *George Collins, AD0W*

Some of the Datak products designed to help your latest project acquire a professional appearance.

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

UPDATING THE EXTENDED FREQUENCY RANGE MODIFICATION FOR THE COLLINS 75S-1

☐ In a previous article, "An Extended Frequency Range for the Collins 75-S-1" (October 1977 *QST*), I presented a method of extending the frequency range of the 75S-1 through an external crystal oscillator plug-in unit. The following additional modification of that circuit, providing coverage from 3.4 to 30.0 MHz, has no effect on the cosmetics of the set and the few wiring changes are so simple that the circuitry can be restored to the original state in a few minutes.

To begin the update project, carefully remove the aluminum angle shield covering the OFF-STDBY-OPER-CAL switch (S5) after unfastening the two nuts that hold the shield in place. Lay out and drill two holes to accommodate a miniature spdt toggle switch (S_{MOD}) and miniature audio jack (J_{MOD}). Make the mounting hole for the jack large enough for an insulated washer to be placed over the shaft, a necessary precaution because the jack is to be connected to the screen lead of the 75S-1 crystal oscillator, V2. The accompanying drawings will assist you in this work.

A 50-ohm miniature coaxial lead connects pin 2 of V2 to S2. Carefully unsolder the lead from S2. Then install a small terminal lug (TB_{MOD}) just in front of the crystal board in the 75S-1. Solder the lead removed from S2 to the lug. Cut and install four insulated wires, routing them as follows: Solder one lead to the terminal lug you installed and the other end to the center contact on the added toggle switch (S_{MOD}). Refer to Fig. 1C.

Solder a lead to one pole of the toggle switch and route to a point on S2 where the miniature coaxial lead was removed. Solder a lead to the other pole of the switch (S_{MOD}) and route it to one contact of the audio jack (J_{MOD}). Connect a lead to the other contact of J_{MOD} and route it to the common side of the crystals in the crystal-oscillator circuit of the 75S-1.

In order to reduce stray capacitance in the oscillator circuit, keep the leads as short as possible. Avoid movement of the leads by securing them with tie wraps or lacing cord. Do not use coaxial cable or shielded leads, which will add too much capacitance to the circuit.

After the modification is completed, touch up the oscillator alignment following the instructions in the 75S-1 manual. Peform only the oscillator trimmer adjustments if you do not wish to peak all the rf circuits. You will need to connect a 47-ohm carbon resistor from the antenna jack to ground. Also, make a signal attenuator by connecting a 0.001-μF capacitor in series with a 5000-ohm potentiometer between pin 5 of the crystal calibrator and ground. For all of these adjustments maintain an S-meter rading no greater than S3.

For general-coverage reception with this modification, place the crystal switch S_{MOD} in the general-coverage position and peak the receiver preselector. To return the receiver to the internal crystals simply throw the switch to the normal position. With the proper selection of crystals, the range of the 75S-1 will cover the frequencies within the limits I've mentioned. The only restriction is that a few "birdies" will be found from 5.0 to 6.6 MHz. — *Vernon L. Gibbs, W4JTL, Mount Sterling, Kentucky*

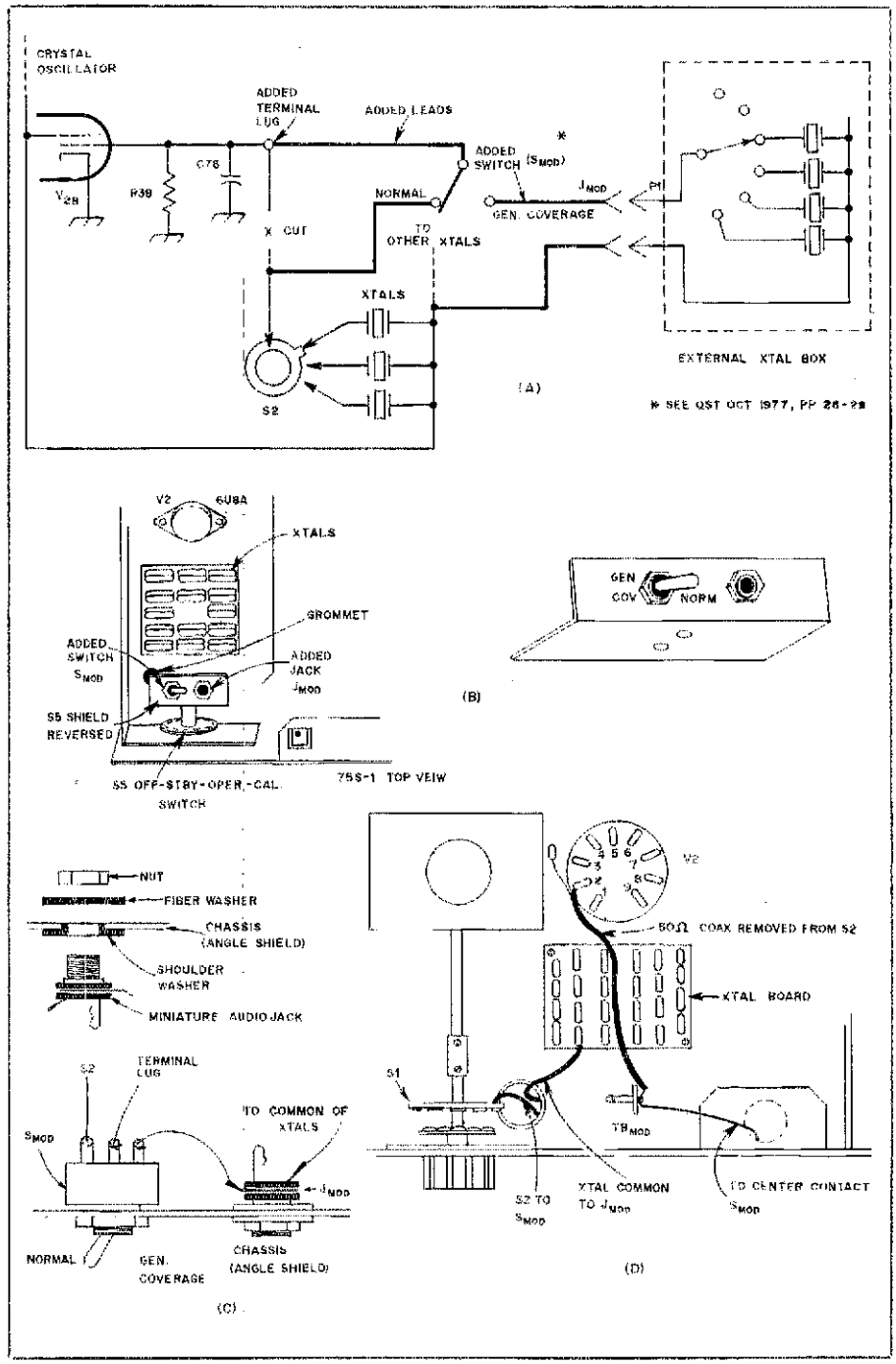


Fig. 1 — The circuit diagram at A is an expansion of the extended frequency range modification of the Collins 75S-1 described by Vernon Gibbs, W4JTL, in October 1977 *QST*. B illustrates how he installed the switch and jack for this additional modification. The jack, part of the oscillator screen circuit, is insulated from the chassis by the washers shown in C. Details for the remaining part of the modification are shown at D. Related information appears on page 94 of October 1978 *Ham Radio*.

TELEPHONE RFI

☐ When telephone company installers failed to cure RFI on my telephone line by means of the customary company capacitors and inductors, I came up with a solution to the two-year old problem that also bothered my neighbor's

*Assistant Technical Editor

line. The inexpensive remedy is to insert ferrite beads in the line at the terminal block. With the rf field generated by my Swan 700-CX, I needed only one bead on each wire going to the various extension outlets in the house. Where the rf field is very strong, three beads may be necessary. Beads that are suitable for this purpose are Amidon's no. FB-75B-101.

Convinced of the effectiveness of the beads on my telephone line, the company agreed to try a set on my neighbor's phone. Again the little "jewels" did the job. — *Lee F. Blodgett, WØTGQ, President, Lee de Forest Chapter, QCWA, Marion, Iowa*

TAILOR-MADE ENCLOSURES FOR PROJECTS

☐ Strong, attractive tailor-made enclosures for projects are easy to fabricate using cookie-sheet aluminum plus readily available hobby materials and tools. I use 3/8-inch (10-mm)-square hardwood strips for enclosure frames, thin plywood for bottoms and aluminum for panels and covers. Form the frame to project size and match the bottom plate and panels. Use glue and brads for rigidity. Shape the cover and screw the circuit board modules to the bottom frame with small screws. Upon completion, you will have a strong, lightweight and economical unit. The accompanying photograph illustrates the tools, materials and a frame in preparation. Also shown are a partially completed transmitter and a receiver using the aforementioned technique. — *Richard McIntyre, K4BNI, Cape Coral, Florida*

VARACTOR TUNING THE MINI-MISER'S RECEIVER

☐ I built the Mini-Miser's Dream receiver from May 1978 *QST* using a pc board from Circuit Board Specialists. The local oscillator in my unit was very unstable. I traced the cause to a faulty variable capacitor. Rather than locate a new one, I chose to modify the local-oscillator circuit to a voltage-variable capacitance (varactor) type. The results were outstanding.

The drawing shows the circuit I developed. With the values shown, the tuning range is 6990 kHz to 7160 kHz. R1 is the tuning control. It is a 10-turn Helipot, thereby giving me plenty of vernier action. Performance is excellent; I am unable to measure any drift from a cold start to a period much later. The diodes I used are MSI Electronics no. 7C-808. Other brands of tuning diodes should work equally well in this circuit, provided the capacitance range is selected for the frequency spread desired. — *Kit Kohlmoos, W6ISO, Palo Alto, California*

TS-180S SEMI BREAK-IN CW

☐ A number of TS-180S transceivers I have heard on the air have a more or less severe dwell on the first cw character when the VOX relays activate. The owner can diagnose the fault by 'scoping the rf envelope or by listening with a separate receiver (age off). The dwell is aggravated if less than full power is used.

My transceiver was severely affected, probably as a result of worst-case component tolerances. Comments about my signal from other hams were quite positive until a ham neighbor broke the news to me after a late-evening test on a dead band where we worked semi break-in.

The heart of the matter is the slow recovery of switching transistor Q18 from hard saturation. It is located on the i-f board and is responsible for changing the operating point of FETs Q16 and Q17 between transmit and receive (see "Speech Processor" in section 6.6 of the operating manual). In receive mode, Q18 is hard saturated and you might find the V_{CE} near zero volts. In the transmit mode, Q18 has no base drive and the V_{CE} is about 2 volts as the product of the combined currents of Q16 and Q17 across R94 (470 ohms).

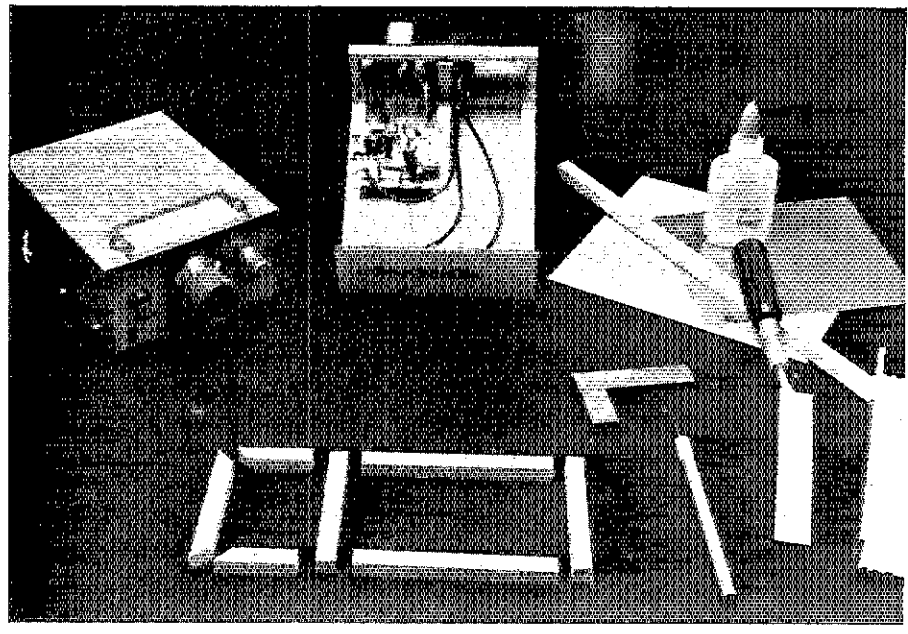
The cure is to bring Q18 out of hard saturation by changing the base-to-ground resistor R75 (on the far side of the i-f board) from 10 kΩ to a lower value. This diverts base drive and changes the discharge time constant of C170 (3.3 μF) and R75. The new value of R75 is found in the receive mode. Decrease R75 until Q18 shows between 50 and 100 mV V_{CE}, an indication that it is out of hard saturation. The new value may be as low as 1.8 kΩ.

This modification fully cures the changeover problem and does not affect the normal keying waveform. Neither does it affect ssb or normal cw operating conditions. — *W. F. Kohlrausch, KB2FS, Woodstock, New York*

HINTS

☐ Nuts and bolts that become loosened by vibration can be secured by applying a drop of Loctite liquid to the threads. — *John C. Nelson, W2FW, Rotterdam, New York*, Hints and Kinks for the Radio Amateur (1968)

☐ After giving my Accu-Keyer the initial test, I noticed the first dit or dah of a string was longer than the rest. As it states in *The Radio Amateur's Handbook*, the problem can be solved by changing the value of R5. Instead of digging through the junk box for resistors close to the original value, I installed a 500-ohm miniature potentiometer directly on the board. By repeatedly starting a string of dits or dahs, the first lock pulse can be set to equal the rest by listening to it. The mini-pot does not obstruct the mounting scheme, as it is not too large. — *Rick Dolinsky, WB3JZA, Tamaqua, Pennsylvania*



Richard McIntyre, K4BNI, submitted this photograph to illustrate the simple materials he uses to make very inexpensive enclosures for his projects. See text for explanation.

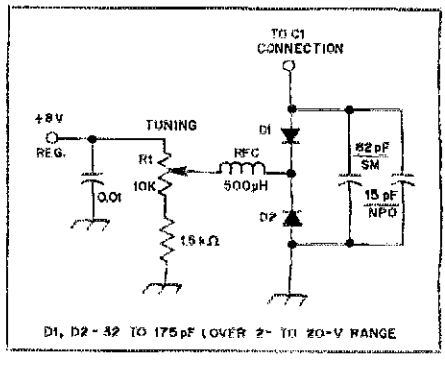


Fig. 2 — Excellent stability is provided in the Mini-Miser's Dream Receiver (May 1978 *QST*) by installing varactor tuning of the local oscillator. The circuit is the work of Kit Kohlmoos, W6ISO. Resistance is in ohms. Capacitance is in picofarads except for the decimal value, which is in microfarads.

REMEDY FOR CRYSTAL CALIBRATOR

☐ When I completed the "Weekender Crystal Calibrator" project (July 1979 *QST*), I encountered a slight harmonic difficulty. The 1-MHz harmonics were present at the output upon depressing S1. When S1 was released and S2 was activated, however, the output contained harmonics of 200 kHz instead of the expected 100 kHz. Furthermore, 20-kHz harmonics instead of 10 kHz appeared at the output with S3 depressed.

I traced the problem to a glitch in the 1-MHz waveform that caused the first decade counter (U2) to be clocked at a 2-MHz rate. By connecting a 0.01-μF disc capacitor across U1B (pin 4 to pin 6), the problem was eliminated. A smaller value of capacitance would probably work, but the results with the 0.01-μF capacitor were so complete that I made no further experiments with other values. I now enjoy the luxury of those 10-kHz calibration points. — *Donald R. Stickle, K2OX, Lake Hopatcong, New Jersey*

Feedback

☐ I wish to apologize for my error in the schematic diagram of "An Optimized QRP Transceiver" (August 1980 *QST*). The phasing of T1 is incorrect as shown. Since writing the article I have developed an improved buffer that uses fewer parts, is insensitive to phasing, and is less critical with regard to output transformer choice. In addition, it will work as shown from 160 to 10 meters. I encourage builders to use it instead of the one shown in the schematic.

Other comments: For people who aren't trying for extremely small size, T3 and T4 may each be more easily wound with five trifilar turns on a T37-72 core. D1 was not identified on the parts list. It is a 15-volt, 400-mW Zener, 1N965 or equivalent. — *Roy W. Lewallen, W7EL*

☐ The foil-side view of the FT-101ZD final amplifier board shown in "Hints and Kinks" (May 1980) is incorrect; a corrected layout is shown here.

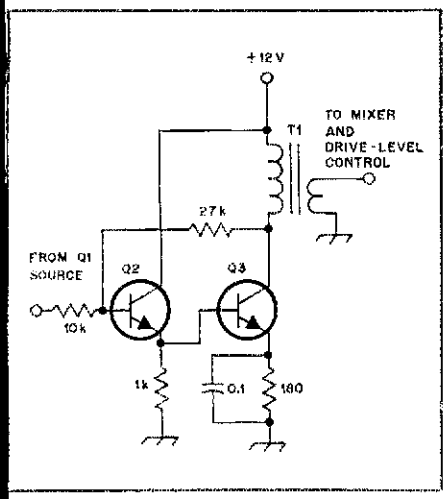
☐ The coil winding data for Fig. 4 of "A High-Performance Synthesized 2-Meter Transmitter," September 1980 *QST*, was inadvertently omitted.

L1 — 2 turns no. 20, 1/4-in. (6-mm) ID.
L2 — 5 turns no. 20, 1/4-in. (6-mm) ID.
L3 — 1 turn no. 18, 1/4-in. (6-mm) ID.
L4 — 2-1/2 turns no. 18, 3/8-in. (9.5-mm) ID.
L5 — 1 turn no. 18, 3/8-in. (9.5-mm) ID.
L6, L8 — 5-1/2 turns no. 18, 3/16-in. (4.8-mm) ID.
L7 — 4-1/2 turns no. 18, 3/16-in. (4.8-mm) ID.

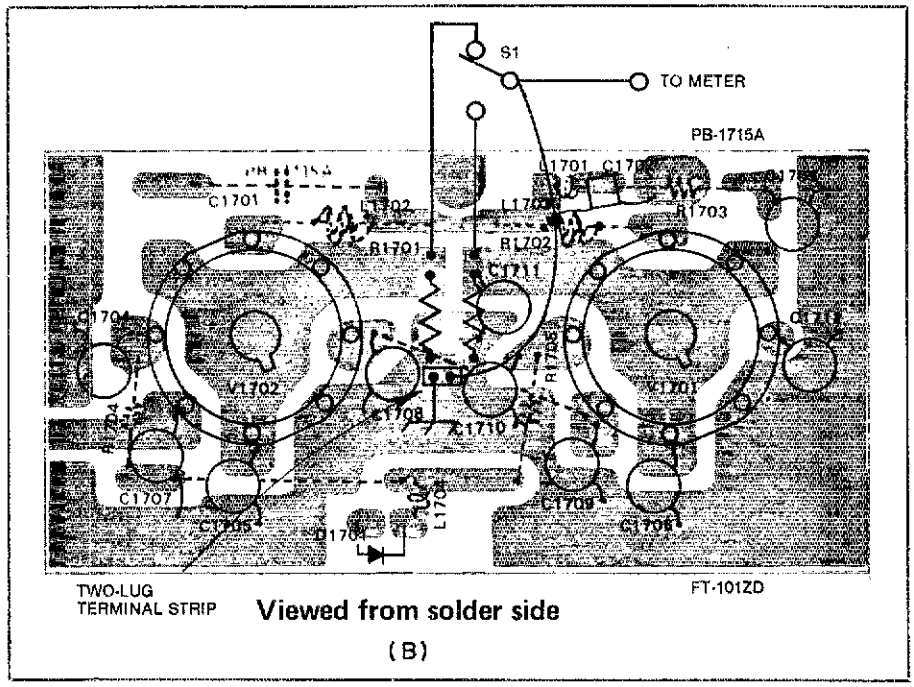
☐ The address of Communications Specialists was inadvertently omitted from the product review of the TE-64 tone encoder in September *QST*. That address is: Communications Specialists, 426 West Taft Ave., Orange, CA 92667.

☐ The address of Maurice A. Knight, Jr., ex-8AOK, was incorrectly listed in September "Silent Keys." It should have read Akron, OH.

☐ Apologies to Guido Emiliani, whose last name we misspelled as first author of the article, "An S-band Receiving System for Weather Satellites." The caption for Fig. 7 on page 30 for that article should read "The triplers Q8 and Q9 . . .," not Q7 and Q8.



An improved VFO buffer for Lewallen's "Optimized QRP Transceiver." Cores listed below are available from Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607, or from Radiokit, Box 411, Greenville, NH 03048.
Q1, Q2 — General-purpose, silicon npn, 310 mW; 2N3904 or equiv.
T1 — Pri. 15 t., sec. 3 t. on T37-72 core, or pri. 10 t., sec. 2 t. on BLN-43-2402 core. Phasing is unimportant.



Corrected parts layout for the FT-101ZD final-amplifier board.

Strays

COMPUTER NET INFO

☐ David P. Allen, W1UKZ, of Scituate, Massachusetts, serves as NCS on three computer nets. An East Coast Apple net meets at 1300 UTC on Saturdays on or near 7260 kHz, lsb. In the Boston area there is a 2-meter Apple net on the Norwell (65/25) repeater at 8 P.M. local time on Wednesdays. A new Atari international net meets at 0100 UTC on Tuesdays on 20 meters, near 14,329 kHz, usb.

SEANET CONVENTION

☐ The annual SeaNet convention will be held in Manila, Philippines, November 27 to 29. Information about convention details can be obtained from the SeaNet, which meets daily at 1200 UTC on 14,320 kHz, or by writing Earl Hornbostel, Box 445, Greenhills Post Office, Metro Manila, Philippines 3113. Radiograms (telegrams) may be sent to "Valex" Manila, Philippines, and Telex to RCA (722) 27840, Answerback: FEW PH, Attn: Hornbostel.

ROBINS USE MORSE CODE

☐ No, not the birds — Morse code is making a comeback at the 5th Combat Communications Group at Robins Air Force Base, Georgia, where radio operators are dusting off code keys and learning to send and receive the code. Morse is being revived at the direction of higher headquarters because it is an effective means of communications during periods of jamming. Any prospective hams there? — *Edward F. Warren, K8RD, Torrance, California*

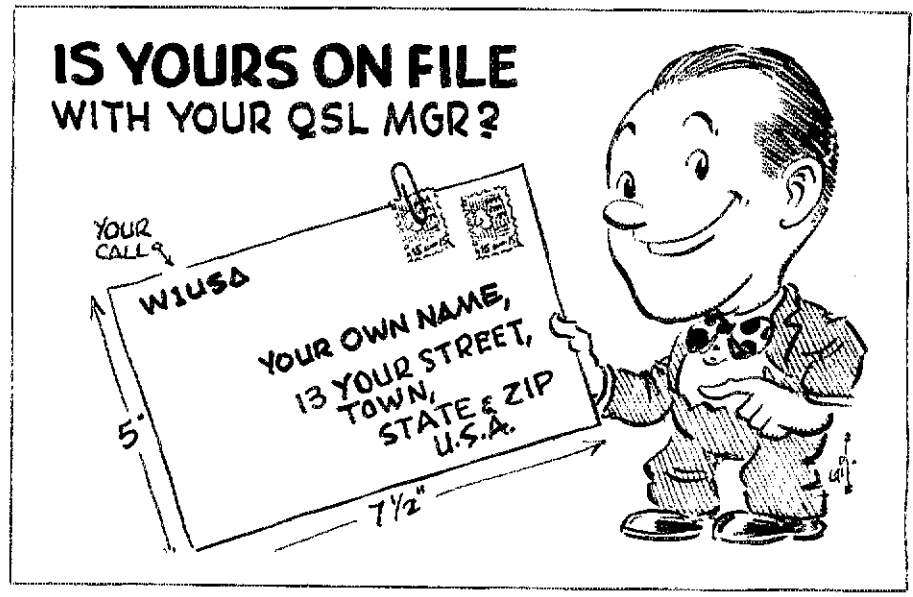
Your Incoming QSL Bureau . . .

. . . What it is and how it works.

By Jesse Bieberman,* W3KT

You have just discovered the world of DX! You have had the thrill of working your first foreign stations. Naturally you are anxious to get QSLs to confirm these QSOs, and you have asked the DX stations to QSL direct to your home QTH, but in just about every case he has responded with "sure QSL via the bureau." You have tried to get your full QTH across to the DX stations, for a direct QSL, but he was not really interested.

Why does he insist on this "QSL via bureau" thing? You must remember that stations outside the USA and Canada can work us with the greatest of ease and can put literally thousands of W/VE stations in their logs in a relatively short period of time. An active DX station would find the financial burden of QSLing direct to his W/VE QSOs very great indeed, and in addition he might not have a recent *Callbook*. So, he sends his QSLs to your bureau, either direct or via his own national amateur organization. Okay, so what is a QSL Bureau, how do you get your cards from it and how soon can you get your cards?



Where Are the Bureaus?

The Incoming QSL Bureaus in the U.S. and Canada are sponsored by ARRL/CRRL. Every amateur should be an ARRL member, but you don't have to belong to the ARRL to use the Incoming Bureaus.[1] There is an ARRL Incoming QSL Bureau for each U.S. and Canadian call area, and there are also bureaus in Hawaii, Alaska, Puerto Rico and other U.S. possessions. Your DX QSLs will come to the bureau in your call area, the one in which you are licensed. Thus, if you operate as W3XYZ/6 your QSLs will arrive at the third call-area QSL Bureau, not the sixth. The addresses of these bureaus appear every other month in *QST* in the "QSL Corner" column. They are also listed on page 68 of the new League publication, *The ARRL Operating Manual*. You should get the address of your bureau from a current list.

The QSLs reach the bureaus in various ways. Some come direct from individual DX stations; others are sent by the bureaus in foreign countries. Many DX cards are sent to ARRL headquarters, where they are sorted by call area and passed along to the bureaus.

What Happens at the Bureaus?

You might envision a large pigeonhole-filled room with a large, well-paid, full-time staff, cheerfully stuffing QSL cards into the pigeonholes. Not so; the bureaus are usually operated by a manager with the assistance of a few local hams (or non hams!) plus up to 50 or more "helpers," who are normally members of a sponsoring club. The manager and his assistants sort the cards into 26 groups, by the first letter following the number in the call, and distribute the cards to the helpers. The helpers sort the cards by individual calls, and at some convenient time, mail them out.

This is where your part of the job comes in. The first thing you need to do is find out how your bureau works, since they do not all operate in exactly the same way. Don't depend on word-of-mouth information on the bureau. This kind of information may be inaccurate or out-of-date. Write to your bureau for the latest information — and please enclose a self-addressed stamped envelope (s.a.s.e.), not a postcard. Many of the bureau managers prefer not to transact bureau business over the telephone. Over half of the bureaus prefer a system by which you pay for mailing credits, which will be explained on the information card you get from the bureau, but all bureaus will accept s.a.s.e.'s. If you are going to send s.a.s.e.'s, don't send just any old envelope — 5- × 7-1/2-inch envelopes will be accepted by most bureaus. These envelopes must be addressed to yourself, have your call plainly printed in the upper left hand corner and be stamped. Put at least one unit of postage on each envelope, or if you expect a lot of cards, put enough

*RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355

[1]This article deals strictly with the operation of the Incoming QSL Bureau system. ARRL also sponsors an Outgoing Bureau, which is restricted to League members only. See "QSL Corner" every other month for details on how to use the Outgoing Bureau.

postage on each envelope to carry several ounces of cards, up to what would be a sensible limit on how much weight can be put in one envelope without causing it to break open in transit. Don't be too optimistic! Cards come through slowly, as you will learn, and when you place postage for 6 ounces on your s.a.s.e. you are telling the bureau to hold your envelope until it has about 50 cards. This may take a long time, unless you are very active. Don't send too many s.a.s.e.'s. They can create a storage problem. The bureau will usually accept four envelopes. After you have sent either funds or s.a.s.e.'s, sit back and wait — patiently.

"But why," you ask, "do I have to be so patient? After all, the DX station said he would QSL right away. Shouldn't I get his card in a few weeks, even through the bureau?" If you have followed the sequence of events described, it should be clear that the cards cannot come through quickly. Cards seldom arrive in less than six months, and may take up to two years or more to make their way to you via the bureaus. Regretfully, we must tell you that some DX stations will never QSL, even though they have faithfully promised to do so. Most DX stations will eventually answer, however. [See "How's DX?" USSR QSLs, September 1980 *QST*, p. 67. — Ed.] The literally millions of cards that pass through the bureaus is a vivid demonstration that most stations will answer.

Most of the bureaus will indicate on the envelopes they send you the number of mailing credits or s.a.s.e.'s left, or will at least show when you are receiving your last envelope. When you run out of mailing credits or s.a.s.e.'s, you should *immediately* send more — don't wait! Do it at once! As you must have gathered by now, running a QSL bureau is a big job, and one of the greatest problems is the accumulation of uncollected cards. You should either send for your cards on a continuing basis, or, if you have no interest in QSLs, at least notify the bureau that you will not be collecting them and that they may be discarded. In general, the ARRL bureaus do not return uncollected cards to the DX stations. [The ARRL Board of Directors voted, at their July 1980 meeting, that the QSL bureau guideline for card retention be changed from one year to 90 days. — Ed.]

Volunteers Operate the Bureaus

I've tried to explain how the QSL Bureaus operate. It's a big job. Try to understand the problems of the bureau and cooperate with it. Remember, the people who operate the bureaus are volunteers, and they must do the work in their spare time. Most of the managers and helpers hold down full-time jobs; they may have families to raise; chores to do around the home and they even like to do a little hamming now and then. If you think you have a problem with your QSL Bureau, it is your privilege to write to ARRL hq. about it. But you must remember that Headquarters does not have the answers to your questions and they can only ask the bureau manager to check. You may as well write directly to the manager. It is usually not possible to write to the helper, who is, in most cases, anonymous. If you do write to the bureau manager, enclose an s.a.s.e. Remember, the manager cannot answer such questions as: "How many mailing credits do I have left? How many s.a.s.e.'s do you have on file for me? Are there any QSLs at the bureau for me? Will you please send me any cards you have for me?" All this information is in the hands of the helper who handles your letter group. The manager would have to write the helper a note, call him on the phone, work him on a 2-meter net, ask him at the next club meeting and then possibly have to wait until the next club meeting to get an answer. While some bureaus are set up to do this more quickly than others, it may take as much as three months to get an answer. In most cases you already know the answer! The last envelope you received showed what you had left in the bureau in the way of mailing credits or s.a.s.e.'s. If you have s.a.s.e.'s or credits on file, you will get your cards when the helper makes a mailing. If you don't remember what your last envelope showed in the way of credit, the simplest thing to do would be to send another s.a.s.e. or dollar. Because of the way in which FCC assigns calls, some letter groups are larger than others and it sometimes takes three or four helpers just to take care of one group. The man in charge of one such group tells me that he spends eight to 10 hours a week just taking care of his letter. How many of you are prepared to take on that big a job?

While the ideal situation would be for each helper to make a mailing once a month (or less) — and some helpers in some bureaus still manage to do this — it is not realistic to expect this to happen with the larger groups. Some are only able to manage to make a mailing every two or three months. Even a QSL Bureau helper has other commitments and may have a period of illness or go on a vacation. Again, please be patient and understanding, unless you are willing to take over the bureau managership yourself and have about 50 helpers ready to work with you. You would be surprised how quickly you could become a QSL Bureau manager! QST

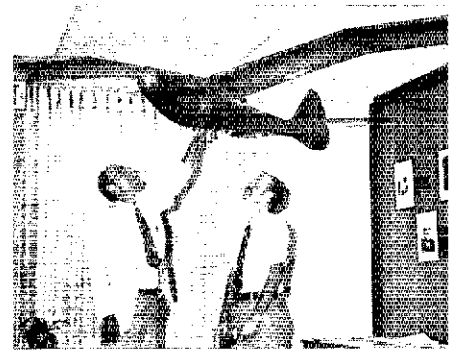
The author is ARRL Atlantic Division Director, a member of the International Affairs Committee and operated the Third Call Area QSL bureau for 33 years, until November 1, 1979. His main operating activity is DX — he's on the DXCC Honor Roll in the mixed, phone and cw categories.

Strays

IT'S A BIRD, IT'S A PLANE, IT'S . . .

☐ A large radio-controlled sailplane, built in 1937 by Ross Hull, associate editor of *QST* and R. B. Bourne, W1ANA, curator of the ARRL Museum of Amateur Radio, made many successful flights and was displayed at the international soaring meet in Elmira, New York, in the summer of 1938. The front section of the plane contains relays and two receivers which operated in the old 56- to 60-MHz band. The rudder was actuated by a reversible electric motor, powered by small flashlight batteries, and was turned either left or right as the corresponding receiver was energized. Two transmitters were used and the range of the system was up to a mile and a half.

Over the years, time deteriorated the bird, moving injured it and blemishes distracted from the beautiful lines of its awesome 16-foot wingspan. Under the expert guidance of Pete Reed, K1ONG, the plane has now been restored to its original look and splendor and is on view in the Museum of Amateur Radio area in the Headquarters' lobby. Pete's words upon completing the restoration project were, "Let's go fly it. Anyone got some 5-meter gear?" — *W1CUT*



Pete Reed, K1ONG (left) and Laird Campbell, W1CUT, inspect the restored radio-controlled model sailplane that is now displayed in the lobby of League Headquarters in Newington.

ARRL FOUNDATION DONATION

☐ The ARRL Foundation recently received a substantial contribution from the Inglewood (California) Amateur Radio Club. The club had been in continual existence since 1938, and sadly, recently disbanded. The club members voted to donate a large part of the club's remaining assets to the Foundation in support of programs devoted to the enhancement of Amateur Radio. — *Rick Palm, K1CE*

PR in Palos Verdes

Here's how hams in an affluent image-conscious city successfully turned aside well-organized opposition to liberalize a restrictive antenna ordinance.

By Wayne Overbeck,* N6NB

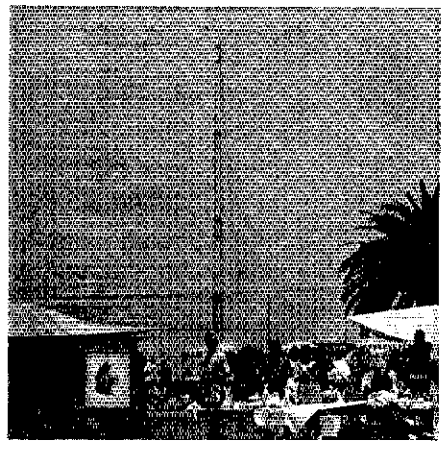
For millions of people, owning a home in an area like California's Palos Verdes Peninsula is the American dream. Although it is located just a short drive from the employment centers and cultural attractions of metropolitan Los Angeles, Palos Verdes symbolizes suburban living at its best.

Drawn by these advantages, thousands of Southern Californians have migrated to the Palos Verdes Peninsula in recent years. Radio amateurs have not been left out of this modern-day land rush. Palos Verdes has long been considered one of the finest radio locations anywhere, thanks to unobstructed views in many directions, the high elevation and relative freedom from radio noise sources.

In 1975 things changed, however. After a lengthy court battle over land use and building densities, the largest portion of the peninsula that had been unincorporated Los Angeles County territory was incorporated as the city of Rancho Palos Verdes. There were already three other smaller cities on the Peninsula, but overnight some 40,000 Peninsula residents found themselves in a new city where local control over development was the "battle cry" of the community.

As the new city rushed to meet legal deadlines in adopting a general plan and zoning laws, one of the leaders of the incorporation battle, a part-time real estate salesman, proposed a highly restrictive radio antenna ordinance. Because there was no one to speak for the local hams, the restrictive ordinance was inserted in place of a more standard one proposed by the city staff and modeled after Los Angeles City's antenna law.

Within minutes after the change was suggested, the new City Council adopted the zoning regulations, and with them the restrictive antenna ordinance! Reading about it in the next day's newspaper was a shock for the local hams, many of whom had paid dearly for homes with radio locations that were the dream of a lifetime.



Amateur Radio takes its place alongside other hobbies on display at the July Fourth Carnival at Rancho Palos Verdes City Hall. Only a short time earlier, the possibility of erecting a 70-foot tower like this anywhere in Palos Verdes seemed out of the question, but now the local hams — and their antennas — are welcome at City Hall itself.

Almost immediately, local radio amateurs, realizing they had a tough fight on their hands, began organizing for what was to be a four-year battle to win a more liberal antenna law. How they did it, and the obstacles they faced, are a story that offers many lessons for radio amateurs who may have to fight similar battles elsewhere.

The Antenna Ordinance

Things indeed looked grim for Rancho Palos Verdes hams as Christmas 1975 approached. The new ordinance established a tough approval process even for amateur antennas less than 40 feet high, and the procedure for getting permission for a higher one was ridiculous. An amateur who wanted to put up a 35-foot mast for his inverted V, for instance, would have to convince city planning officials it would not adversely affect any neighbor's view or property values. And if, perchance, an amateur dared to seek a permit for a typical 50-foot crank-up tower with a triband beam, he would have to win a conditional use permit after a hearing at which all of his neighbors within 500 feet would be invited to comment on the request. To apply for the permit, there would be a nonrefundable $350 fee, with the cost possibly escalating during the hearing process.

What of amateurs who already had large antennas? They would be permitted to keep them, but they could not make any significant changes in either the tower or the antenna itself without going through this process.

Perhaps the most amazing thing about the tough new law was the fact that the City Council didn't even realize it would be controversial. With no amateurs active in local government, there was virtually no debate when the new restrictions were penciled into law.

The Campaign For Change

After the initial setback, local radio amateurs went to work. The first step was to organize a local radio club. Letters were sent to all hams whose *Callbook* address fell within Rancho Palos Verdes, and almost all of them, about 200 people, showed up for the organizational meeting in December 1975. Thus the Rancho Palos Verdes Amateur Radio Association was formed.

Presentations were quickly arranged before City Council and Planning Commission members to tell the story of Amateur Radio and its contribution to the community. Then, early in 1976, the local amateurs convinced the City Council to order a Planning Commission review of the antenna ordinance. They then proposed a liberalized ordinance, one eliminating the costly and time-consuming conditional use permit requirement.

Local amateurs also worked to sell Amateur Radio to city officials on an

*5818 Woodlake Ave., Woodland Hills, CA 91367

individual basis, and several city officials became staunch supporters of Amateur Radio. This person-to-person diplomacy quickly paid off. A vacancy arose on the Planning Commission, and an amateur, K6KSY, was appointed to fill it! Although he was not permitted to vote in July 1976 when the Planning Commission approved a revised antenna ordinance (because he was not a commissioner during the debate on the issue) his presence was a key factor in winning commission approval. The next, and seemingly final, step would be the City Council.

At this point, however, a new element in the drama emerged — organized citizen opposition to Amateur Radio antennas. Perhaps the most important thing about the Palos Verdes story is what caused this anti-ham movement to coalesce.

Why Opposition Formed

The opposition was led by De De Hicks, an articulate community activist who was president of the Stoneridge Homeowners Association. Almost singlehandedly, Ms. Hicks got the presidents of 14 other homeowners' associations to support the campaign that she organized against amateur antennas. Why did Ms. Hicks become so committed to the fight?

Her home is atop one of the highest points on the Peninsula; there are no fewer than 18 licensed amateurs in the Stoneridge tract. Ms. Hicks happened to live in an ideal radio location, and she was surrounded by hams. Moreover, Ms. Hicks *often complained about the manner in which at least one of the nearby hams declined to help her solve a serious television interference problem.* The result was that local amateurs found themselves with a massive fight on their hands — against sophisticated and highly motivated opponents, who at one point gathered 2500 signatures on petitions opposing Amateur Radio antennas.

The Council Retreats

In the face of Ms. Hicks's well-organized anti-ham forces, the City Council rejected the liberalized antenna ordinance in September 1976, and ordered the Planning Commission to reconsider the matter. The local amateurs were back where they started.

Throughout 1977, the Planning Commission and City Council weighed the alternatives. Ms. Hicks's group conceded that requiring a conditional use permit for antennas was asking too much, but she insisted that those living near a proposed antenna installation should be notified and given a chance to be heard before any permit is granted. She also demanded very specific restrictions on the size of the antenna array mounted atop an approved tower. At one point, she proposed a limit of 12 square feet of antenna windloading, thus precluding large stacked Yagi arrays, such as those owned by two well-known

In a display of civic support for Amateur Radio that would have been almost unimaginable a few years ago, Rancho Palos Verdes Mayor Ann Shaw takes the microphone at the demonstration ham station set up for the city's July Fourth Carnival. With Mayor Shaw are (from left) W6NUI, WA6HXM, K6KSY and WA6QAM.

DXers in her neighborhood. When the opposition starts taking about things like windloading and stacked Yagis, it's obvious you aren't dealing with ignorant people!

The hams, meanwhile, were continuing their efforts to win official support for a less-restrictive ordinance. And in the face of this division between two well-organized groups of constituents, the council decided to do what was politically astute. They delayed any action until after the 1978 municipal elections.

After the elections, the City Council created a subcommittee on antennas, which eventually asked the city attorney to draft a compromise ordinance. This turned out to be fortunate for the amateurs, because Planning Commissioner Hughes, K6KSY, had kept the city attorney informed about a successful antenna lawsuit against the city of Placentia, California. He was thus aware of the potential for protracted and costly litigation should an amateur wish to fight an unduly restrictive ordinance.

The city attorney drafted an ordinance that allowed most antennas less than 40 feet high upon issuance of a routine building permit. Even for higher antennas, the costly conditional use permit procedure, with its public hearing requirements and $350 minimum price tag, was eliminated completely. In its place, the new ordinance called for a "minor exception permit," which the planning director was required to grant after notifying neighbors and allowing written comments — but without a hearing. All that was required would be reasonable steps to ensure the safety of the tower and to minimize obstructions to other homeowners' views. There was no mention of the size of the array itself in the proposed ordinance.

The Ordinance Passes

In May of 1979, more than three years after the antenna controversy began, the City Council unanimously approved the liberalized ordinance. This new ordinance is far from ideal. It costs about $65 to secure the "minor exception permit," and the Planning Director is empowered to impose a requirement that the amateur use a self-supporting crank-up tower, and keep it cranked down when not in use if necessary to avoid obstructing a neighbor's view. Moreover, the ordinance includes an absolute limit of two antenna structures per city lot. Compared to what might have been, however, the new antenna ordinance was a major victory for the local amateurs in the face of stiff and organized opposition.

Why was the council persuaded to liberalize the rules? Surely the *ongoing public relations* of the local amateurs was a major factor. When the crisis arose, not one radio amateur was active in local government. But before it was over three hams were serving on various local boards and commissions, and K6KSY was chairman of the all-important Planning Commission. Meanwhile, another planning commissioner, John McTaggert, had become WD6GBZ thanks to the radio club's training program!

Throughout the struggle, the amateurs had *carefully avoided confrontation* with either the anti-ham forces or city officials. Following a policy of conciliation and cooperation, the local amateurs got to know local officials — and ultimately some hams became public officials, while public officials were becoming hams!

Along the way there had been many other public relations activities of importance. Among them: WA6HXM began writing a column on Amateur Radio for a local newspaper, W6AM began inviting city officials to his famous annual open house at the big rhombic farm, and the radio association began taking part in community activities such as the city's July Fourth Carnival at City Hall.

Rancho Palos Verdes is a very special kind of place, an affluent suburban community in an ideal natural setting. Radio amateurs there may never have the absolute freedom to put up as many antennas as they please, but thanks to a massive and well-organized public relations effort, they can put up substantial towers and enjoy their hobby in this dream radio location.

The author, who does not live in Palos Verdes but watched the unfolding drama with interest, particularly wishes to thank Peter Von Hagen, WA6HXM, and his wife Caren, WA6IBZ, as well as Mel Hughes, K6KSY, for their assistance in researching this article.[1]

The author is an attorney and a communications professor at California State University, Fullerton.

[1] In addition to the others mentioned, many amateurs, including several attorneys with the Personal Communications Foundation, were indispensable to the campaign for a more liberal antenna ordinance.

Advertising Acceptance — A Membership Service

How ARRL advertising acceptance protects you when you buy products advertised in QST.

By Lee Aurick,* W1SE

"The publishers reserve the right to decline or discontinue any advertising which cannot be endorsed by them." (September 1, 1919)

The oldest *QST* advertising rate card to survive the ravages of time contains the above notice to advertisers. It probably wasn't a new idea, even then.

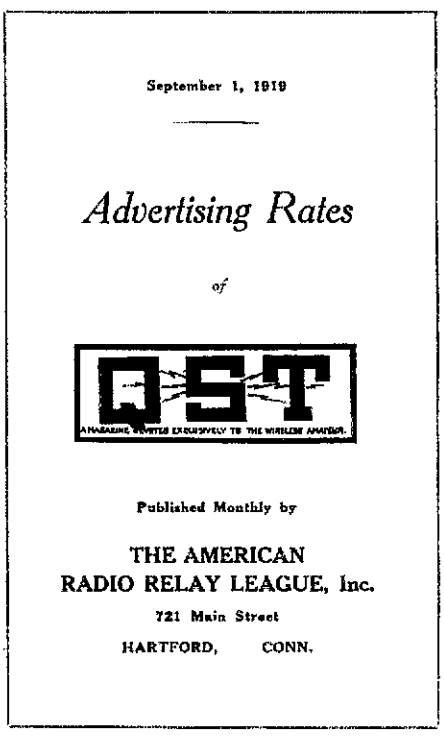
At least since that date, policies governing the acceptance of advertised products (as well as the claims made for those products) have been largely responsible for the integrity League members associate with *QST* advertisers. From the very beginning of the *QST* adventure, the Board of Directors were determined to ensure that your journal would be free of the conflict of interest that is a problem with almost all periodicals. Unable to serve both the reader and owner at the same time, publishers must frequently choose between the best interests of one or the other. Since *QST*'s owners and readers are one and the same, the League need consider only what best serves that one group. As a consequence, *QST*'s advertising policies are more restrictive than those of most publications — it is unnecessary and undesirable to make compromises where such compromises could be even slightly injurious to League members.

Not Everyone Gets In

QST cannot prevent anyone from entering the Amateur Radio business. It can, and does, however, deny the facility of *QST* advertising space to those whose manner of doing business does not seem in the best interests of Amateur Radio.

One example of *QST*'s advertising acceptance policy in action will perhaps prove the need for, and merit of, a rigid procedure. Early this year, a manufacturer of a compact antenna intended for indoor installation, sought to have it advertised in *QST*. The sample antenna was provided, and assembled in the ARRL lab. At about 400-watts input (key down) it burst into flame. This product never appeared in *QST*, but ads for it continue to appear in another Amateur Radio publication. How would you like to have this antenna in your attic?

QST advertising policies have grown since 1919 and are now collected in a small booklet that is available to advertisers and prospective advertisers. The most important ones may be found on the back of the present advertising rate card. This card details costs, ad sizes and mechanical requirements for advertisers. Included are the guidelines that for many years have spelled out the conditions by which *QST* will accept advertising from dealers and manufacturers of Amateur Radio equipment.



September 1, 1919

Advertising Rates

of

QST

A MAGAZINE DEVOTED EXCLUSIVELY TO THE WIRELESS AMATEUR

Published Monthly by

THE AMERICAN RADIO RELAY LEAGUE, Inc.

721 Main Street

HARTFORD, CONN.

The oldest *QST* advertiser's Rate Card to survive. It announced an early effort to protect radio amateurs.

New Requirements

Recently, the Board of Director through its Management and Finan Committee, approved a restatement of t acceptance conditions. In addition to t desirable feature of placing these conc tions in one convenient form, there e isted a need to incorporate into these co ditions several new and significa policies.

Spectral purity tests: Since April 197 *QST* has required advertisers to subm models of transmitters, transceiver

*Advertising Manager, *QST*

amplifiers and rf-switched receiving preamplifiers for examination on the League's spectrum analyzer. Here, equipment is tested to determine that it meets FCC-established spectral-purity requirements at specific frequencies and power levels. This requirement has now been incorporated into the overall acceptance procedure.

Here is how it works. When a piece of equipment passes the ARRL lab tests (and most do), the advertiser is notified of its acceptance, and he is then free to submit ads on the product. Occasionally, some defect is discovered, and the unit fails to pass the test. Perhaps it's something as minor as the setup technique employed at the factory. Only the prospective advertiser is notified of this rejection. He is told precisely what has been discovered, and may even be given suggestions as to how to correct the problem. In any event, advertising is not accepted until we have seen a properly operating model, and have been assured that necessary changes have been incorporated into the production run.

Mail order: In the last few years there has been an almost explosive growth in the purchase of Amateur Radio equipment by mail. It was believed necessary to include specific safeguards with respect to refunds when products are ordered and undeliverable, and to specify the time limits within which refunds must be made. For your protection when making such purchases, *QST* advertisers are required to observe all Federal laws in their dealings with League members.

All of these requirements for *QST* advertising acceptance are now included in one booklet which has been distributed to advertisers. As new prospective advertisers appear, they too will be required to meet these conditions, and you may be assured that they, and their products, have passed the same demanding scrutiny.

It's Your Program

By tradition, *QST* advertising revenue just about pays for the paper, printing and mailing of your journal. This means that the costs of this advertising acceptance program are paid by *you*; through your membership dues and through your purchases of other League publications. It is a service that only *QST* provides.

As a further safeguard, *QST* advertisers are pledged to respond appropriately to customer complaints and to stand behind and support all claims and specifications mentioned in their advertising. An advertiser can't make a claim in an ad, and then sell you a product that doesn't meet that claim. He also can't avoid discussing a complaint with you. If you have a complaint, approach the advertiser first. If you believe you have not had proper treatment, give us all the facts in writing.

We're proud of the integrity of *QST* advertisers, as well as their products. Both have been tried and tested.

The complete text of the League's and *QST*'s Advertising Acceptance Procedure follows. It's working to protect you. QST

AMERICAN RADIO RELAY LEAGUE, INC.

ADVERTISING ACCEPTANCE PROCEDURE

To provide the important membership service of product examination for quality assurance, *all* new products (including kits, books and components) to be advertised in *QST* must first undergo evaluation by the Advertising Manager and a designated member of the Technical Department. This evaluation will include an assessment as to quality of construction, adequacy of operating instructions, suitability for use by radio amateurs, retail value, and on-the-air checkout, where appropriate. All transmitting equipment, including rf-switched receiving pre-amplifiers, will be subjected to test on the ARRL spectrum analyzer for compliance with FCC spectral-purity requirements.

1. The sole purpose of ARRL's advertising acceptance procedure is to assure ARRL members that only worthwhile products are advertised in *QST*. The ARRL does not function as a consumer test bureau for its members or as a design consultant for *QST* advertisers. Advertisers will be provided with test data, where appropriate, but this information will not be disclosed to anyone else. Upon the appearance of an advertisement in *QST*, it will become public knowledge that the product has been accepted by the ARRL.

2. Announcement advertisements of new products, by current advertisers, are permitted in *QST*, but don't necessarily imply ARRL approval. However, each announcement advertisement of a product that is not *then* available must indicate, in a positive manner, *when* such equipment is to be available. Announcement advertisements must be specific as to the date when an adequate supply of merchandise will be available at each of the advertiser's outlets. Market Survey-type advertisements, with product delivery scheduled for more than three months in the future, are not acceptable.

3. Advertisers agree, as required by Federal law, that when a deposit is accepted and the product is not available within the stated time, or within 30 days, the prospective purchaser will be given the opportunity to cancel the order, and receive a full refund. The advertiser must notify the prospective purchaser of the delay, and provide a free means of reply. If the delay is more than 30 days, the prospective purchaser must give *express consent* to the delay. The advertiser must return the deposit at the end of the first 30 days of delay unless this *express consent* has been given. *QST* advertisers are required to observe all Federal laws in their dealings with ARRL members.

4. As soon as a new product is available for sale, a production model of that product must be made available immediately to ARRL. Only production models are suitable for advertising acceptance examination. Engineering prototypes and samples of pre-production runs are not acceptable. Should an advertiser not provide ARRL with a production model of a new product immediately upon its availability for sale, further advertising of that product may not be accepted until the product is tested and accepted by ARRL. Products will be returned to the advertiser in "as received" condition as quickly as possible (often within two working days of receipt). Antennas may be excepted from this requirement, at the option of ARRL.

5. All transmitting equipment irrespective of manufacturer or importer, or the length of time that advertiser has appeared in *QST*, must be examined for advertising acceptance. This requirement includes transceivers, transmitters, amplifiers and rf-switched receiving pre-amplifiers. There will be no exceptions to this policy, including previous FCC type acceptance.

6. Should a case history of problems develop in a previously tested and accepted product, ARRL reserves the right to recall that product to further laboratory examination.

7. To avoid conflict with advertising deadlines, and to prevent a last-minute rush of test procedures, equipment submitted for advertising acceptance must be at ARRL by the 10th of the second preceding month in which an advertisement is to appear. This means, for example, that for an advertisement of a new product to appear in June *QST* the product must be at ARRL by April 10th.

8. The Technical Department will provide technical advice and guidance on matters of advertising acceptance to the Advertising Manager. In case of any question as to the acceptance of a particular unit, the decision shall rest with the General Manager.

9. All questions regarding advertising acceptance should be directed to the Advertising Manager.

A Snowless Wonderland

HAMCATION '81 — The 27th ARRL National Convention, Orlando, Florida, March 13-15 — y'all come!

By Al Canning,* WB4HAK

As the traveler peers down on the approach to Orlando International Airport, hundreds of lakes and ponds shimmer and glisten amid the lush greenery of the citrus country. Small wonder that Orlando bears the most befitting title — The City Beautiful! Extending to the outskirts of the city, entertainment centers abound to keep the many visitors happily engaged in the enjoyment of their visit to the Southeast.

The Convention Site

In the center of this desirable setting, the Orlando Amateur Radio Club has selected the site for HAMCATION '81 and the 27th National ARRL Convention — the Sheraton Twin Towers Convention Center. Remember these dates, March 13, 14 and 15.

The center boasts over 700 guest rooms in twin towers of 20 stories each, an exhibition area of over 50,000 square feet plus adjoining conference rooms and meeting areas. Parking for 1500 cars is available, with arrangements made for additional areas for RV parking and overflow. Three restaurants, from fast food to the classy new Verandah are on site, plus a mini shopping center. A junior olympic swimming pool, golf and tennis privileges are provided for the sports-minded.

Transportation

The center is just 15 minutes from downtown Orlando and the airport. For the road traveler, easy access is provided by I-4 and the Sunshine Parkway. I-95 and I-75 are also within a short drive. Rail and bus terminals are located in Orlando. Consult your travel agent.

*6 Camelia Dr., De Bary, FL 32713

The Orlando area offers many beautiful parks and lakes to National Convention visitors. This is Lake Eola with its park, in downtown Orlando. *(Photo courtesy of Orlando Area Chamber of Commerce)*

Convention Highlights

Activities commence on Friday, March 13 with registration from 4 to 9 P.M. The Swap Shop will be open from 6 to 9 P.M. Registration continues on Saturday, 8 A.M. to 4 P.M. and Sunday from 9 A.M. to 3 P.M. An information booth will be located in the convention lobby.

Commercial exhibits and the Swap Shop will be open Saturday, 8 to 4 and Sunday from 9 to 3. The Saturday evening banquet will be held at SeaWorld, with a cash bar at 6:30, a Polynesian Luau at 7:30, a guest speaker and the "Drums of Tahiti" floor show following. Transportation will be provided for all attendees. Register *early*, as seating is limited to 450.

The ARRL convention will start on Saturday, with forums led by Headquarters' staff and division directors. Many seminars, displays and DX meetings are scheduled.

The special ladies program, which has brought plaudits every year, will be featured throughout the sessions. Sheraton guests may use the free air-conditioned buses to Disneyworld, SeaWorld, Stars Hall of Fame, Disney Shopping Village and Wet 'N Wild. Special tours are available. Other nearby attractions are Kennedy Space Center, Circus World, Cypress Gardens, Silver Springs, Busch Gardens, Six Gun Territory, Gatorland and Mystery Fun House.

Over 125 exhibitor booths will provide the curious with the latest ham radio and technological displays. Over 250 Swap Shop tables should whet the appetites of the "horsetraders." Our League President Harry Dannals, W2HD, Hq. staffers, Division Directors and many other officials, including the FCC, will attend. The banquet speaker will be announced at a later date.

Registration Information

Emphasizing the limited capacity, banquet tickets are $16 ($18 after February 20, if available). Convention registration is $4 for all amateurs and students 14 and over; amateur's spouse and children under 14, free, no ticket required. After February 20, registration for amateurs and students will be $5.

For hotel, motel and RV information, convention registration, Swap Shop table reservations or banquet tickets, write immediately to: HAMCATION Chairman, P. O. Box 191, De Bary, FL 32713. Include an s.a.s.e. to speed things up, please.

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE
MEETING NO. 382
September 13, 1980

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at 9 A.M., Saturday, September 13, 1980, at the Headquarters offices of the League in Newington, Conn. Present were President Harry J. Dannals, W2HD, in the Chair; First Vice President Carl L. Smith, WØBWJ; Directors Gar Anderson, KØGA, William J. Stevens, W6ZM, L. Phil Wicker, W4ACY, and Stan Zak, K2SJO; and General Manager Richard L. Baldwin, W1RU. Also present as observers were Directors Frank Butler, W4RH, and John Sullivan, W1HHR; Vice Director George Diehl, W2IHA; Washington Area Coordinator Perry F. Williams, W1UED; and General Counsel Robert M. Booth, Jr., W3PS.

The Committee proceeded at once 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, a phone call was made to one candidate to clarify details of employment. The Committee made findings and ordered actions as detailed below, all by unanimous action of those present:

Central Division

For Director: Edmond A. Metzger, W9PRN, and Don C. Miller, W9NTP, 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: Edmond A. Metzger, W9PRN, was found lawfully nominated and eligible, but his nomination as Director takes precedence in accordance with the By-Laws. Kenneth A. Ebneter, K9EN, and Norman E. Meyers, N9MM, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

Hudson Division

For Director: Stan Zak, K2SJO, 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 Hudson Division for the 1981-1982 term without membership balloting.

For Vice Director: George A. Diehl, W2IHA, and Linda S. Ferdinand, N2YL, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

New England Division

For Director: John C. Sullivan, W1HHR, 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 New England Division for the 1981-1982 term without membership balloting.

For Vice Director: Richard P. Beebe, K1PAD, 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 New England Division for the 1981-1982 term without membership balloting.

Northwestern Division

For Director: Dale T. Justice, K7WWR, Mary E. Lewis, W7QGP, and Robert B. Thurston, W7PGY, 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: Mel C. Ellis, K7AOZ, and Ronald D. Mayer, K7BT, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

Roanoke Division

For Director: L. Phil Wicker, W4ACY, was found lawfully nominated. The Committee was in receipt of a letter from Mr. Wicker withdrawing his name as a candidate. Gay E. Milius, W4UG, 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 the Director from the Roanoke Division for the 1981-1982 term without membership balloting.

For Vice Director: Gay E. Milius, W4UG, was found lawfully nominated and eligible, but his nomination as Director takes precedence in accordance with the By-Laws. John C. Kanode, N4MM, 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 Roanoke Division for the 1981-1982 term without membership balloting.

Rocky Mountain Division

For Director: Lys J. Carey, KØPGM, and Hugh Winter, W5HD, 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: Marshall Quiat, AGØX, Karl O. Ramstetter, WAØHJZ, and Robert A. Scupp, WB5YYX, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

Southwestern Division

For Director: Fried Heyn, WA6WZO, and Jay A. Holladay, W6EJJ, 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: The Committee was in receipt of a petition nominating Gordon V. West, WB6NOA. After extensive review, the Committee determined that he was ineligible under the terms of Article II. Peter F. Matthews, WB6UIA, was found lawfully nominated and eligible. Being the only eligible candidate, he was thereupon declared, pursuant to the By-Laws to be duly elected as Vice Director from the Southwestern Division for the 1981-1982 term without membership balloting.

West Gulf Division

For Director: Raymond B. Wangler, W5EDZ, 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 West Gulf Division for the 1981-1982 term without membership balloting.

For Vice Director: Thomas W. Comstock, N5TC, 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 West Gulf Division for the 1981-1982 term without membership balloting.

On motion of Mr. Wicker, the Committee recognized the names of 73 members who had recently been elected to Life Membership, and directed the General Manager to list their names in *QST*.

On motion of Mr. Wicker, the affiliation of the following clubs was approved: Acadiana DX Association, Erath, Louisiana; Barron County Amateur Radio Emergency Service, Barron, Wisconsin; Bethel Middle School ARC, Bethel, Connecticut; Bolingbrook Amateur Radio Society, Lisle, Illinois; Centrafina Amateur Radio Club, Maiden, North Carolina; Coastal Area Repeater Society, Savannah, Georgia; End-Of-The-Line Amateur Radio Club, Hoyt Lakes, Minnesota; Fellowship Amateur Radio Club, Miami, Florida; Megapulse Amateur Radio Club, Bedford, Massachusetts; Orange County Council of Amateur Radio Organizations, Costa Mesa, California; Oregon Tualtin Valley ARC, Portland, Oregon; Pentucket Repeater Association, Groveland, Massachusetts; Shackelford County ARC, Albany, Texas; Wyndmoor Repeater Club, Oreland, Pennsylvania. (With the above action, the League now has 1902 Category I affiliated clubs, 8 Category II clubs, and 353 Category III clubs.)

On motion of Mr. Anderson, approval was granted for the holding of the following ARRL conventions: Florida State, February 7-8, 1981, Miami, Florida; Mississippi State, April 25-26, 1981, Jackson, Mississippi.

At the request of the sponsors, the Committee rescinded its July 22, 1980 action in approving a Delta Division Convention on August 1-2, 1981.

On motion of Mr. Zak, the Committee approved an additional 1980 appropriation of $2000 for the Canadian Radio Relay League headquarters account.

On motion of Mr. Anderson, the Committee approved an additional 1980 appropriation of $1000 for the Committee on the Biological Effects of Radio Frequency Energy.

On motion of Mr. Anderson, the Committee approved an additional 1980 appropriation of $3000 for the National Traffic System.

On motion of Mr. Zak, the Committee approved an additional 1980 appropriation of $2000 for the Management and Finance Committee.

After discussion and review of a draft by the Headquarters, the Committee approved its filing in response to FCC Docket 80-252.

After discussion and a report by General Counsel Booth, on motion of Mr. Anderson, the Committee approved funding of the Personal Communications Foundation in the amount of $350 per month for seven months, with the first payment to be made on or about September 15.

On motion of Mr. Anderson, the Committee voted to provide an additional $5000 for Attorney Frederick J. Lawson to support various legal cases involving amateurs on the West Coast.

On motion of Mr. Stevens, the Committee approved a change in the dates of the 1983 National Convention from July to October 7-8-9.

On motion of Mr. Stevens, the Committee voted that effective January 1, 1981, the monthly pension benefit paid the present retirees would be increased by 20% or $50, whichever was greater.

The Committee designated Messrs. Anderson, Stevens, and Wicker to be the Committee of Tellers at the November 20th ballot counting, with Messrs. Dannals, Houghton and Huntoon as alternates.

In response to Minute 42 of the July Board meeting, Washington Area Coordinator Williams presented the draft of a filing with the Commission in support of digital data communications at vhf. The Committee instructed Mr. Williams to secure the input of several other knowledgeable amateurs in reviewing the draft before its filing by mid-October.

The General Manager reported on compliance with actions taken at the July meeting. Minutes, 55, 61, 63, 69 and 76 are considered by the General Manager to be Standing Orders. Action has been completed on Minutes 16, 32, 38 and 40. Action is in progress on Minutes 26, 27, 33, 36, 42, 43, 47, 48, 51, 65, 66, 70, 74, 75, 78, 79, 80, 81, 85, 88, and 89.

Mr. Smith, on behalf of the Interference Task Force, presented an oral report on their meeting this weekend and their proposed course of action.

Director Butler of the Southeastern Division was asked to provide the Executive Committee with a National Convention program for approval well in advance of the March date.

During the course of the meeting the Committee discussed, without formal action, the following matters: cases of litigation involving radio amateurs, legal insurance for members of the League, the sale of ARRL publications at ARRL conventions, the shipment of publications to conventions, the proper handling of Strays submitted to *QST*, the editorial article backlog for *QST*, the availability of net directories at conventions, the appreciation by Camp Courage of the attendance by Hq. staffer Rick Palm, and the costs to individuals of having to travel to regular FCC examination points.

(The Committee was in recess for lunch from 12:21 to 12:45, and from 11:15 to 11:45 to speak by telephone with director nominees.)

The next meeting of the Executive Committee will be held on November 19, 1980 at 2 P.M. at the Headquarters offices of the League in Newington.

There being no further business, the meeting was adjourned at 3:20 P.M.

Respectfully submitted
Richard L. Baldwin, W1RU
Secretary

Life Member Applicants are listed on page 98.

Happenings

Conducted By W. Dale Clift,* WA3NL

ARRL Elections — Slate of Candidates

Every two years, ARRL full members have the opportunity to select directors and vice directors to represent their ideas and needs on the ARRL Board. The Board of Directors is ultimately responsible for all League matters, including deciding ARRL priorities and services that will be made available to the membership. ARRL directors and vice directors are elected to represent specific geographic areas called divisions. (To determine your division and the names of your director and vice director see page 8 of this, or any, issue of *QST.*)

This year, nominations were open in the *Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern* and *West Gulf* Divisions. The ARRL Executive Committee of the Board met September 13, 1980 to examine nominating petitions filed by members for League directors and vice directors. The Committee has declared the following lawfully nominated and eligible for director and vice director:

Central Division — two candidates for director: Edmond A. Metzger, W9PRN and Don C. Miller, W9NTP. Two candidates for vice director: Kenneth A. Ebneter, K9EN and Norman E. Meyers, N9MM.

Hudson Division — one candidate for director: Stan Zak, K2SJO. Two candidates for vice director: George A. Diehl, W2IHA and Linda S. Ferdinand, N2YL. Because there was only one eligible candidate for director, the Executive Committee declared Mr. Zak to be elected to the office of director from the Hudson Division for the 1981-1982 term without membership balloting.

New England Division — one candidate for director: John C. Sullivan, W1HHR. One candidate for vice director: Richard P. Beebe, K1PAD. Because there was only one eligible candidate for each office, the Executive Committee declared Mr. Sullivan and Mr. Beebe to be elected to the respective offices of director and vice director from the New England Division for the 1981-1982 term without membership balloting.

Northwestern Division — three candidates for director: Dale T. Justice, K7WWR; Mary E. Lewis, W7QGP; and Robert B. Thurston, W7PGY. Two candidates for vice director: Mel C. Ellis, K7AOZ and Ronald D. Mayer, K7BT.

Roanoke Division — one candidate for director: Gay E. Milius Jr., W4UG. One candidate for vice director: John Kanode, N4MM. The Committee was in receipt of a petition nominating L. Phil Wicker, W4ACY, as a candidate for director. However, Mr. Wicker declined the nomination and asked that his name be withdrawn from consideration. Because there was only one eligible candidate for each office, the Executive Committee declared Mr. Milius and Mr. Kanode to be elected to the respective offices of director and vice director from the Roanoke Division for the 1981-1982 term without membership balloting.

Rocky Mountain Division — two candidates for director: Lys J. Carey, KØPGM and Hugh Winter, W5HD. Three candidates for vice director: Marshall Quiat, AGØX; Karl O. Ramstetter, WAØHJZ; and Robert A. Scupp, WB5YYX.

Southwestern Division — two candidates fo director: Fried Heyn, WA6WZO and Jay A Holladay, W6EJJ. One candidate for vic director: Peter Matthews, WB6UIA. The Com mittee was in receipt of a petition nominatin Gordon V. West, WB6NOA, to the office o vice director. After extensive review, the Com mittee determined that Mr. West was ineligibl under the terms of Article II of the By-Laws Because there was only one eligible candidat for vice director, the Executive Committe declared Mr. Matthews elected to the office o vice director from the Southwestern Divisio for the 1981-1982 term without membershi balloting.

West Gulf Division — one candidate fo director: Raymond B. Wangler, W5EDZ. On candidate for vice director: Thomas W. Com stock, N5TC. Because there was only one elig ble candidate for each office, the Executiv Committee declared Mr. Wangler and Mr Comstock to be elected to the respective office of director and vice director from the Wes Gulf Division for the 1981-1982 term withou membership balloting.

Ballots have been sent to all full members o the League in those divisions where there more than one candidate for either office. T be valid, the ballots must be returned to Head quarters by noon, November 20. A committe of tellers will count the ballots and results wi be announced over WIAW and in *QST.* An full member of one of these divisions who ha not received a ballot by November 1 should im mediately contact Donna Frechette at ARR hq. — *Richard Palm, K1CE*

PETITIONS FOR SPANISH EXAMS DISMISSED

The FCC has dismissed two petitions for rulemaking requesting that amateur examinations be available in Spanish. Action on the petitions, RM-2529 filed by Sociedad Internationale de Radioaficianados of Miami, Florida, and RM-2757 filed by ARRL, was not necessary, the Commission said, because it was already providing the exam for elements two and three in Spanish. The agency added that they would have at least two more sets of Spanish exam papers on line before the year's end.

FCC DECLINES TO ASSIGN PHONEPATCH SUB-BANDS

The FCC has dismissed a petition for rulemaking (RM-3074) that proposed the assignment of third-party phonepatch sub-bands selected by the Commission. In support of his petition, John P. Weber Jr. felt that the assignment of such sub-bands would reduce the potential for interference and "intramural feuding."

In its Order terminating the proceeding, the Commission said that "we do not believe that the assignment of sub-bands in the existing amateur radiotelephone bands, where third-party traffic would have to be handled, is desirable. To do so would limit the flexibility that amateur radio operators now have in choosing the frequencies on which they want to handle third-party traffic." The Commission further indicated doubt that there would be less interference among Amateur Radio users if sub-bands were assigned. — *Richard Palm, K1CE*

PETITIONS FOR RULEMAKING FILED WITH FCC

Expansion of Phone Subbands Proposed

James H. Simon, W1YY, and William H. Bennett, W7PHO, have jointly filed a petition with the Commission requesting expansion of the present U.S. amateur phone sub-bands. Specifically, the petitioners request the frequency segments 3.75 to 3.775, 7.05 to 7.150, 14.100 to 14.200, 21.200 to 21.250 and 28.400 to 28.500 MHz be made available to U.S. amateurs for phone operation. In their petition, Simon and Bennett cite curren underutilization of these segments, increase foreign amateur competitiveness in the equip ment and antenna arena, and frequency discrimination on the part of the Commissio relative to the privileges allowed by foreig governments. The Commission has assigne RM-3734 to this petition. (James H. Simon W1YY, 5541 So. Holly St., Seattle, WA 98118 William H. Bennett, W7PHO, 18549 Norman dy Terr. S.W., Seattle, WA 98166)

In a similar request, David Novoa, KP4AM asks the Commission to expand the phone sub bands in 40 and 20 meters. In his supportin remarks, Novoa states that "The telephon mode has more users per 'space' available tha the radiotelegraph mode." FCC has assigne RM-3729 to this petition. (David Novoa KP4AM, P. O. Box 50073, Levittown, P 00950)

Petition to Extend Station I-D Time Periods

In a petition filed by John M. Gebuhr, th Commission is requested to increase from 1 minutes to 15 minutes, the time betwee transmissions that requires station i-d. Addi tionally, the petitioner requests deletion of th

*Deputy Manager, Membership Services

requirement that amateurs identify the corresponding station at the end of the contact. In support of his proposals, Gebuhr states that "The present 10-minute identification requirement disrupts amateur network and emergency communications." Furthermore, ". . . none of the other two-way services under FCC jurisdiction currently operate under an identification requirement as short as 10 minutes." With respect to his proposal for deletion of the requirement that an amateur station identify the station with which it has established contact, Gebuhr feels that the result of this action would be an increase in operating efficiency. (Brian Zdan, attorney for John M. Gebuhr, 4817 Douglas St., Omaha, NE 68132)

10 MHz Band Proposal

The Schenectady (New York) Amateur Radio Association, Inc., has filed a petition with the Commission proposing the allocation of technical standards for the new 10-MHz amateur band. The club recommends that the band be divided into two sub-bands: (1) a subband of 10.10 to 10.12 MHz, exclusively A1 and F1, available to Novices through Amateur Extra Class licensees with a Novice power limit of 250 watts input; and (2) the remaining 30 kHz, 10.12 to 10.15 MHz devoted to A1, F1 and A3J (single-sideband emissions) and available to General class licensees and above. SARA feels that the adoption of these technical standards for the new band would "strongly enhance the ability of the Amateur Radio Service to react in the case of natural disasters . . ." and further, would decrease band congestion on other amateur frequencies. (SARA, Inc., Box 6, Alplaus, NY 12008)

Interested parties will have an opportunity to file appropriate comments with the FCC Secretary. Send the original and five copies to: FCC Secretary, Washington, DC 20554. (Note: Don't forget to send a copy of your comments to the petitioner.) — *Richard Palm, K1CE*

FCC "CENSURE-Y" CLUB

KA1AQ Cited, Fined

James H. Rafuse Jr., KA1AQ, of Scituate, Massachusetts, paid a fine of $50 for violation of §97.121 (false signals). The Commission's attention was drawn to the operation of Rafuse by complaints of interference to several nets along the east coast. As a result of close FCC surveillance, Rafuse was cited for violation of §97.78 (good amateur practice) and fined for violation of §97.121. Rafuse was observed to call other stations between 5:57 P.M. and 6:05 P.M. on 3965 kHz without allowing time for answers between calls. He was further observed transmitting tape recordings of other stations without their authorization (the fine was levied for false call sign transmission by way of these recordings).

FCC SCORECARD

The following is a list and brief summary of actions pending before FCC which may affect Amateur Radio. Only those proposals that have proceeded to the point of being assigned docket numbers are listed.

Docket 20654[1] — An inquiry into interference from spark-type ignition systems in motor vehicles. Reviewed this year, continued without action.

Docket 20777[2] — This docket has often been referred to as the "Bandwidth Docket." Originally, this proceeding was started to investigate better ways of defining emission types. Recently, it was a vehicle to permit amateurs the use of ASCII (American Standard Code for Information Interchange). See April 1980 *QST*, page 74. The docket remains "open" for future proposals regarding further deregulation of radioteletype emissions in the Amateur Radio Service.

Docket 78-205[1] — FCC proposal to reimburse the needy who participate in Commission rulemakings. See May 1980 *QST*, page 55.

Docket 78-250[1] — Inquiry into the administration of code tests to blind and handicapped applicants. See October 1978 *QST*, page 54.

Docket 78-307[1] — NOI investigating a consumer-oriented grading system for TV receivers. See January 1979 *QST*, page 63.

Docket 78-316[2] — FCC Fee Refund Docket. Refunds in progress; see January 1979 *QST*, page 65 and October 1980 *QST*, page 10.

Docket 78-352[1] — Quiet Zone Docket. NPRM would establish a quiet zone for amateur repeaters to protect the National Radio Astronomy Observatory and Naval Research Laboratory from harmful interference. See January 1979 *QST*, page 62.

Docket 78-369[1] — NOI on the susceptibility of electronic equipment to radio-frequency interference (RFI). See March 1979 *QST*, page 9.

Docket 79-140[1] — NOI on the creation of a new Personal Radio Service at 900 MHz. See March 1980 *QST*, page 72.

Docket 79-144[1] — NOI to solicit comments on the effects of rf exposure standards on radio services and equipment, and whether the FCC should consider the biological effects of radio-frequency radiation when authorizing the use of radio-frequency devices. See March 1980 *QST*, page 72.

Docket 80-7[1] — NPRM to provide frequencies and standards for nationwide Civil Disaster Radio Response Program. See May 1980 *QST*, page 55.

Docket 80-135[1] — NPRM to permit the continued use of 420 to 450 MHz for nongovernment radiolocation on a shared, noninterference basis. See May 1980 *QST*, page 56; July 1980 *QST*, page 51; and August 1980 *QST*, page 58.

Docket 80-136[1] — NPRM to simplify amateur station-identification rules. See June 1980 *QST*, page 58.

Docket 80-184[1] — NOI into changes to International Regulations for Mobile Services WARC. See August 1980 *QST*, page 58.

Docket 80-252[1] — NPRM released June 12, 1980 to permit facsimile and television transmissions on additional frequencies. See August 1980 *QST*, page 58. — *Richard Palm, K1CE*

[1]Filing deadlines for comments passed, awaiting Commission action.
[2]Some provisions adopted, others pending.

Robert M. Booth, Jr., W3PS, ARRL general counsel

BEHIND THE DIAMOND

This month, the BTD news team traveled to the office of the general counsel for a visit with Bob Booth, W3PS — ARRL's "League-al Beagle." With offices in Washington, DC, Bob, along with Chris Imlay, N3AKD, maintains a close liaison with the FCC and other government agencies on behalf of the League. ARRL's expert on legal affairs, Bob is concerned with all matters of law affecting the League.

Robert M. Booth Jr. first became interested in radio in 1921, when his father built crystal and, later, tube broadcast receivers. Bob was given a copy of *QST* by a friend of his which sparked (no pun intended) his interest in ham radio.

First licensed in 1927 as 8DDF in Cincinnati, Ohio, and later as 8PV (portable in Cincinnati), his amateur license got him a job at age 16 as a troubleshooter on a radio production line at Crosley Radio. He attended Purdue University from the fall of 1929 until his graduation (B.S.E.E.) in 1933. He served as president of Purdue's Amateur Radio club (W9YB) and as commanding officer of his naval communications reserve unit. While at Purdue, Bob held the calls W9DDB and W9DY. In 1932 he was involved in early television pioneering efforts, operating a 1600-kHz TV station employing scanning discs.

Upon his graduation from Purdue, Bob returned to Crosley Radio's broadcast division as an engineer for WSAI, International Station W8XAL, and a 500-kW experimental broadcast station, W8XO, which operated as WLW from 1934 to 1940.

His work as an operator of WLW got Bob interested in the workings of the FCC, which in turn led Bob to study law at night at the Salmon P. Chase College of Law, from which he was graduated in 1941. He was ordered to active duty from the naval reserve in the fall of 1940, and served at the Naval Aircraft Factory as a superintendent of the radio and electrical lab of the Naval Air Experimentation Station, Philadelphia, Pennsylvania, from 1941 to 1944. After being transferred to the Bureau of Aeronautics in Washington, DC, he was released in October 1945 and has practiced communications law ever since.

Immediately after the war, Bob was licensed as W3PS and has continuously held that call sign. In 1961 he served as president of the Federal Communications Bar Association, and in 1970 as trustee of the Washington Section of the Institute of Electrical and Electronic Engineers (IEEE).

He has served as ARRL general counsel from 1961 to the present, and in 1979 received the first distinguished amateur award from the National Association of Broadcasters. Bob has appeared as an expert witness in favor of amateurs before many zoning boards in antenna cases, has testified at hearings before the FCC, and regarding legislation, before the U.S. Congress.

Bob, who was listed in the 1973 edition of *Who's Who in America*, is an active amateur indeed. He enjoys chasing DX with his Collins S-Line.

Correspondence

Conducted By Bruce R. Kampe,* WA1PO

HURRICANE ALLEN

☐ When Hurricane Allen was bearing down on the South Texas Coast, I chanced to be in the remote wilds of the Gila Wilderness of Western New Mexico. TV reception is nonexistent and commercial radio reception is poor at best. So, in order to receive the latest on the massive storm, I kept the 520S tuned to the hurricane net on 14.325 MHz.

To say my blood boiled is an understatement when I kept hearing the vicious interference being intentionally inflicted on the NCS and other operators in the net. Whistles, constant carriers, unwarranted swearing and other childish idiocy gave me a sick feeling in the pit of my stomach, especially to know that somewhere there are real "sickies" who hold ham tickets.

I suppose the real purpose of this letter is to tip the old fedora to all of those who were able to keep their cool and keep information coming at a rapid pace. These folks are "gems" and are appreciated not only by me, but by thousands of others who "stood by" on frequency. When I returned to the Texas south plains area, I found our own local group (in Lubbock) had been active relaying Teletype bulletins, taken from hf, through a 2-meter RTTY hookup to our ARES trailer set up at one of the local TV stations. Local folks found out that Lubbock hams are serious about their Public Service duty even though the disaster was 600 miles away. Needless to say, that "sick" feeling has long since been replaced by an immense feeling of pride in belonging to such a dedicated group of people. — *Ed Redwine, K5ERJ, Tahoka, Texas*

☐ After 16 years in the Dallas Police Department, I am not unacquainted with emergency situations, since four of those years were spent as a supervisor in police communications. I am pointing out that in order to be effective, you must have a clearcut purpose, you must have experience, control must be exercised, a capable NCS is a must, bragging is out of order and you must have cooperation. None of the above was observed during the time I monitored 20 meters.

More positive help would have been provided by the net if each participant had mailed a check for $5 to the Red Cross and then unplugged their mike. There comes a time when mere good intentions are just not good enough. — *Wayne L. Brandon, WB5HMB, Dallas, Texas*

☐ It was a pleasure to hear the tireless efforts of certain individuals trying to keep their frequency open for the primary purpose of the emergency. — *Louis Fisk, K4PPP, Boca Raton, Florida*

☐ My heartiest congratulations go out to those who acted as net-control stations during this trying time. These people spent many, many hours at their rigs trying to help those who were in the affected areas. — *Allen E. Hughes, WD5EYM, Centreville, Mississippi*

☐ A big word of thanks should go out to those operators who diligently stuck with it, trying to be of assistance to those needing information concerning the affected area. It is good to know that we have some operators who care.

It is most certain that there will be a story in *QST* relating to what an important role Amateur Radio played in Hurricane Allen. We, the South Georgia ARC, implore you to make an appeal to thoughtless amateurs to clean up their act. We also need to encourage those who want to participate in a net to learn the procedure; some people don't even know what a net control operator is. — *Ken Elsberry, WD4ERM, Valdosta, Georgia*

☐ The many Amateur Radio operators involved in the hurricane net on 14.325 MHz, and the other nets of equal importance, performed services that were necessary and valuable not only to Amateur Radio operators but also to the people of many countries affected by the storm. The dark clouds of malicious interference caused the unselfishness and dedication to shine through and appear brighter than expected. I applaud a job well done through rough conditions. The number of hours volunteered by so many individuals was unbelievable. Thank you from myself and from the many other people who I know feel the same way. — *Ed Larose, N5CCA, Humble, Texas*

☐ It seems that the criminal stations generating deliberate interference take great delight in ruining the work of public-spirited amateurs who are giving of their time and effort to help save lives and property. In several instances the NCS begged the QRMers to stop, but the interference would continue. In fact, the more attention given to the QRM the more it increased! — *Norman W. Pinney, KC4AR, Montgomery, Alabama*

☐ Some of the undesirable and interfering transmissions would have been eliminated if the net controls would state often the purpose of the net, authority for the net, authorized net control stations and call signs, the type of traffic to be handled, significant net affiliations pertinent to information interchange, net information sources, and other net frequencies and services functioning. It may not seem like important information to the net control in the "heat of battle," but is essential to the majority of those desiring interaction with the net services, particularly since many have not been continuously involved with a net.

On numerous occasions the 14.325 MHz net was crippled by malicious transmissions. During one of these periods, while the net control was exclaiming "I can't believe it," a malicious, though disturbingly accurate, transmission called attention to the fact that the problems were being created by the net control's arrogant, onmipotent attitude coupled with their continuous inane lectures demeaning virtually anyone attempting interaction with the net, and general failure of the net control to acknowledge the existence of anyone except a few "privileged" calls. The result of such a attitude on the part of a net control is that mos listeners became frustrated, tempers flare, an malicious transmissions increase.

Several times the net controls spent mor than 1 minute informing a station that "unde no circumstances could his information or re quest be construed as appropriate or of con cern to the net," again inviting bitterness an additional malicious transmissions, which wer subsequently provided. As further evidenc that the problems of the net were actually deep ly rooted in the attitude of the net control, a additional example is given. At one point, on of the net controls relaxed the formality of th net and responded quickly and politely to such "trivial" requests as repeats of hurricane co ordinates, etc., and during this time, th malicious interference stopped and more infor mation changed hands than during all the othe hours that the net was monitored. — *A. Bren White, W7LUJ, Richmond, Utah*

☐ During the threat of Hurricane Allen I was very disappointed with the things I heard on 20 meters. I had never heard such foul talk in my life, not even on CB. — *Clyde Scott, Jr., KA4IOB, Albany, Georgia*

☐ I was listening to the Hurricane Net when Allen was heading for the Gulf Coast. Then i happened. The proverbial sickie powered up I'm sure he couldn't have been a ham, but he did have the equipment. Never have I seen such blatant behavior. This activity could have very well cost in human lives. This is murder in my book. — *Rick Collins, KA8IVZ, Montrose, Michigan*

☐ Some of us are slightly paranoid, recognizing certain types of jamming that sounds too professional, and we see a sinister aspect smacking of sabotage. Most of what we hear, however, can be classified as the satanic acts of the "sickies" of the world. Unfortunately these people turn their anger on others, making the sane angry and forming a chain that continues producing confusion and chaos. The evil overrides the good intentions of all the sincere amateurs who want to help the unfortunate victims in emergency situations.

Since none of the "sickies" will read my message, it is no use to plead for understanding on their part. My message must go to the sincere, worthwhile participants of all the nets who took part in the recent emergency, Hurricane Allen. But after we've tasted the gall in our mouth, felt our stomachs churn and taken two aspirin for the headache that has come on, what a breath of fresh air to hear a quiet voice offering a comment of humor. In all tense situations the elements of humor can surface. That calm voice said, "Will Hurricane Allen please stand by while the net resumes normal conditions." — *Patricia McGehee, KYL-WD0FFG/MM2, Grand Cayman Island, BWI*

[Editor's Note: In the time this editor has been conducting "Correspondence," the volume of mail observed on a single subject has never been as large as on the topic of Hurricane Allen.]

*Membership Services Assistant, ARRL

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

A Surprise Quiz

Want to add a little spice to your club's next meeting? Why not have your members try this little brain-teaser on for size. Designed to test one's Part 97 prowess, this light-hearted quiz represents a turning of the proverbial tables — now it's *your* turn to answer the questions!

Definitions

1) *The Amateur Radio Service is* (97.3)

a) a commercial public communications service carried out by licensed Amateur Radio operators.

b) a non-commercial radio communication service carried out by Amateur Radio operators solely with a pecuniary interest.

c) a radio communication service of self-training, intercommunication and technical investigation carried on by Amateur Radio operators.

d) a branch of the Armed Forces.

2) *Radiocommunication conducted from a specific geographical location other than that shown on the station license is known as* (97.3)

a) portable operation.

b) fixed operation.

c) clandestine operation.

d) auxiliary operation.

3) *An amateur station remotely controlling another amateur station is called a* (97.3)

a) repeater station.

b) auxiliary station.

c) police station.

d) mobile station.

4) *A Petition for Rulemaking is*

a) a written request for FCC action involving a rulemaking filed with the FCC Secretary.

b) a document filed by FCC staff with the seven Commissioners.

c) an FCC action which changes the rules.

d) a formal staff proposal deemed unacceptable by the Commissioners.

5) *NPRM stands for*

a) New Petition for Rulemaking.

b) Notice of Proposed Rules Moratorium.

c) Notice of Penalty for Rulemaking.

d) Notice of Proposed Rulemaking.

Station Identification and Logging Requirements

6) *The Commission has recently issued a proposal in Docket 80-136 that would*

a) simplify the Amateur Radio Service rules by deleting them from Title 47 of the U.S. Code.

b) simplify station identification.

c) simplify logging requirements.

d) simplify digital electronics by deleting the OFF state.

7) *Which of the following must be entered into a station's logbook?* (97.103)

a) A notation of call signs of stations worked.

b) A notation of mobile operation.

c) A notation of portable operation.

d) A notation of appendix operation.

8) *Peter, WB1GEX, a General class licensee, is operating at Novice station KAØXXX in the General class portion of the band. Which of the following is a valid i-d?* (97.84)

a) "This is WB1GEX."

b) "This is KAØXXX."

c) "This is Peter."

d) "This is KAØXXX/WB1GEX."

Prohibited Practices

9) *When may an Amateur Radio operator receive payment for operating his amateur station?* (97.112)

a) Only when the station is used for conducting *emergency* communications.

b) An operator may be remunerated only for incidental expenses such as gas or electricity.

c) Never.

d) When broadcasting Rossini's *William Tell Overture*.

10) *When an amateur receives an Official Notice of Violation, he/she must* (97.137)

a) reply in writing to the FCC office originating the notice within 15 days of receipt of the notice.

b) report in person to an FCC Monitoring Station within 24 hours of receipt of the notice.

c) make a log notation: "I will not violate the rules again," 50 times.

d) reply in writing to the FCC office originating the notice within 10 days of receipt of the notice.

11) *Which of the following is not prohibited in the Amateur Radio Service?*

a) The transmission of one-way communications consisting of a bulletin containing information of direct interest to the Amateur Radio Service.

b) Communication with codes and ciphers.

c) Interference for the express purpose of preventing a violation by another amateur station.

d) Communication for the express purpose of performing a cashectomy on the First National Bank.

Repeaters

12) *A repeater may be controlled automatically when* (97.85[c])

a) an autopatch is in progress.

b) a repeater may never be controlled automatically.

c) devices and procedures are implemented to ensure compliance with the rules when a control operator is not present at a control point.

d) the owner is on vacation.

13) *Emissions from a station in repeater operation* (97.85[a])

a) must be discontinued within 10 seconds after cessation of a radiocommunication by a user station.

b) must be discontinued within 5 seconds after cessation of a radiocommunication by a user station.

c) may consist of unidentified signals.

d) must continue indefinitely.

14) *Which of the following is a valid repeater i-d?* (97.84[d])

a) KA1AHD 34/94

b) KA1AHD repeater

c) "You're tuned to beautiful radio Mt. Greylock repeater."

d) KA1AHD portable

Third Party Traffic

15) *International third-party traffic is permitted* (97.114)

a) never.

b) always.

c) in certain cases where the U.S. has a third-party agreement with the country involved (and then only under certain conditions).

d) with all Western European countries.

16) *An example of illegal third-party traffic is* (97.114)

a) a message sent to a friend in Canada via Amateur Radio.

b) an autopatch to a commercial towing company asking for assistance with a vehicle breakdown on a highway.

c) an unlicensed friend speaking into the microphone at a control point.

d) an autopatch to order a double anchovy pizza.

Call Signs

17) *The proceedings in FCC's Call Sign docket (21135) were terminated recently with*

a) the adoption of Phase I of the call sign system.

b) the adoption of Phase II of the call sign system.

c) the adoption of Phase shifting.

d) the adoption of the Third Report & Order (which essentially dooms new club, RACES and Military Club station licenses).

18) *Under the present call sign assignment system,* (97.51)

a) station licensees have the option of retaining their call signs in all cases when modifying their licenses.

b) amateurs *must* have calls that reflect their call area.

c) amateurs may request a one-letter call sign.

d) if a station licensee forgets his primary call sign, he may request a new one.

International

19) *The U.S. is in International Telecommunication Union*

a) Region 1.

b) Region 2.

c) Region 3.

d) Region 4.

20) *Worldwide amateur frequencies are allocated by*

a) the FCC.

b) the Food & Drug Administration.

c) the International Telecommunication Union.

d) the AFL-CIO.

Note: Answers appear on page 78.

*Membership Services Assistant, ARRL

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRC

The Red Cross/Ontario Section Agreement

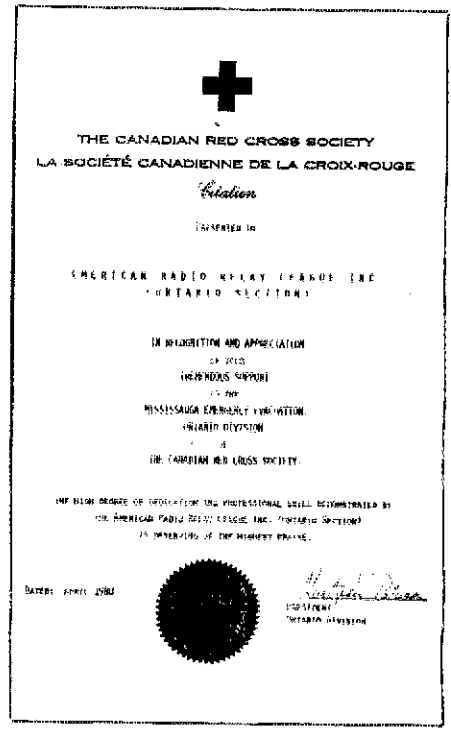
First it was Hurricane David. Ontario amateurs assisted Canadian Red Cross by clearing hundreds of health-and-welfare messages between Canada and storm-torn Dominica. Then, a year ago this month, a train derailment in Mississauga, Ontario, initiated a series of events that included fire, explosion, threat of chlorine gas poisoning and the evacuation of 200,000 people from their homes. Throughout that ordeal, Canadian Red Cross relied heavily on Amateur Radio operators working within the framework of ARES, the League's Amateur Radio Emergency Service, to provide the communications necessary to coordinate the evacuation effort. As a result of these two experiences, Ontario Division Canadian Red Cross officials were determined never to do without amateur assistance. They began to work toward signing an agreement with the amateurs, an agreement that has now become reality.

The official title of the agreement is "A Cooperative Understanding Between the Canadian Red Cross Society, Ontario Division, and the American Radio Relay League, Inc., Ontario Section, for the Provision of Amateur Communication." Its eight-page text goes far beyond recommending that amateurs keep their hand-helds by their beds. It specifies that the League's Ontario Section officials — SCM, SEC and STM · · · will maintain liaison with Emergency Services, Ontario Division Canadian Red Cross, to coordinate plans and facilities for disaster relief. The Ontario Section field organization, consisting of ARES groups and NTS official traffic stations, will extend emergency communications planning to the local level, working with local Red Cross branches. Whenever an emergency requires the use of Amateur Radio communications, Ontario Division Canadian Red Cross will contact Ontario Section officials near the emergency site, and have those officials alert Amateur Radio volunteers according to a prearranged plan, establish a network of fixed, mobile and portable stations for local coverage and point-to-point contact between Red Cross posts, and provide for continuity of communications in the event of an extended emergency period.

The agreement strongly recommends that local Red Cross branches have Amateur Radio representatives on their disaster-preparedness and relief committees, and that amateurs maintain stations, at Red Cross headquarters in Toronto and at local Red Cross branches. The first of these, the headquarters station, VE3RCO, is now operational and was recently activated during Hurricane Allen.

Will there be similar agreements in other provinces? Hopefully, yes. Amateurs in Manitoba and Saskatchewan are certainly ready. Nowhere in Canada is the League's Amateur Radio Emergency Service better organized, or more firmly established. In Quebec, this type of agreement already exists between Réseau d'Urgence RAQI and La Protection Civile du Quebec. In fact, La Protection Civile du Quebec recently provided Réseau d'Urgence RAQI with $44,000 to cover initial administrative costs, and the purchase of equipment for nine key stations in their emergency network!

The Ontario agreement with Canadian Red Cross is a milestone. It gives recognition to past efforts of Amateur Radio Operators in time of emergency, and expresses confidence in the ability of those operators to give equally good service in the future. It deserves to be copied in all parts of Canada.



THE CANADIAN RED CROSS SOCIETY
LA SOCIÉTÉ CANADIENNE DE LA CROIX-ROUGE

Citation

Ontario Division Canadian Red Cross presented this certificate to officials of the Ontario Section of the League to show its appreciation for the excellent communications provided by Amateur Radio operators during the November 1979 Mississauga evacuation. CRRL has now made reproductions of this certificate and has distributed them to the 230 amateurs involved.

CRRL NEWS

Bill Loucks, VE3AR, is preparing a report on behalf of Canadian League members. The report will make recommendations concerning domestic implementation of frequency allocations made at WARC '79. There will be special emphasis on the new 10.1- to 10.15-MHz band. At present, there are no stations in Canada on this band. A number of frequencies are set aside for use by the Canadian Armed Forces. If the Armed Forces could find other frequencies, 10.1 to 10.15 MHz could become exclusively amateur in Canada.

CRRL Counsel Bob Benson, VE2VW, continues to meet with Department of Finance people, to press for a tariff reduction on amateur transmitters, receivers and transceivers, and the broadening of such a reduction to include accessories such as VFOs and power supplies. Some progress has been made, but with politicians preoccupied with federal-provincial relations and the Canadian constitution, a tariff reduction on hobby equipment is definitely a "back-burner" item. Still, a new federal budget is imminent. Canadian amateurs should plan to check closely the Minister of Finance's budget paper, as soon as it appears in print. A breakthrough could be there.

Bill Choat, VE3CO, well known in the Toronto area for his fine work with blind amateurs, is celebrating 60 years of membership in the League. Bill first joined in February 1920, a month after Ken Warner's editorial, "Greetings, Canadians!" appeared in *QST*. Bill recently loaned CRRL a scrapbook which belonged to the late Bill Sloane, VE3BJ. Bill Sloane assembled his first station in 1912, when he was a boy. The scrapbook traces development of that station over the years. It is of such interest that CRRL is having the scrapbook photographed, page by page, and then getting Bill Choat to do a commentary on it. The resulting slide-tape presentation should be ready for use by clubs early in 1981.

The new *CRRL Amateur Radio Licencing Manual*, by Ralph Zbarsky, VE7BTG, has now been printed and is being distributed to dealers across Canada. Look through a copy at your local radio store. If your dealer is not yet stocking the CRRL *Manual*, and he doesn't know where to get them, give him Ralph's address: 3275 West 22nd Ave., Vancouver, BC V6L 1N1. Incidentally, Ralph, Gil Frederick, VE4AG and Clarence "Mitch" Mitchell, VO1AW, have recently become ARRL-CRRL assistant directors. They'll gladly listen to your concerns and, on behalf of the League, help you in any way they can.

CRRL has a new address. Send all correspondence, club bulletins, inquiries, even complaints to CRRL, Box 7009, Station E, London, ON N5Y 4J9.

*163 Meridene Crescent West, London, ON N5X 1G3

International News

Conducted By David Sumner,* K1ZZ

Sri Lanka, Chapter Two

This column for January 1979 described the initial efforts by members of the Deutscher Amateur Radio Club of the Federal Republic of Germany to establish an Amateur Radio training program in Sri Lanka. Their first visit was so successful that the Radio Society of Sri Lanka (RSSL) and the Ministry of Posts and Telecommunication of the Republic of Sri Lanka extended an invitation for them to return. The second training course was conducted between March 23 and April 11, 1980, by Gerd Schnabel, DJ7GS (as team leader); Hans, DJØVZ; Juergen, DF3OL; Wolfgang, DK5OU; Alfons, DJ6XR; Wolfgang, DF1KL; Struppi, DJ3JW; Angela, DK8KL; Horst, DF7ZH; Erwin, DK5WY; Ingrid, DF5AW; and Juergen, DL2WI. As in 1978, the government of Sri Lanka made available the facilities of the Sri Lanka Foundation Institute in Colombo and provided accommodations for the volunteer instructors.

A special feature was a course to "train the trainers" in which seven students participated, learning how training courses should be prepared and run. Thus, the RSSL will be in a position to continue the training program on its own. The regular training course had 29 students, 28 of whom successfully completed the course. There were students from India and Bangladesh, as well as Sri Lanka. Technical literature was donated by the ARRL and the Radio Society of Great Britain, and Morse code practice oscillators and headphones were donated by DARC.

DJ7GS reports:

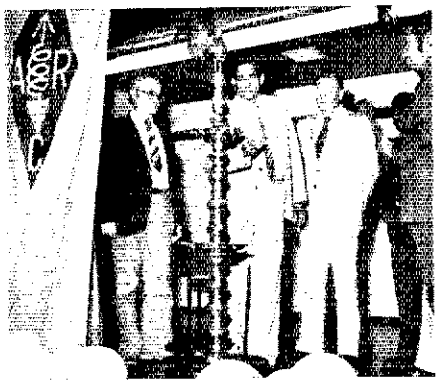
We were also in a position to reactivate two Amateur Radio school clubs, in the Royal College and Wesley College. We had brought with us a Heath HW-32 transceiver which was gifted to the Royal College and was officially handed over to the principal.

During our stay in Sri Lanka we were able to make various contacts which will be useful in the future. We had detailed discussions with the Minister of Education and Youth Affairs, the Post Master General, the personal secretary of the President of Sri Lanka and the German Ambassador and his Charge d'Affaires who also took part in the inauguration ceremony at the Sri Lanka Foundation Institute.

The participants from Bangladesh informed us that so far Amateur Radio is banned in their country. However, since for the first time foreign currency was released for the participation of a Bangladesh national in a ham radio course and since one of the ministers seems to be interested in Amateur Radio, we do hope that this will mean a breakthrough for Amateur Radio in Bangladesh as well.

The public relations on the course was very positive. We not only had press articles in all Sri Lanka newspapers but also a 10-minute radio broadcast which was not only broadcast over the local network but also was transmitted to the Middle and Far East. Furthermore, Sri Lanka television has agreed to fully broadcast a film about the 1978 pilot training course.

The Radio Society of Sri Lanka will continue with the courses until September this year when the Post Master General's examination will take place. After this the RSSL will start another course for beginners and will make use of the new trainers. Two German trainers may return to Sri Lanka to supervise the final stage of the training course, in 1982.



During the inauguration ceremony and the traditional lighting of the oil lamp at the Sri Lanka Foundation Institute: (l-r) Gerd Schnabel, DJ7GS; Mr. A.R.M. Jayawardene, Post Master General of Sri Lanka; Dr. W. Schumann, Counsellor of the Embassy of the Federal Republic of Germany; and Dr. Wesumperuma, Director of the Institute.

Juergen Carow, DF3OL (ex-DM2CYO) during the technical lectures.

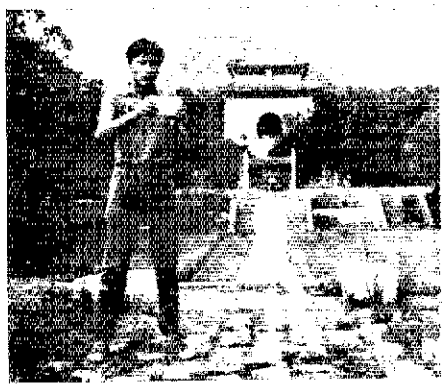
JARL HOSTS CHINESE AMATEURS

In August, three officials of the Association of Radio Sport of the People's Republic of China were guests of the Japan Amateur Radio League for one week. The visitors were Mr. Cheng Ping, Secretary General of the Association; Mr. Wang Xun, Vice Secretary General; and Mr. Yu Zai Qin, an interpreter. The highlight of their stay was attendance at the JARL Ham Festival at Harumi, Tokyo, which attracted some 34,000 attendees this year.

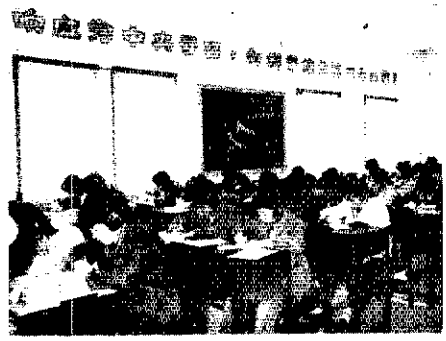
JARL President Shozo Hara, JA1AN, reports: "Before their departure, JARL presented their Association with more than 10 sets of amateur equipment which we hope will be put to good use as they are most anxious to go on the air at the earliest possible date and this feeling is, of course, mutual."

The Association of Radio Sport is affiliated with the China National Federation of Sports. Amateur activities were suspended in 1966 but were reintroduced in 1976, with an emphasis on Morse code training and direction finding (fox hunting). Intercommunication with Amateur Radio stations in other countries has not yet resumed.

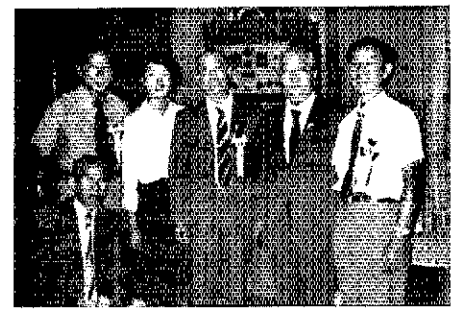
*Assistant General Manager, ARRL



Amateur Radio direction-finding ("fox hunting") activity in China.



A Morse code training class in China.



Visitors from the Association of Radio Sport of the People's Republic of China at the station of JA1AN: (standing) Mr. Yu Zai Qin, an interpreter, Mr. Cheng Ping, JARL President Shozo Hara, JA1AN, and Mr. Wang Xun; (seated) Mr. Masayoshi Fujioka, JM1UXU, a delegate from Japan to WARC-79 who has obtained his amateur license since the Conference and is now JARL Manager of External Affairs.

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

Of Cabbages and Kings

"The time has come," the Walrus said,
"To talk of many things:
Of shoes — and ships — and sealing wax
Of cabbages — and kings —
And why the sea is boiling hot —
And whether pigs have wings."

As Lewis Carroll, speaking through the Walrus, opined, at times there are many things to discuss, and this installment of "FM/RPT" is one of those times. Bob Shriner, WAØUZO, leads off with a lesson about cooperation in the repeater world.

"In Colorado the amateur repeater operators had a problem common to others throughout the country. This is the story of how they solved the problem.

About 15 years ago, a few far-thinking amateurs planned a repeater system for the front range of the Rocky Mountains in Colorado. Denver, the largest city in the state, was the first to come on the air with a 2-meter fm repeater. Naturally, they chose the popular frequency pair of 34/94.

"A little later, amateurs in Pueblo, 100 miles south of Denver, decided to put up a repeater also. As most of the 2-meter fm rigs available at that time were converted commercial units with only one or two channels, the Pueblo amateurs felt that their repeater should also be on 34/94 so that amateurs traveling between Denver and Pueblo would have total intercity communications. Because of the natural barriers between the two cities, they foresaw no possibility of interference. And this arrangement worked fine for a few years.

"During the seventies, 2-meter activity experienced a phenomenal growth in Colorado, as well as nationwide. Amateurs living halfway between Denver and Pueblo who came on the air found it impossible to use one 34/94 repeater without interfering with the other. To compound the problem, each repeater improved technically with better sensitivity and higher power. And each repeater creeped farther up its mountain and farther up its tower. The interference got worse and worse and hard feelings developed between the two 34/94 repeater groups.

"In 1972, the Colorado Council of Amateur Radio Clubs was established. Under its auspices, a repeater committee was formed and a chairman was appointed to be known as the frequency coordinator for the state. Many meetings were held by the committee to try to resolve this and other problems. All possible solutions were discussed and, although there were some harsh words, cool heads prevailed and a solution was finally achieved.

"First, the committee found the following facts:

1) Denver was on frequency first.

WAØSOF and WBØSXJ top off the Paola, Kansas water tower with the receive antenna for WAØSOF/RPT. The repeater is operated by the Miami County ARC for use during severe weather and tornado watches. The transmitter installation is located a half mile away on the Miami County Sheriff's Department radio tower. The split sites are interconnected via a telephone line. *(photo by Gary Ford, WBØUYB)*

2) The interference was worse in Denver and not a big problem in Pueblo, although the problem grew worse there as time went on.

3) Technical solutions, such as tone burst and limiting repeater coverage, were tried and found unsatisfactory or of short-duration solution.

4) Naturally, changing the repeater frequencies was considered and each group found that solution acceptable — but only as long as the other repeater was the one to change.

"Through the encouragement of the repeater committee, the two sides kept trying to find a solution. Finally, it became evident that someone was going to have to change frequencies. There were no channels available in the 146-MHz band for the Denver group to move to, and the Pueblo group was in the same predicament until, one day, the 19/79 frequency pair became available.

"The Pueblo group decided to present a proposal to their members that they move from 34/94 to 19/79. The following arguments were presented:

1) The old argument that 34/94 was necessary because of the one- or two-channel rigs was no longer valid, as practically everyone now had multichannel capability.

2. The opinion that 34/94 was a prestige frequency pair was also no longer valid. Most mobiles passing through the area had multichannel capability, and if a mobile was without a Repeater Directory, he could hunt around a little to find the local repeater.

3) 19/79 was the last 146-MHz pair available in southern Colorado and if the group passed it up, but decided to move later, it would be to another MHz segment.

4) The Denver group agreed to cooperate in every possible way to help in the frequency change.

"The Pueblo amateurs accepted the proposal and the switch to 19/79 took place in April 1980. Hams cooperating with hams — both sides keeping their lines of communications open — was the key to success in the resolution of this problem."

New Repeater Directories

K1XA at ARRL hq. dropped a note to get out the word that Mark Wilson, AA2Z, editor of the ARRL *Repeater Directory*, is now gathering information for the next edition of that book. The deadline for receipt of that information is November 1, so get that info to Mark quickly. (The anticipated publication date of the new directory is the early spring of 1981.)

Meanwhile, the Free Connecticut Repeater Directory is available from this writer. Send a self-addressed, business-size (no. 10) envelope with 15 cents postage for your copy.

Ten-Meter FM News

The first European 10-meter fm repeater began operating in August from Mainz, West Germany (10 miles southwest of Frankfurt). The repeater's call sign, DBØQK, is transmitted automatically every 45 seconds on the output frequency of 29.670 MHz. The repeater may be accessed by means of a 1750-Hz tone burst on the input frequency of 29.570 MHz.

Currently, separate ground plane antennas are used for transmit and receive. The power output is 3 watts, but will soon be increased to 15 watts. Operating hours are 0500 to 1900 UTC. For further information, contact: Amateur Radio DBØQK, Postbox 4040, D-6500 Mainz, Federal German Republic.

Stateside, the ARRL Board of Directors (at its July meeting) adopted a set of CTCSS tones for 10-meter repeater squelch control to provide nationwide uniformity. For the complete list of tone frequencies, refer to motion 30 as published in September 1980 *QST*, page 51.

Booking West

On my operating desk sits a copy of a new book that should be included in the library of every fm repeater enthusiast. "The Practical Handbook of Amateur Radio FM & Repeaters," written by Bill Pasternak, WA6ITF, with technical assistance from Mike Morris, WA6ILQ, contains 46 chapters packed with everything one needs to know about the fm and repeater mode. I highly recommend this book; it is published by Tab Books.

*72 Stiles St., Waterbury, CT 06706

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

New DX Record on 10 GHz

As reported last month, a new 10-GHz world record of 757 km was established on July 12. IØSNY/7 in Brindisi, southern Italy (QRA locator JA30d) worked IW3EHQ/3 and I3SOY/3 at Col Visenti in the Italian Alps (QRA locator GG72j). For details and a map of the European QRA locator system see September 1979 *QST*, pages 79 and 80. Reports indicate that the QSOs were made just after sunset (1921 and 1927 UTC) after the operators had waited for the entire day. The enhanced propagation (over-water ducting) occurred simultaneously with a deep fade in their 2-meter talk-back link and lasted for about 10 minutes. The path chosen was interesting in that one end was at high altitude (1650 m) and inland, but had a line-of-sight path, at grazing incidence, to the sea. This presumably allowed the 10 GHz signal to fire into the northern end of the duct at sea level. The other end of the path was right at sea level, on the coast. A path of similar length in the USA might correspond to working from Cape Hatteras, North Carolina, to the southern New England coast or to northern Florida, so the magnitude of this 10 GHz DX can be readily appreciated. The stations involved should be congratulated on their achievement. The equipment used was not particularly exotic. Wideband fm Gunnplexers (10 mW) were used by all stations together with 1 m dishes. Signals were Q5 and S5-8.

Narrowband Operation on 10 GHz

Most, if not all, of the 10 GHz DX records, including the most recent one, have been established using wideband fm equipment. Wideband refers to the i-f bandwidth of the receiving system, typically 200 kHz. It is well known that the signal-to-noise ratio of a received signal is proportional to receiver i-f bandwidth. For every dB that the i-f bandwidth is reduced, the signal-to-noise ratio will improve by 1 dB. Thus it can readily be seen that in reducing the bandwidth of a 10 GHz receiver from 200 kHz to that of a receiver used on the lower bands, e.g. 2 kHz, a 20 dB improvement in receiver sensitivity will result. Unfortunately, Gunn oscillators, which are free running, are unsuitable for use in narrowband systems because of their inherent instability. Only systems which derive their stability from crystal oscillators can be used. An additional improvement in system capability comes about if cw is used in place of fm. This will typically give a 10 dB improvement. It becomes clear then that a narrowband cw system will produce signals with a 30 dB better signal-to-noise ratio than a wideband fm system of the same power. It seems logical that anyone considering spending time constructing and using 10 GHz equipment should seriously consider the use of narrowband equipment as an alternative to wideband.

Constructional information on narrowband systems is lacking in U.S. journals. September 1980 *Ham Radio* has a detailed article by R. Bitzer on constructional principles of Gunn oscillators for wideband use. For those inexperienced in microwave construction, building a wideband system is a good way to gain experience before trying anything more difficult. *Radio Communication*, the journal of the Radio Society Of Great Britain (RSGB), has narrowband information in its January 1979 and April 1980 issues. An invaluable source of information on equipment for all the bands from uhf to microwave is *VHF UHF Dubus Technik*, a book compiled by the Berlin uhf-shf group, with text in German and English. If anyone knows where this book can be obtained in the USA, I would be happy to print the information in this column.

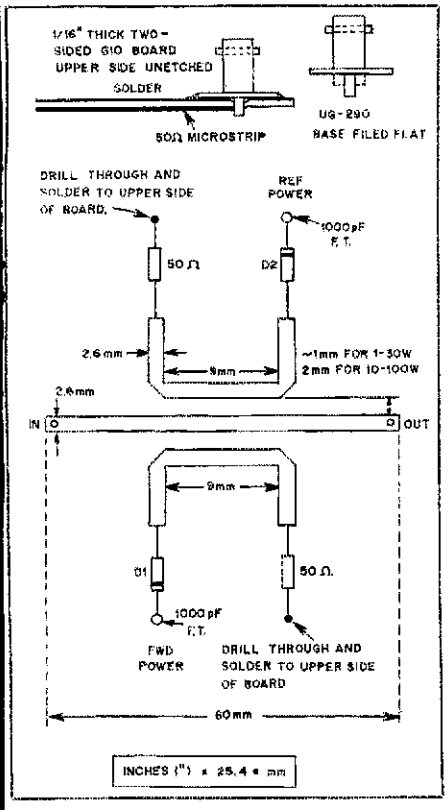


Fig. 1 — Configuration and design data for a 1296 MHz power and SWR indicator.

*c/o ARRL, 225 Main St., Newington, CT 06111

1296 POWER AND SWR INDICATOR

Many power meters used on the lower bands are unsuitable for use on 1296 MHz. A constant (50 ohm) impedance must be maintained in the transmission line to make meaningful SWR and power measurements. The stripline forward and reverse power indicator shown in Fig. 1 will enable such measurements to be made at low cost. Since all the lines on the pc board are 50 ohm microstrip lines with a width of 2.6 mm, they can be laid out using standard 1/10 inch wide (2.54 mm) pc drafting tape as the etch-resistant material, with very little resultant error. This is somewhat easier for most constructors than the use of photoresist etching techniques. Calibration may be effected by comparison with a power meter of known accuracy at 1296 MHz, if one is available. The unit may be used as an indicator for tuning up a low-power transmitter (maximum forward power) or for tuning an antenna (minimum reflected power). The loop-Yagi antenna described in this column last month may be adjusted to a 50-ohm match by bending the reflector loop until minimum reflected power is observed. When performing such adjustments the usual safety precautions should be observed, i.e., don't work with the antenna when the rf power is on. These precautions are even more important at microwave frequencies than at vhf and uhf.

With reference again to the loop-Yagi antenna described last month: If a larger boom diameter is used, the element lengths must be increased to compensate. Add 0.9% to all the element lengths for a 3/4-inch boom or 2.1% for a 1-inch boom. If the loops are made wider, the elements should be made shorter. Reduce their length by 0.3% if 1/4-inch wide loops are made. For every .006 inch the loops are thicker than the original specification (.028 inch), their length should be increased by 0.1%.

10 GHZ NEWS

Two new microwave awards, sponsored by Microwave Associates, have recently been announced. One is for the first two-way QSO over 1000 km on 10 GHz, and the other for the first two-way QSO over 250 km on 24 GHz. The awards will be administered by the RSGB. Aeronautical mobile and repeater contacts will not be valid for these awards.

What may be the first 10 GHz ssb QSO in the USA was made on September 3 between KA1GT and WA1VUW/1, over a 3 km path. Signals were strong and ssb quality was good. G3JVI transverters (described in the *Radio Communication* articles previously cited) constructed at KA1GT, with help from G3WDG, were used. QST

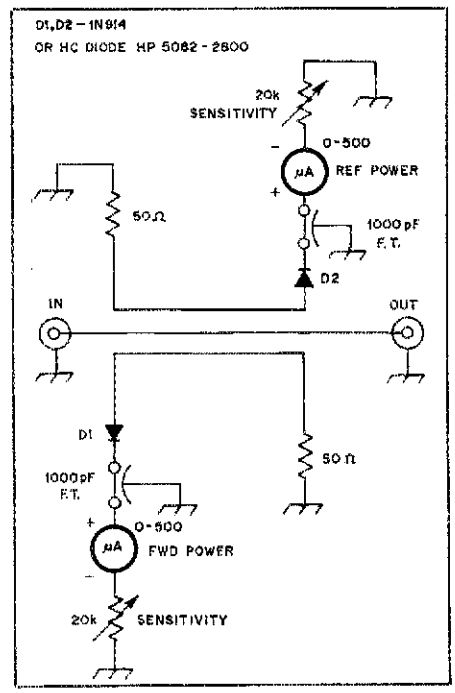


Fig. 2 — Schematic diagram of a power and SWR meter suitable for use on 1296 MHz.

Club Corner

Conducted By Sally O'Dell,* AE8I

THE THREE LITTLE PIGS (OR WHAT YOU MIGHT WANT TO DO WITH YOUR CLUB BEFORE IT'S TOO LATE)

Any similarity to any club, living or dead, may not be purely coincidental. But, as there's much to learn from these judiciously edited tales, we invite you to continue. If you happen to see *your* club in any of the negative examples and you want to do something about it, please do! If, however, you don't care, you might see your club die. We all remember the fairy tale of the three little pigs. Two of the pigs took the easy way out. The third little pig took the time and made the effort to build a solid structure. Will you let the big bad wolf eat your club?

There are three clubs described here. One good and two bad (what happened to the ugly?). Can you see signs of your club in any of the examples? Do you know how your members feel about your (their) club? Do you know what makes your club as good (or as bad) as it is? Have you ever tried to analyze exactly where you stand in relation to other clubs of similar size and geographic location? Maybe now is the time to start thinking about some of these questions and posing some of your own.

Once upon a time (as most fairy tales go) there was a radio club, that, as most clubs, was trying to serve the needs of its members. Since we must have a name, let's call this club The Bad Club (TBC). TBC didn't start out as a *bad* club. It was organized to serve its members in the most efficient manner. At that time the need was for a social evening at a restaurant once a month. The members were entertained with a variety of programs. Some of their programs were market conditions, speakers from local organizations and business, movies, DXing, QSL cards and contacts, linear integrated circuits, slow-scan TV, 2-meter demonstration (before 2-meters heyday), phone-patch demonstration, function of spark transmitter, crystal and regenerative receivers and "What you always wanted to know about the ham shack but were afraid to ask."

These programs kept the members entertained one evening a month. Of course, no women were allowed. The constitution and the bylaws explained the club rules in detail. "We are not strictly a social club although we lean in this direction rather than becoming heavily involved in the many community, public service and outside activities undertaken by other radio clubs. Our club, however, has a wealth of Amateur Radio skills which we believe the members would like to share with others it a great deal of time and effort were not involved." The ages of the members ranged from 29 to 80. The common factor was not age, but Amateur Radio.

As time went by — as restaurant prices went up — more of the members found they could afford fewer evenings out. They tried to switch to cheaper restaurants, but who wants to eat out regularly at a cheap place (even if it is the only thing you an afford)? And of course, those who could afford better didn't want to eat at the cheaper places. Slowly, over 10 years, the club began to disintegrate. New members could not afford the high prices *and* the old ones didn't like the cheap places. That was the death of TBC.

At the same time that TBC was organizing, The Second Bad Club (TSBC) was already moving toward its 12th club anniversary. TSBC didn't start out as a *bad* club, either. They also had some membership needs to meet: to foster interest in Amateur Radio, to establish coordinated emergency communications for volunteer use in local or national disasters, to promote good relations and understanding between Amateur Radio and the general public, and to provide united effort and mutual assistance in solving problems related to Amateur Radio.

TSBC was run and organized (as most clubs are) with bylaws and a constitution. They had meetings where business was conducted first and then a program entertained those who stayed. About 45 members attended for many years. Then, along came a president who (along with winning a popularity contest) knew how to organize the members so that they felt they were doing something useful. Suddenly, the membership jumped from mid-40s to 80, and one year, 90. Membership levels will often stay at a peak until someone or something chases them away.

The "someone" for TSBC was a president who got away with a lot more than he should have. The members didn't stop him. The constitution didn't stop him. He did as he wanted and ignored the consequences. Firmly in control of the financial purse strings, this president was having a blast spending the money that the club had earned through dues and projects. He started going on side trips — charging the club for his expenses. When no one questioned his authority to spend the money as he saw fit, he saw fit to spend more. Embezzlement? Yes. But those club members who knew what was happening were afraid to say anything, while others didn't know. Then came a new president, whose lackadaisical approach complemented the earlier mismanagement. Shortly, the club dissolved. People stopped coming to meetings — and that tolled the death of TSBC.

This not-so-fictional fairy tale could go on and on about the *bad* clubs, but there is no need. Instead, let's move along to TGC (that's right. The Good Club). There are so many good clubs out there that it is hard to narrow the selection. Therefore, TGC, just as TBC and TSBC, will be a composite of the good points of many clubs. There is no actual TGC (although many of you might recognize *your* club here).

TGC was organized in the '40s. It started out small — 12 members who wanted to get together and discuss their hobby — just a bunch of folk with similar interests. Not too many women joined this club. Women, in those days, were not trained (?) to understand electronics. Slowly, more people became interested in Amateur Radio and wanted to speak to someone who had been through it all before; from FCC exams to setting up equipment. The scope of the group began to expand. "Maybe it's time for a constitution and bylaws. Let's put in something about community spirit but still have some social side. We could become involved in Field Day, participate in SET and still sponsor a summer picnic and fall party." The group grew slowly.

By the early 1970s, they had a repeater on the air and 60 paid members. The meetings showed a balance between routine club business and entertainment programs. Today, not all members show up at every meeting, but a large portion of the group gathers regularly to enjoy one another's company. TGC has some active female members, although not many. But their number has been increasing! Anyone is welcome to join the group. The only requirement is an interest in Amateur Radio.

Once upon a time there were three little pigs. There were two little pigs who thought they were soooo smart. The first little pig spent too much time socializing and not enough organizing. The second little pig mismanaged his affairs and then ignored them. The wolf ate them. Then there was the third little pig who, knowing he wasn't the brightest pig around, was well balanced and tried harder. The wolf didn't break down his brick house and he is still fine. Do you see your club here? Do you like what you see? If not, are you willing to do something about it?

*Club Program Manager, ARRL

Coming Conventions

November 1-2
South Florida Section, St. Petersburg

November 7-9
Hudson Division, South Fallsburg, NY

February 7-8, 1981
Florida State, Miami

ARRL NATIONAL CONVENTIONS

March 13-15, 1981
Orlando, Florida

July 23-25, 1982
Cedar Rapids, Iowa

October 7-9, 1983
Houston, Texas

Hamfest Calendar

Indiana: The Allen County Amateur Radio Technical Society presents its eighth annual Fort Wayne Hamfest on Sunday November 16 at the Allen County Memorial Coliseum, located on U.S. 30 in Fort Wayne. Displays, large indoor flea market and prizes. Doors open 8 A.M. to 4:30 P.M. Sellers may start set-up at 5 A.M. Admission is $3 at the door and $2.50 in advance. Tables available for $5 and special tables are $20. Talk-in on 28/88 and 52. For tickets, tables or info write to ACARTS Hamfest Chairman, P. O. Box 10342, Fort Wayne, IN 46851.

Indiana: The Fort Wayne Radio Club will sponsor a Funfest on November 15 from 7 to 12 P.M., at the Hartley Motel (off Rte. 69 at exit 33). Displays, prizes and mini forums. Talk-in on 28/88. Tickets $2.50 at the door or $2 in advance from Kathy Drake, WD9DGA, 6835 Wrangler Trail, Fort Wayne, IN 46815. This event will precede the Allen County Amateur Technical Society, Inc., Hamfest.

Michigan: The Oak Park High School Electronics Club will hold their 11th annual Swap & Shop on November 30 from 8 A.M. to 4 P.M. at the Oak Park High School, Oak Park. Admission is $1.50 in advance and $2 at the door. Tables (all 8 ft.) $5 in advance, $6 at the door; half tables $3. Refreshments will be available. Prizes to be given at the Swap and Shop. North and east doors open at 6 A.M. For additional info send s.a.s.e. to: Herman Gardner, 13701 Oak Park Blvd., Oak Park, MI 48237, or Tel. 313-543-8569 and ask for Bruce.

Minnesota: The annual Winter Hamfest of the Handi-Ham system will be held on December 6 at the Eagles Club in Faribault. There will be a flea market, dinner at noon, programs and prizes. For more info contact Don Franz, 1114 Frank Ave., Albert Lea, MN 56007.

Ohio: The Massillon ARC will sponsor Auctionfest '80 on November 16 from 8 A.M. to 5 P.M. at the Massillon Knights of Columbus Hall, Massillon. Flea market opens at 8 A.M., with the auction to start at 11 A.M. Three major prizes to be given away at the Auctionfest. Tickets are $2.50 advance, $3 at the door. For further info, tickets or table reservations contact Steve Nevel, WD8MIJ, 1864 Massachusetts S.E., Massillon, OH 44646.

How's DX?

Conducted By Clarke Greene,* K1JX

Back to the Drawing Board

We continue this month with our discussion of station design parameters for the DXer. Once again, we'll draw heavily from W3AFM's 1966 *QST* series, "Station Design for DX"; if not in substance, at least in philosophy.

Now that you've learned all about your own QTH from the last month's column, let's investigate which antennas might be a good choice.

"Horizontal is by far the preferable polarization. The problem with vertical polarization is primarily ground losses. Broadcast stations customarily use 120 buried radials to overcome these losses. Such an installation is impractical for amateurs. Radiation efficiency is probably less than 20% for an installation employing say, four radials. G. H. Brown in *PIRE*, June 1937, says that for quarter-wave antennas with 0.4 radials, efficiencies are:

2 radials — 12.4%
15 radials — 46.2%
60 radials — 64.0%
113 radials — 88.0%

"Furthermore, the vertical radiation pattern is characterized in practical locations by a null at the low angles. The low-angle radiation of a ground-mounted vertical quarter-wave, often shown for perfect earth as being good right down to 0° elevation, actually has a null there. Vertically polarized antennas are more susceptible to QRNN (man-made electrical noise) than horizontally polarized.

"With horizontal polarization, the antenna is balanced with respect to ground, and ground losses are customarily only a few percent.

"Under certain circumstances, a vertical groundplane can be advantageous, i.e. (a) for a saltwater reflection zone, (b) for its set-up convenience on DXpeditions, or (c) for constructional and economic advantages on bands lower in frequency than 14 MHz. Even in such cases, the vertical loses important advantages of (1) gain, receive and transmit, and (2) receiving effective S/N, including rejection of QRM from undesired directions."

Indeed, horizontal antennas do have some advantages. Up through 30 MHz the reflective coefficient for horizontally polarized signals is so close to one (100%) that losses can virtually be ignored. This property is quite significant when you take into account the effect of ground reflection gain.

Gain? We're jumping ahead a little too far. When an antenna is placed relatively close to the ground (less than 20 wavelengths high), the energy radiated by the antenna interacts with the energy reflected from the ground. The direct wave interferes with the reflected wave both constructively and destructively, causing peaks and nulls in the vertical pattern of the antenna system. That's where those "peacock" patterns that you see in *The ARRL Antenna Book* come from. The resultant pattern is a direct function of the antenna's height above ground. In general, as an antenna is raised, the angle of radiation for the first lobe is lowered, and more lobes appear. So if you want a low angle of radiation, you need a high antenna. (If the shortest explanation of ground reflectors in the history of radio just given leaves you a little short, check out *The ARRL Antenna Book* for a better one.)

When the ground-reflected wave and the direct wave destructively interfere, the null is quite deep; 20 dB or more. But when the two waves constructively interfere, the two waves add and the intensity of the lobe created is twice what that same antenna located in free space would produce. That means a gain of 6 dB!

The patterns shown in the *Antenna Book* are for dipoles, which have an omnidirectional pattern in the plane perpendicular to the antenna. A beam or other gain antenna usually doesn't have such a pattern. That's where the gain comes from; energy is sacrificed from one direction and is added to another. So, to arrive at a given height above ground the dipole pattern for an antenna at that same height must be mathematically multiplied by the free-space pattern of the beam. That sounds like a lot, but what it means is that those high-angle lobes shown in *The Antenna Book* are suppressed and the lower angle lobes are enhanced. So the old adage (fairy tale is a better term) that a beam antenna has a lower angle of radiation than a dipole is a bunch of bunk. What really happens is that the beam concentrates more energy in the low-angle lobes than a dipole does. It's not quite the same thing; the results are similar, though.

"Another topic which deserves mention is the question of gain quotations on Yagi antennas. Manufacturers have stated these gains in ways which may be confusing. One manufacturing firm, for example, chooses to relate the gain of a horizontally polarized antenna array at optimum height above ground, to a half-wave dipole in free space. In this way he gives himself 6 dB of ground reflection gain. His quotation should be correspondingly discounted. The practical basis of comparison is to a half-wave dipole, same height and foreground. Almost all manufacturers, when they do not state that the gain is related to a half-wave dipole, are relating their gains to an isotropic radiator. This raises the gain by 2.2 dB as compared to gain over a half-wave dipole. If the manufacturer has assumed that the reference isotropic radiator is in free space, whereas his array is at optimum height above a perfectly reflecting ground, then his quotation should be discounted by 8.2 dB.

"The most helpful relation evaluating gain in a Yagi antenna is the formula:

$$\text{Gain} = 10L/\lambda$$

where L is the length of the boom in the same units as the operating wavelength, λ. Here the gain is that of the Yagi over a half-wave dipole, broadside, at the same height and foreground, expressed as a factor. In dB

$$\text{Gain (dB)} = 10\log_{10}10L/\lambda$$

This rule is good for optimized designs with element spacings up to approximately 0.2λ maximum. It says some designs are carrying more elements than they need, and may be delivering less-than-optimum performance on that account.

"Measurements of antenna gain are tricky. Usual complications are (a) ground reflections, (b) impedance matching, (c) near-field effects, (d) reflections and absorptions from nearby objects, (e) calibration of measuring detector and attenuators, and (f) polarization effects. When scaling is attempted, further complications are incurred. The subject is treated professionally. The same material is published as IEEE Standards No. 149 (revision of 48 IRE 2S2), January 1965, and is available from IEEE Headquarters, 345 East 47th St., New York, NY 10017.

"From the foregoing, one might infer that Yagis and quads are all a ham should use. Because they can be rotated, this is not far from correct for 10 through 40 meters, where most DX is worked. Log-periodics are unattractive for hamming because of their low gain, high cost and structural complications. For really high gain, up to, say, 16 dB, a rhombic can be a good dollar's worth, real-estate considerations permitting. Rhombics can be nested — that is, several can be stacked, with azimuths in various directions, on the same tract. Inter-couplings are less than commonly supposed. Sloping Vs are of course inferior performers.

Next month: some practical examples.

OTHER TOPICS

Want to plot your own antenna pattern? With this handy-dandy formula simplified by K1GQ, you can compute the vertical pattern at any horizontally polarized antenna. Just enter the wave-angle one degree at a time, and plot the associated field intensity on a graph (preferably a polar graph).

$g(\alpha) = 4\cos^2(k\alpha)\,(\sin^2[h\sin\alpha])$

where
$g(\alpha)$ = gain factor over a dipole in free space
$k = 90°/\theta_{3\,dB}$ (where θ is the half-power beamwidth of one Yagi in free space), and
h = the height above ground (in degrees)
= the wave angle

If calculating a pattern by hand for 0° through 90° seems a bit much, here's a program designed for use with a Hewlett-Packard HP-25.

```
ϕ
STO ϕ .      STO ϕ—enter antenna height
               in degrees (360° = 1 wavelength)
!
STO + ϕ      STO 2 — enter k (vertical shape
               factor)
RCL ϕ
f sin
RCL 1
X
f sin
g x²
RCL ϕ
f PAUSE
f PAUSE
RCL 2
```

*187 Stafford Ave., Forestville, CT 06010

X
f cos
g x^2
X
4
X
f PAUSE
f PAUSE
GTO Ø3

To use the program, just enter the program, enter the appropriate information into the storage registers and run. The calculator will first display the wave angle in degrees and then display the relative intensity for that angle. The calculator will then increment the angle by one degree, display it and continue. Plotting antenna patterns takes about 10 minutes. QST

QSL Corner

Administered By Joan Becker

The ARRL DX QSL Bureau System (Incoming)

Within the U.S. and Canada, the ARRL DX QSL Bureau System is made up of call area bureaus that act as central clearing houses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free and ARRL membership is not required.

How it Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL-Membership Overseas QSL Service. The member sends his cards to his outgoing bureau where they are packaged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus where volunteer workers sort the incoming QSLs by the first letter of the call sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an s.a.s.e. for a prompt reply.

Claiming Your QSLs

1) Send a 5- × 7-1/2-in. s.a.s.e. to the bureau serving your district.

2) Neatly print your call sign in the upper left hand corner of the envelope.

3) A preferred way to send envelopes is to affix a 15-cent stamp. If you expect to receive more than 1 oz. of cards, please affix postage accordingly.

4) When requesting *any information* from the bureau serving your district, always include a s.a.s.e. for a prompt reply.

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of s.a.s.e.'s. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. A period of 6 to 8 months, or longer, may take place before you receive your cards.

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

Do keep self-addressed 5- × 7-1/2-in. envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of first-class postage.

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs are the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade.

Do include an s.a.s.e. with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column every other month).

Don't send envelopes to your "portable" bureau. For example, WA1SQB/2 sends envelopes to the W1 bureau, *not* the W2 bureau.

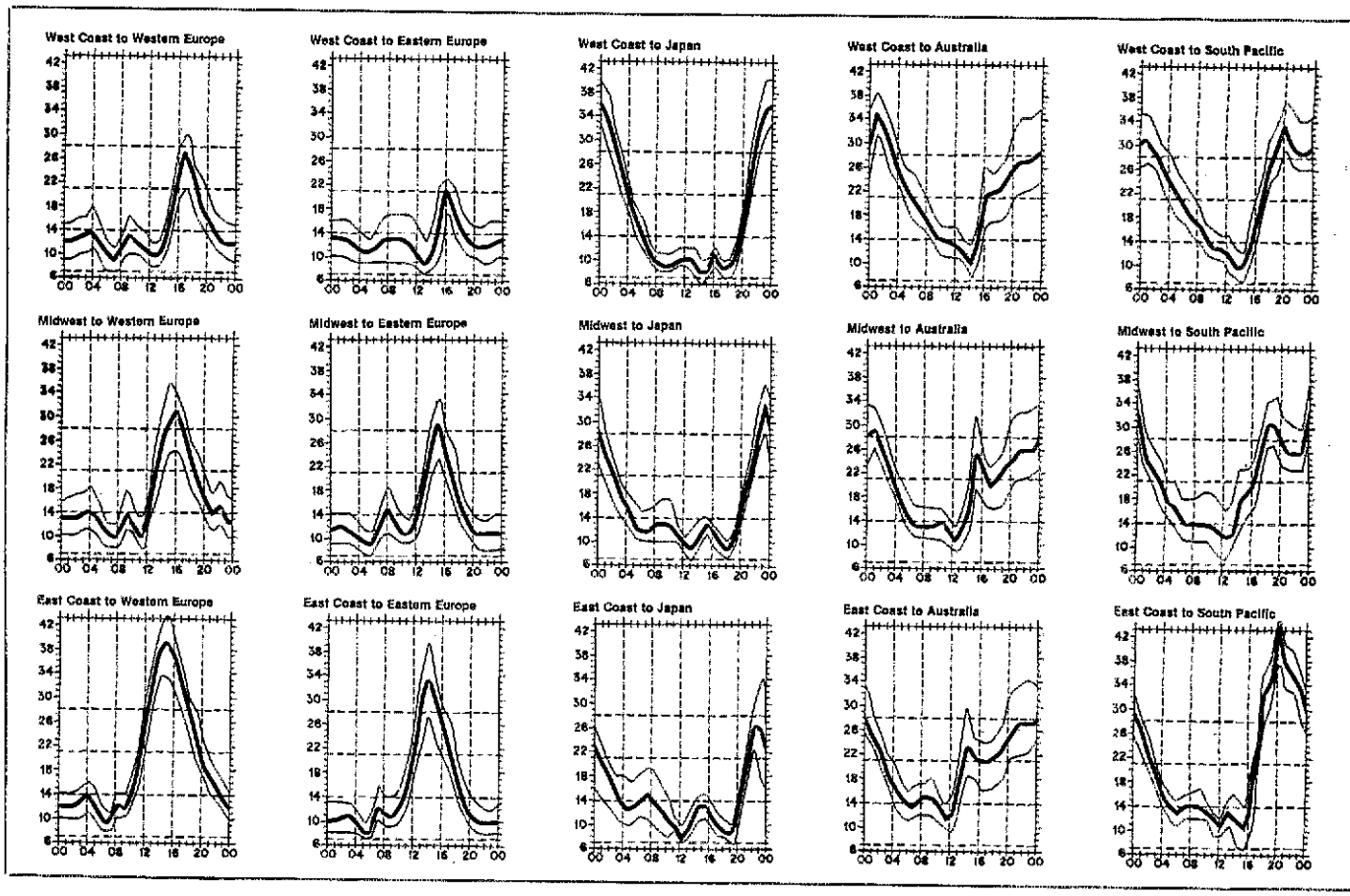
ARRL DX QSL Bureau System

First Call area: all calls* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls* — North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.

Third Call Area: all calls* — Leon Lapkiewicz, K3GM, P. O. Box 6238, Philadelphia, PA 19136.

Fourth Call Area: all calls — Mecklenburg ARS, P. O. Box DX, Charlotte, NC 28220.



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

Fifth Call Area: all calls* — ARRL W5 QSO Bureau, Box 1690, Sherman, TX 75090.

Sixth Call Area: all calls* — ARRL Sixth (6th) District DX QSL Bureau, P. O. Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls — Willamette Valley DX Club, Inc., P. O. Box 555, Portland, OR 97207.

Eighth Call Area: all calls — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

Ninth Call Area: all calls* — Northern Illinois DX Assn. Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls* — WØ QSL Bureau, Ak-Sar-Ben Radio Club, P. O. Box 291, Omaha, NE 68101.

Puerto Rico: all calls* — Radio Club de Puerto Rico, P. O. Box 1061, San Juan, PR 00902.

U.S. Virgin Islands: all calls — Graciano Belardo, KV4CF, P. O. Box 572, Christiansted, St. Croix, VI 00820.

Canal Zone: all calls — LPRA, P. O. Box 9A-175 Panama 9A, Republic of Panama.

Hawaiian Islands: all calls* — John H. Oka, KH6DQ, P. O. Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls* — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.

SWL — Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

QSL Cards for Canada (VE and VO) may be sent to: CRRL Central QSL Bureau, P. O. Box 663, Halifax, NS B3J 2T3. Or, QSL cards may be sent to the individual bureaus.

VE1* — L. J. Fader, VE1FQ, P. O. Box 663, Halifax, NS B3J 2T3.

VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.

VE3 — The Ontario Trilliums, P. O. Box 157, Downsview, ON M3M 3A3.

VE4* — W. A. Stunden, VE4BJ, 578 Oxford St., Winnipeg, MB R3M 3J9.

VE5 — A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, SK S4S 5E3.

VE6* — G. D. Holeton, VE6AGV, 4003 First St., N.W., Calgary, AB T2K OX2.

VE7* — Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.

VE8* — Rolf Ziemann, VE8RZ, 2888 Lanky Ct., Yellowknife, NT X1A 2G4.

VO1, VO2 — CRRL VO QSL Bureau, P. O. Box 6, St. John's, NF A1C 5H5.

VY1 — ARRL QSL Bureau, W. L. Champagne, VY1AU, P. O. Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

Here is some QSL information for those of you who would like to QSL direct to the station location. It is passed along as we receive it and therefore may not be entirely accurate.

CX4CR c/o Ricardo Susensa,
CX1BBL P. O. Box 5063,
CX2CS Montevideo, Uruguay

EA9GT (WA2JOC)
FØFKW (PAØLOB)
HL9WZ (WA2JOC)
HP1XAT (WB3KGY)
KA6ED (WA2JOC)
KBØQA (6W8IC)
KG4AH (Box 537, Guantanamo Bay, Cuba
OH2BP/OHØ (OH2PQ, Box 26, 00661, Helsinki 66, Finland)
PJ8JOC (WA2JOC)
T3AT (G3XZF)
VP2KAQ (NØTG)
VP2VEN (K5GOE)
VP2VEZ (K5GOE)
ZF2BP (W4YKH)
ZF2DL (WD4AEX)
ZF2DA (N4AJO)

Corrections

PZ1DR (WD4NBX)
CX7AAR (AA1U)
Many tnx to WB2ENW and AA4MI for QSL information.

QSL MANAGER VOLUNTEERS

WB9FMR
WD4JQD
VE7DZR

QSL information for mini DXpedition, completed in May 1980, another this coming November: ZB2GJ Direct, LCDR Robert H. Meurer Jr., P E P Detachment, c/o American Embassy, APO New York, NY 09159.

VS6EZ will be operating for one year from Sultanate of Oman, under his old call sign of A4XGR. QSLs should be sent to P. O. Box 981, Muscat, Oman, with 5 IRCs for air mail return of his QSL card.

HELPRUL INFORMATION: LIST OF NEW QSL BUREAU ADDRESSES

GI — RSGB, R. Parsons, GI3HXV, 45 Erinvale Ave., Finaghy, Belfast, Northern Ireland BT10 0FP

KA6-2 × 2 only: Amateur Radio Club, Box 217, Torii Station, APO San Francisco, CA 96331

PA, PI: Dutch QSL Bureau, Postbus 330, 6800 AH Arnhem, The Netherlands

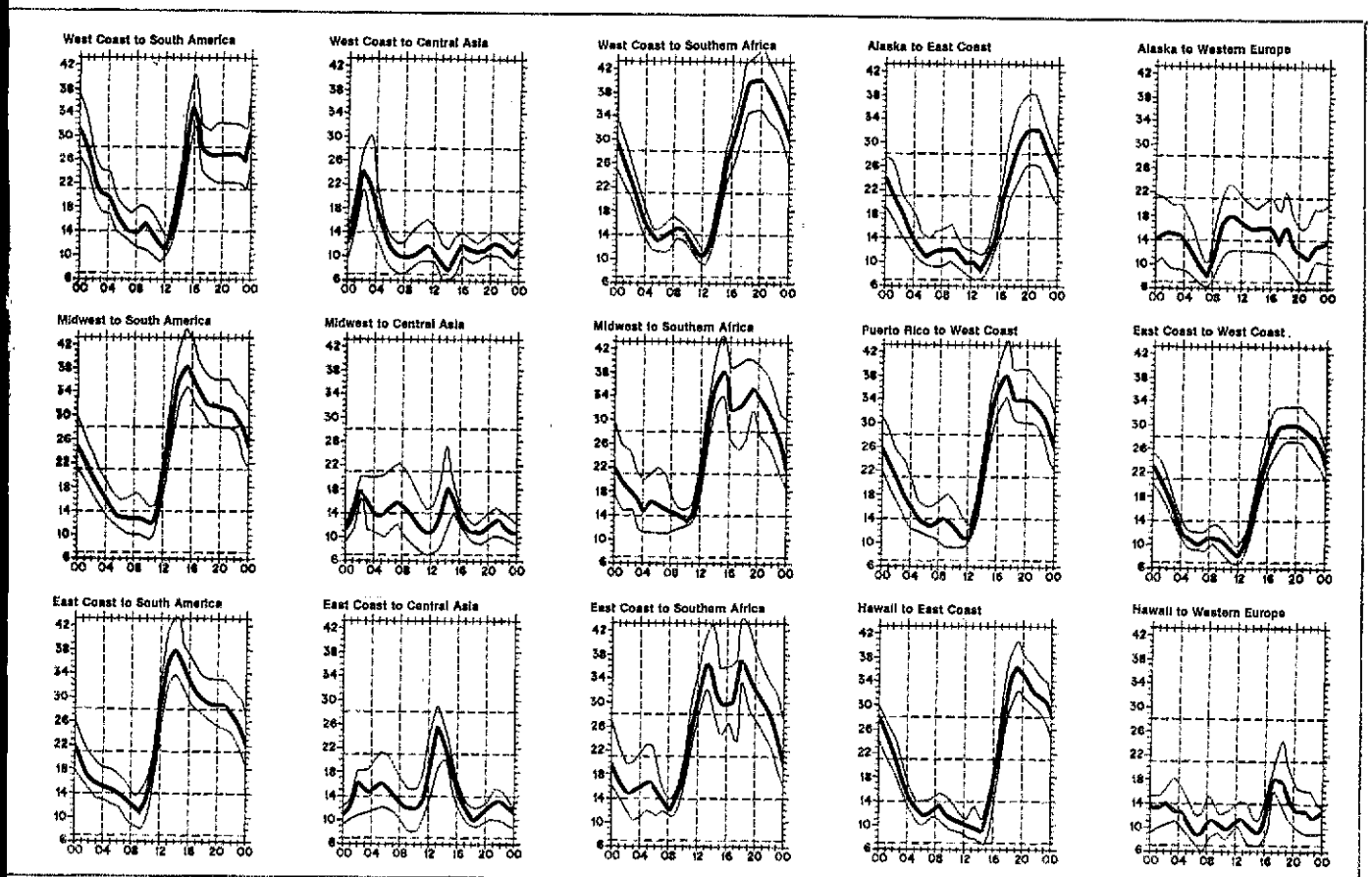
VK5: QSL Bureau, Ray Dobson, VK5DI, 16 Howden Rd., Fulham, South Australia 5024

VK3/AX3: QSL Bureau, Barbara Gray, VK3BYK, 1 Amery St., Ash Burton, Victoria 3147, Australia

VK9-Ø: N. R. Penfold, VK6NE, 388 Huntriss Rd., Woolands, West Australia 6018

VY1: ARRL QSL Bureau, W. L. Champagne, VY1AU, P. O. Box 4597, Whitehorse, YT Y1A 2R8

For more information, contact: ARRL Outgoing QSL Service, 225 Main St., Newington, CT 06111.



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, Colorado. These predictions, for November 15 to December 15, 1980, assume a sunspot number of 143, which corresponds to a 2800-MHz solar flux of 188.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations 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 August 1 through August 31, 1980. 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

DF3TN/201 JA1JWP/239 SM7CQY/109 WA1SMH/107 AB3D/109 KS4C/119 AD5E/132 N7AAL/100 AI9W/103
DF4RD/223 JE1CYH/117 SM7GCP/114 WA1VVX/100 K3CR/103 N4AJZ/198 K5JN/124 N7YL/100 K9AJW/103
DF8GV/100 JH1OJU/227 VE2FQU/102 WB1CSE/104 K3IJ/106 N4CWL/111 K5UBD/120 WA7ZUG/107 K9AZG/163
DJ1PT/158 JA2QVQ/120 VE3DOP/159 K2EQU/108 K3JS/111 N4UV/190 KA5CWE/164 WB7OGV/104 K9RR/199
DJ3NW/286 JE2JML/103 VE3IMV/102 KA2BYC/108 KA3DDT/117 W4ZEI/139 KB5WQ/110 WB7QFI/144 W9GSB/100
DK2UA/183 JF2ACK/121 VE3OY/108 KA2CDJ/108 KB3HZ/105 W4ZWE/133 KF5V/103 KA8ANQ/109 W9LQI/104
DK7EO/103 JA5ELM/100 VE4AFO/136 KA2EWT/129 N3KR/139 WA4GOF/100 WB5ZRD/100 KA8DDU/105 W9WH/101
DL1VJ/113 LA5WN/177 VE5TT/106 N2BQL/100 W3DDG/104 WB4LMI/105 KM6N/122 KB8MG/114 WB9VGJ/126
EA1QJ/213 LZ1KPM/101 XF4MDX/108 W2IIX/106 AG4V/106 WB4TPU/311 N6AXD/118 KB8SX/105 WD9IOS/100
EA5CQ/100 LZ1WR/101 YU2RTC/161 WA2RSU/103 K4ADI/124 WB4YOL/136 W6OGC/112 N8BIK/110 KØHP/105
F6CKH/314 OK2BKR/303 ZF2AG/103 WA2SEL/101 K4GJD/298 WB4YVC/101 W6SWE/106 W8ANM/103 KØVGB/134
G3XTT/208 OY9R/123 4X4RD/119 WA2SQY/101 K4JHT/101 WD4EPX/108 WA6LZM/100 W8KKF/261 KBØJX/104
G3ZAY/302 OZ4CG/109 KN1DPS/210 WA2VZQ/107 K4ZGB/196 WD4FFX/101 WB6JGS/106 W8ZNH/100 WØOIR/123
HB9BOK/104 SLØFRO/108 W1GNE/162 WB2CLL/108 KA4GKQ/102 WD4KSZ/104 WB6TVX/100 W8QBY/108 WAØGWC/122
HH2MC/180 SM5API/324 W1HDD/100 WB2KMY/101 KC4IB/181 WD4NAE/101 WD6EDY/103 WB8ZFB/106 WBØNSF/100
I5YTP/101 SM5DBR/250 W1HSB/251 WB2SBO/104 KM4F/101 WD4PVI/100 KB7MM/109 AG9G/100 WDØFAZ/118
IØFFO/122 SM5HYL/207 W1VS/103 WB2VOQ/104 KO4O/150 AA5I/110

Radiotelephone

DF1KJ/105 JE1CYH/105 SMØBZH/169 KA2EWT/103 AG4V/101 WA4LBJ/203 N6FT/108 WA7COR/100 AE9X/104
DF2XC/145 JG1XEZ/241 VE3IYA/103 KB2DM/155 K4GJD/298 WB4YBE/115 N6HC/104 WB7QFI/143 AI9R/194
DF3TN/199 JH1FTV/109 VE4AFO/125 N2XJ/133 K4GOK/144 WB4YTZ/104 W6XI/106 AG8B/148 K9RR/179
DF7QD/147 JA2QVQ/11 XE1MDX/149 W2GTN/102 K4ZGB/171 WD4IXE/100 WB6JGS/102 K8WOW/103 KB9PO/108
DJ3NW/182 JE2OTM/110 XF4MDX/104 W2IIX/106 KC4IH/108 WD4MSL/110 WB6OBB/104 KA8ANQ/107 N9AIB/104
DJ4AO/104 JF2ACK/120 YBØWR/216 WA2MTR/101 KT4P/193 K5AD/104 WD6EEQ/108 KA8DAY/103 W9TX/177
F6CKH/312 KH2AD/103 KA1JV/100 WB2CLL/106 N4AJZ/175 K5ZTI/106 KA7DBS/109 KB8SX/102 W9ZYL/110
G3VUH/177 LU2BAT/102 N1AFB/101 K3QWG/109 N4AKO/110 KB5FU/228 N7AJA/103 N8BKB/101 WA9OHU/106
G3XTT/156 OK2BKR/292 N1API/107 KA3CNL/107 N4BQB/104 W5IJU/102 N7BFS/108 W8ANM/103 WB9IJL/109
G3ZAY/300 OY9R/123 WB1CSE/104 KB3HZ/103 N4PY/101 W5KIA/185 W7AEP/150 W8KKF/259 KØVGB/108
HH2MC/177 PY4AXJ/104 K2EQU/108 N3ADI/135 N4UV/189 AJ6A/232 W7BI/127 WD8IIA/107 NØACH/109
I2WZX/112 PY5OC/152 K2QIE/140 WB3AVN/130 W4ZWE/126 K6QEH/103 W7JDF/102 WD8MPY/123 NØBKL/105
IT9YSW/110 SM5HYL/204 KA2CDJ/103 WB3FSI/220 WA4GKT/100 N6AHV/107 W7TVF/186 AA9U/107 NØBKY/106
JA1DCO/105 SM7GCP/112

Cw

DK7DO/101 GW3GWA/111 SM6BZE/165 KN1DPS/144 W2IQB/104 W3ESU/125 K4XG/103 W5SP/146 WBKBZ/102
DL1VJ/112 JA1JWP/239 SM5FYK/121 N1AJI/100 WA2HWJ/110 W3GG/122 W4DJJ/136 W6MJL/125 AI9R/113
EA5CQ/100 OH2EJ/117 VE2BP/100 W1VEI/100 WA2JNN/207 W3GOH/175 WA4KZF/100 K7WA/111 WA9EKA/106
EA5DD/103 PAØLOU/179 VE3GCO/151 WA1AER/139 AD3R/101 W3XN/105 KA5A/103 W7TVF/108 WDØAVG/100
G3XTT/102 SLØFRO/106 VE6WQ/147 K2OB/113 N3KR/127 K4JC/227 KA5CWE/118

RTTY

5BDXCC

W2PSU W6JOX W2SM W8UVX W9TG SM5AHK VE3CXL K8RD JA8BAR

Endorsements

Mixed

CEØAE/274 LU1SE/237 AA1M/227 W2IFK/225 K4JW/230 W4SNR/281 W5SP/322 W7CG/347 K9HA/280
DF3FI/210 OE1BFW/275 AD1C/241 W2IQB/275 K4KFH/295 W4YKH/290 WA5QZH/178 W7DH/300 K9MBQ/183
DJ1ND/207 OE2VEL/281 K1CC/305 W2IQZ/226 K4KUZ/238 WA4DPU/240 WB5PLD/204 W7FP/272 K9MFI/211
DJ4XA/293 OH2KP/227 K1CV/286 W2JQ/159 K4LQ/275 WA4LOF/289 WB5TZZ/225 W7HR/263 K9MZJ/195
DJ8WD/227 OK3IF/176 K1EM/273 W2LPE/356 K4MG/313 WA4MAV/282 WB5UFR/130 W7JUO/300 K9VTD/140
DK3SF/316 ON4NC/360 K1HMO/280 W2TU/160 K4RZ/305 WA4MIT/190 WD5DRS/152 W7LR/290 W9DDX/270
DL1KS/314 ON7EJ/228 K1KNM/262 W2UP/251 K4TWJ/198 WA4OOM/292 WD5JFM/180 W7OK/290 W9EB/338
DL1PM/321 OZ9PP/300 K1SA/291 WA2CBB/328 K4XG/315 WA4QBX/285 K6CBL/300 W7PK/312 W9FD/343
DL7RT/252 PAØLOU/350 K1TN/300 WA2IBF/140 K4XQ/245 WA4TLI/305 K6ELX/280 W7TVF/280 W9GW/324
EA2HW/259 PAØTAU/330 W1AB/321 WA2OHD/278 K4XR/273 WB4AGT/200 K6FS/181 WA7IHN/202 W9NYW/128
F3CY/168 PY1LW/293 W1ER/323 WB2AIO/315 KA4P/179 WB4ASV/264 K6GXO/206 AB8K/275 W9RW/256
G3HTA/318 PP5UG/327 W1GU/316 WB2OHD/266 KB4FO/254 WB4HOK/295 K6QC/184 AC8R/162 W9RY/319
G3KAA/305 PS8YL/300 W1GME/331 AD3R/188 KE4I/327 WB4IWW/235 KC6X/176 AG8B/259 W9TA/287
HB9AIJ/311 SM3DMP/251 W1HSP/261 AE3T/312 KG4F/202 WB4ONR/180 KK6X/160 K8CH/328 W9WI/163
HB9HX/314 SM3EVR/309 W1PV/250 K3AV/335 KN4F/163 WB4PAB/299 N6HC/159 K8HV/272 WA9EKA/188
HK3BAE/121 SM5AHK/283 W1PWK/190 K3JGJ/200 KT4D/200 WB4RUA/300 N6RJ/321 K8IC/205 WA9TNC/160
I2MQP/280 SM6BZE/226 W1QV/300 K3OIA/183 KU4J/267 WB4RZN/150 W6AYQ/254 K8MC/151 WA9WWT/240
I3BLF/245 SM6CKS/334 W1WEF/242 K3WS/315 KU4N/217 WB4UBD/250 W6CRF/266 K8MNG/250 WA9ZWL/200
I5EFO/252 SM6DBB/301 W1YRO/179 KB3AP/126 N4IA/302 WB4VUA/231 W6GMF/340 K8ST/318 WB9EBO/317
JH1EIG/325 SMØCCE/341 WA1AER/292 W3ECN/116 N4JF/315 WB4YFF/181 W6GO/281 K8BEC/181 WB9LFD/216
JH1IFS/315 SMØHEP/183 WA1FCN/197 W3EV/256 N4OT/222 WD4KRK/198 W6MND/209 K8BLT/201 WD9ADB/228
JR1EBF/263 SM7BOL/282 WA1PDG/152 W3HMR/140 N4PB/278 AK5B/203 W6NLG/156 W8CEU/260 WD9EJE/125
JR1TNE/271 VE1UG/222 WB1EMN/250 W3YY/290 N4PY/181 K5CG/258 W6OKX/275 W8CFG/325 WD9IIX/270
JA2KVD/290 VE2FEX/201 K2BSM/202 WA3OVC/120 N4QF/289 K5GO/326 W6OMM/297 W8PR/337 ACØA/231
JA3DGC/304 VE3BXF/134 K2HVN/309 WB3DNA/253 N4RR/307 K5GY/201 W6PQZ/285 W8YAH/226 ACØM/250
JA3EMU/314 VE3BZI/304 K2IJL/235 AA4AR/295 N4VG/210 K5IMC/142 W6RPK/201 WA8LSO/300 AFØO/177
JA4ESR/190 VE4MG/169 K2NJ/276 AA4MW/226 N4ZS/250 K5NW/300 W6TFO/285 WA8NDL/260 AGØJ/147
JA8KB/322 VE6WQ/294 K2RSG/140 AA4T/282 W4DJJ/291 K5RW/276 W6VBI/315 WB8OBA/275 KØJPX/166
JA8MS/324 VE7BAF/234 AA4TP/259 W4FU/204 K5TA/226 W6VW/281 WA6GFE/337 WB8PHO/183 KØRQF/256
JA8SW/228 VE7DFW/274 AB4Z/290 W4FX/337 K5UR/330 WA6GFE/337 WD8BKM/228 NØAIT/211
JA9CZF/282 VE7IO/301 AD4Y/132 W4HY/290 K5VRX/283 WB6RIU/300 WD8KKF/255 NØJW/180
JA9DDM/149 VO2CW/245 AF4M/268 W4JVN/252 KA5ACC/236 WD6EEQ/144 WD8MOV/262 WØAX/359
KH6CF/299 YU3DQ/275 N2AP/301 W4KFC/342 N5BET/178 K7ZR/308 AI9R/221 WØBL/330
KH6GI/207 YV5AE/328 N2AQH/241 K4AEB/301 W4OO/346 N5CF/207 N7JB/129 K9BIL/208 WØDEI/347
KP4DGT/153 ZL1AJU/340 N2VW/251 K4BYK/221 W4ORT/326 N5FG/305 N7RO/325 K9CT/315 WØFF/286
LA1ND/219 ZS6LW/353 W2BTG/270 K4GLA/321 W4PNY/151 W5CPI/300 W7AO/344 K9FD/273 WBØSYT/120
LA8GJ/298 4X4FQ/311 W2CC/310 K4ITV/163 W4RIM/300 W5KGX/353 W7BJ/291 K9GX/270 WDØGML/180
LA8LF/334 4X4NJ/300 W2HKM/160 K4JAG/203 W5ODD/166
W2HRT/356

Radiotelephone

CX7BF/273 DJ2UU/265 DJ4XA/262 DJ9OV/251 DK3SF/304 EA2HX/342 EA8LD/281 EA8OZ/290 EP2TY/205 F3DJ/343 G4FJT/126 GM4CUB/120 HI8LC/278 HI8GGL/227 HM1SX/155 HP1XRK/300 I2MQP/279 I2RSB/199 IV3TQE/249 I4WZK/286 I5EFO/252 I6GAS/200 I6ZAJ/182 IS0NZA/199 JH1EIG/319 JR1EBE/202 JA2KVD/276

JA3DGC/290 JA4DLP/300 JA8BAR/303 JH8GWW/201 JA9CZF/280 JA9DDN/148 KP4DGT/153 LA1ND/209 LA7EU/151 LA8LF/326 LA9GV/285 LU1SE/231 OE1BFW/272 OE2VEL/280 PA0HBK/228 PA0LEG/153 PA0LOU/283 PT2TF/262 PY2BGO/152 PY2CYK/330 PY4AKL/300 PP5UG/324 PT7TP/180 SM6CKS/334 SM7BOL/278 SM0AJU/318 SM0HEP/178

SV1IW/215 TG4NX/262 VE3BDB/306 VE3CKP/271 VE3ENF/126 VE3GCO/325 VE5QY/199 VE6WQ/280 VE7DFW/168 VO2CW/228 VP9CP/268 XE1NI/272 XE1OW/235 XE1OX/236 XE1XF/225 YV4ACY/199 ZL3QN/325 ZP5EF/252 ZS6LW/352 AA1Q/203 K1CV/277 K1KNM/262 KA1AWH/149 N1YL/259 W1HSP/242 WA1AER/298 WA1BYE/119

WB1EWP/176 K2EYJ/251 K2GPL/276 K2IJL/233 KB2LB/143 N2AQH/241 N2VW/251 W2CC/309 W2GBC/325 W2HTI/355 W2IQB/252 W2IQZ/172 W2NCL/270 W2YTO/250 WA2DXJ/299 WA2WYR/CX/198 WB2AIO/277 WB2EZU/250 AD3R/167 K3RPY/254 K3WS/299 W3EFA/259 W3KHQ/232 W3NB/177 W3YY/280 KB3HE/200 WB3JWC/230

WB3KOJ/164 AA4AR/296 AA4MW/216 AA4R/284 AK4E/209 AK4T/180 K4AEB/301 K4JW/230 K4KUZ/208 K4LQ/246 K4MG/311 K4NJS/293 K4RSB/289 K4XG/187 K4XH/307 K4XQ/243 K4BYK/203 KA4P/176 KB4CL/176 KB4FQ/248 KB4VG/160 KE4I/320 KG4F/194 KN4F/158 KO4O/240 KT4G/279 N4AQA/125

N4AVB/259 N4BHJ/201 N4PB/273 N4QF/287 N4VG/208 W4DJJ/287 W4JVN/249 W4KHW/204 W4KKP/129 W4TAC/255 W4WMO/160 WA4JEP/132 WA4LOF/285 WA4LTG/239 WA4OEJ/253 WA4OOM/284 WA4OPW/312 WA4QBX/243 WA4TLI/295 WA4VLB/238 WA4ZUS/125 WB4ASV/254 WB4IWW/231 WB4MTE/241 WB4QGI/296 WB4RZN/148 WB4TPU/308

WB4UBD/250 WB4VUA/225 WD4EFD/211 K5FM/299 K5GO/291 K5GY/183 K5UR/327 N5ACD/226 N5FG/300 W4PNY/133 W5KGX/348 W5SP/300 WB5ZCS/176 WD5DII/205 WD5JFM/171 K6GNZ/142 K6HNZ/239 N6NA/334 W6BCQ/281 W6CN/250 W6CRE/183 W6GO/274 W6NLG/154 W6RPK/191 W6TFO/254 WB6PSY/208

WB6KQI/150 WB6POP/309 WB6RIU/300 WB6WCW/277 WD6DLK/225 K7DS/250 K7ICW/284 N7AET/122 W7BJ/288 N7RO/318 W7AE/291 W7FP/272 WB7QVB/121 K8EX/160 K8IG/204 K8HV/260 W8CFG/322 W8NXF/323 W8PR/311 WD8BKM/227 WD8BSX/246 WD8MOV/252 AI9U/200 K9BIL/192 K9FYZ/290 K9GX/270

K9HA/279 K9HLW/240 K9KB/287 K9QVB/261 K9UAA/270 N9JK/160 N9MP/261 W9DDX/270 W9RW/227 W9RY/289 W9TA/281 WB9EBO/306 WB9JXT/212 WB9LFD/215 WB9VGJ/125 WD9ADB/228 WD9FOE/176 AC0A/228 K0SE/207 K0VRW/265 W0BL/294 W0EVE/242 W0FF/263 W0FHA/151 W0ZRA/175 WB0OQV/250

Cw

DF3FI/188 DJ4XA/191 DK5AD/203 DL1PM/265 DL7AA/250 GM3YOR/142 I3BLF/191 JH1EIG/265 JR1EBE/207

JA2KVD/185 OH2BN/250 ON7EJ/203 OZ1DYU/178 SM3EVR/289 SM0AJU/273 SM0CCE/239 VE1UG/161

VE3JUG/155 VO2CW/201 ZE4JS/134 AD1C/221 AI1S/175 K1SA/227 N1YL/123 W1AB/250

W1GL/266 W1YY/247 WA1FCN/147 N2XJ/157 WA2CBB/177 K3QIA/165 AA4KT/202 K4ITV/158

K4KUZ/163 K4LQ/223 KE4I/275 KU4J/145 KU4N/173 N4OT/203 N4PY/163 N4RR/240

W4JD/203 WA4WYN/175 K5GO/204 K5NW/260 K5RW/263 W5ODD/152 AD6D/162 K6QC/163

W6GO/190 W6JI/199 W6OKX/222 W6TFO/251 WA6PNY/121 K7ZR/263 N7MC/199 N7RO/175

W7EKM/175 W7LR/266 WA7ZVI/139 W8RT/270 WB8OBA/257 WD8IFX/150 WD8MOV/129 K9LV/181

K9MFI/168 W9GW/245 W9RW/196 W9SFR/281 W9WI/133 WD9EJE/125 K0JPX/125 W0CAW/221

DXCC Notes

Honor Roll Corrections: Mixed, N4RA 310/322. Phone, W4DPS 314/329, W7LFA 311/327.

Strays

HAMS HELP HANDICAPPED CHILDREN AND SCOUTS

The L'anse Creuse ARC, W8LC, of Mount Clemens, Michigan, recently assisted Boy Scouts and a group of handicapped boys on a weekend campout. Boy Scouts from the Macomb district of the Clinton Valley Council, about 50 in all, and their leaders, took an equal number of handicapped boys to the Lake Orion Scout Reservation for two days and a night of activities. The L'anse Creuse ARC provided security and communications for the entire camp. The club members, headed by Larry Wahoski, N8AGC, used their new van as a communications base and provided the boys an experience not soon forgotten, with contacts with Germany and ships in the Panama Canal. — *H. J. Waltzer, Scout Commissioner, Mount Clemens, Michigan*

West Gulf Division Director Ray Wangler, W5EDZ (left), presents the ARRL Charter of Affiliation to Border Amateur Radio Society (BARS) President George Loos, W5LFG (center), and BARS Vice President Dr. Sigifredo Salinas, XE2SSV. The charter was presented at a recent BARS meeting in Piedras Negras, Mexico.

REMEMBER THE HOSTAGES ANNIVERSARY

In Macon County, Illinois, amateurs will conduct a "Remember the Hostages" special event from November 1 to 4. They will be calling "QRZ Hostage Anniversary" or QRZ/HA (cw) near the center of the General and Advanced portions of the 75-, 40-, 20- and 15-meter phone bands; the center of the 80-, 40-, 20- and 15-meter cw bands; 28.750 MHz and the approximate center of each Novice band. A special QSL card is offered to any amateur contacting a Macon County amateur during this operation. Send a 5- × 7-inch s.a.s.e. with a QSL card made out to the amateur worked to Remember the Hostages Anniversary, Box 72, Oreana, IL 66524. — *Bob McGeehon, K9IQH, Decatur, Illinois*

QRP VS. QRO

Roger Hayward, KA7EXM, of Beaverton, Oregon, recently had an unusual experience while camping in southwestern Oregon. Roger and his uncle returned from a day of hiking on the Rogue-Umpqua Divide to find a rather impressive hunting dog at their camp. The dog, obviously lost, wore a collar with a name tag and a phone number in Klamath Falls, a town about 50 miles away. A contact, using 1.5-watts output and a dipole antenna on the 40-meter Novice band, resulted in a phone call to the dog's owner with instructions for retrieving the hound.

Traffic *can* be handled on frequencies other than 2 meters and on modes other than fm — indeed, even in the Novice bands. The dog's owner showed up a few hours later and asked Roger to show him the radio gear that allowed such impressive communications. The dog's owner was especially interested to learn that the rig was homebuilt. He was even more impressed with the power, making the statement, "Gee, I couldn't do that with the CB in my car, and I have a 500-watt linear on it." — *Wes Hayward, W7ZOI, Beaverton, Oregon*

Lee F. Blodgett, W0TGQ, is a popular speaker at club meetings and hamfests in Iowa and Illinois. The Marion, Iowa, resident is president of the Lee De Forest Chapter of the QCWA. Presentations of the subject of RFI, focusing especially on line noise, highlight his talks. Lee believes that if amateurs can be shown that something can be done about line noise, more positive action will be taken in this regard. This photograph was taken at the Sooland Hamboree, in Sioux City, Iowa, where Lee addressed the quarterly meeting of the 3900 Club, Inc. *(K0HR photo)*

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

220 — The Coming Band

Our most neglected vhf band finally appears to be on its way to widespread use. At vhf conferences and on the bands above 50 MHz, one hears the oft-repeated comment, "220 is the band I'm trying next"; or "I just put a rig on 220 — how about a sked?" The same theme is also reflected in the mail received by this conductor. Many who write are speaking of impressive layouts with power in the order of several hundred watts, or more, and very respectable antenna installations. Much of the credit for this substantial increase in 1-1/4-meter interest can be ascribed to a few intrepid devotees who have been pushing, as well as operating, the band for many years. Among these are W1OOP, WB6NMT, N6NB and K5FF. In recent months, W1JR, W4WD, WØPW and W6PO, along with K5FF and WB6NMT and others, have been especially instrumental in showing off the potential this band holds, especially for EME. In fact, there have been more moonbounce contacts completed on 220 in the past six months than over the last 20 years. But EME is not the whole story. In widely scattered sections of the country, many vhfers are acquiring first-class terrestrial 1-1/4-meter set-ups. In addition to her outstanding EME and terrestrial operating, K5FF deserves the principal credit for putting 220 on the map. Her persistent cajoling of fellow vhfers to get on the band and give her another contact, or a new state, is beginning to pay dividends in terms of permanent occupancy. In recent months, Lee has begun publishing an informative *220 Newsletter*, which has also contributed a great deal to awakening interest.

Another factor favoring increased enthusiasm for 1-1/4 meters is the elimination of threats to take part or all of the band away from the Amateur Service. With that specter finally laid to rest, more people are now willing to invest time and money in equipment. Also contributing to this pool of new 220 users is the fact that many have accomplished great things on 2 meters and are desirous of taking on a new challenge. The ranks of 2-meter WAS holders increases each month. Will it be one of them, or someone altogether new, who will be the first to amass 50 states on 1-1/4? Other 2-meter operators do not feel that they wish to take the EME plunge and have gone about as far as they can via terrestrial modes. The next higher band represents an ideal new field to conquer.

Some may feel that they want to try a band where homemade equipment is more in vogue than it is on many of the other bands. Since 220 to 225 MHz is assigned to amateurs only in ITU Region 2 (North and South America), it is not blessed with the array of manufactured gear that is available for other parts of the spectrum. Nevertheless, for those of us who never seem to have the time, or possibly the talent, to construct first-class vhf equipment from scratch, there is help. Lunar Electronics is one manufacturer offering equipment suitable for 1-1/4 meters. It comes in the form of a series of modules which, when connected, make up a transverter for any band from 50 to 432 MHz. This gives the ham who wishes to do some home construction the chance to build part of his 220 rig and buy the rest. In the antenna department, several firms including Lunar, KLM and Cushcraft offer excellent beams. But 1-1/4-meter arrays are particularly easy to make.

Increased 1-1/4-meter activity is not limited to the weak-signal modes. Fm is one of the mainstays of the band. Particularly in southern California, this mode is very popular for both simplex and repeater operation. In fact, I am told that 223.5 in that area sounds about like 146.52 in other parts of the country. N6NB, a well-known proponent of fm on 220, notes that the first 1-1/4-meter contact between the West Coast and Hawaii in over 20 years took place on that mode when he and AA6DD worked KH6IAA during a trans-Pacific tropo opening in late July.

Until very recently, a controversy raged as to what part of the 1-1/4-meter band would be used for weak-signal work. In most of the country, what activity there was centered around the low end of the band, just above 220 MHz. On the West Coast, because of radar interference and perceived difficulties from channel 13 TV stations, activity was concentrated at 222 MHz. Several months ago, W6PO reported that the radar had been taken off the air, clearing the way for a unified national band plan. Since that time, there has been strong pressure to make the national ssb/cw calling frequency 220.1 MHz. K5FF backs this choice and is lending her considerable influence in support of it. Those attending the VUAC/CAC seminar held at the recent Central States VHF Conference enthusiastically supported this arrangement. The concept that all calling frequencies should be used for calling, with QSOs taking place either above or below the calling frequency, was also heartily supported. For more on recommendations made at the Conference, see the section that follows.

So there you have it: 1-1/4 meters appears to be the new "hot" vhf band. There's already a lot more activity on it than a year ago. Is it your next adventure in the World Above 50 MHz? The first step you can take is simple and puts no strain on the pocketbook. Send a stack of s.a.s.e.'s to Lee Fish, K5FF, Box 73, Edgewood, NM 87015, so you can start receiving her newsletter. When you do become active, let me know. I will endeavor to devote increased space to 220 reports from now on. Bear in mind, however, that this will have to be at the expense of material for other bands. *QST* space is still very much at a premium. CU on 220!

CENTRAL STATES VHF CONFERENCE REPORT

This year's meeting of the Central States VHF Society was held in Colorado Springs from August 15 through 17. As usual, it was a first-class affair — technically and socially. The spectacular Colorado surroundings made this year's conference especially enjoyable. AAØL, KØKE, WBØMHP and their fine crew did a great job of putting on a most memorable conference. The ladies program was ably organized by AAØL's XYL Diane, WBØMHP's XYL Cheri, and Charleen, WBØYOB, XYL of NØAVY. The technical sessions included an informative talk by W6XI entitled "VHF Hamshack Gimmicks and Gadgets." Among Gary's bag of tricks was a simple noise source for adjusting receivers and a very effective kilowatt level low-pass filter for reducing harmonics from 6-meter transmitters. K6MYC provided a very interesting discussion on improved feed systems for dishes. W3IWI and W3GEY told the group about some of the design details of the Phase III satellite, and summarized AMSAT's plans for the future. Included was information on the UOSAT spacecraft now being built in Great Britain for launch by NASA a year from now.

An especially interesting talk on tropo ducting at sea was given by KØRI, who has been studying the subject professionally. Also on the subject of tropo propagation, W9IP and K9AKS presented results of the study that they and W3EP/9 conducted on the massive tropo opening of early September 1979. Incidentally, I have copies of this fine paper available. Anyone wishing one, please send me a 9- × 12-inch envelope with 54-cents postage. For EMErs, W5LUU gave a well-documented talk on the effects of cosmic noise on moonbounce operation. I can make copies of Derwin's charts available on the same basis as for the above tropo paper.

The VUAC/CAC forum, presided over by VUAC Chairman W4WD and CAC member WØSD, was especially lively and covered several aspects of operation on the vhf and uhf bands. Fm is always a hot subject in contests. A general consensus was reached that, at least on 2 meters, fm operation in vhf contests should be limited to the frequencies below 146 MHz. There was also considerable sentiment expressed for a similar arrangement on 1-1/4 meters, limiting fm operation to below 222 MHz. Band plans and calling frequencies also came in for discussion. W4WD presented a VUAC recommendation that 500 kHz of each band, including the proposed 902-MHz band, be used for weak-signal modes such as cw, ssb and a-m. The remainder of each band would then be used for wideband, higher-signal authorized modes such as fm, ATV, etc. It was generally agreed that 500 kHz, if it could be kept free of interference from widgband modes, would be enough to satisfy the needs of weak-signal operators. It was recognized, however, that 6 meters represents a special situation, with weak-signal windows needed at 51 and 52 MHz to enable working stations in parts of the world not having access to the whole 50- to 54-MHz band. It was also proposed that 50.0 to 50.080 be used for beacons, with 50.080 to 50.100 for cw QSOs and 50.1 to 50.5 for cw, ssb and a-m operation. There was a strong majority in favor of moving the national ssb calling frequency from 50.110 to 50.2 to make it consistent with 2 meters as well as spread out the activity.

On 1-1/4 meters, as stated above, there was strong support for 220.1 as the cw/ssb calling frequency. It was strongly suggested that, once contact is established, cw stations QSY down and those using voice QSY up. It was emphasized that this procedure should apply to the 70-cm calling frequency of 432.1 as well. This conductor would very much like to hear from vhfers who might have views on these recommendations. I will pass them along to the appropriate people for consideration.

As a feature of the Saturday-evening banquet activities, the coveted Chambers Award was presented to Ian King, W3GEY, for his outstanding contributions to Amateur Radio in connection with the design and construction of the AMSAT/OSCAR satellites. Ian accepted the award on behalf of all who assisted in this effort. The presentation was made for the society by

*Send reports to Bill Tynan, P. O. Box 117, Burtonsville, MD 20730, or call 301-384-6736 and record your message.

50-MHz DX Standings

Number of DXCC countries worked via 50 MHz based on information received by September 18, 1980.

	1	2	3	4		1	2	3	4
LU3EX	47	45	0	0	K8UNV	22	22	1	1
JA4MBM	47	44	0	0	KØGJX	22	21	0	0
JA1RJU	44	43	0	0	K1FWF	21	21	9	4
JA1VOK	44	43	0	0	K3QMX	21	20	7	7
JA2GHT	44	42	0	0	N7AKB	21	15	1	0
JA2DDN	43	42	0	0	WB2MAI	20	17	8	5
JA3EGE	43	41	0	0	W1AIM	20	19	0	0
W2IDZ	42	39	9	4	AD1C	19	18	10	2
W8CMS	41	38	7	5	WA9AHZ	19	18	9	9
JA5HTP	41	41	0	0	K2OVS	19	14	10	5
JE1TGN	39	36	0	0	K2YOF	17	16	7	7
K5SW	37	36	10	10	WB9OPD	17	16	1	0
JA7QVI	37	35	0	0	K1FJM/4	17	16	6	3
KH6IAA	36	33	0	0	W7KNT	17	17	0	0
K7ICW	33	32	1	1	W5NKG	17	16	0	0
VE1AVX	32	28	18	7	W3OTC	17	14	0	0
K5ZMS	31	29	2	0	KØCJ	16	15	5	2
W2BN	31	24	4	1	KØWN	15	15	1	1
LU6DLB	31	16	0	0	VK3AQR	15	14	0	0
W3BWU	29	29	8	5	WB9DRA	14	12	5	4
KH6FLD	29	27	0	0	WØRGU	14	13	3	1
WA5IYX	29	25	6	6	KØSE	14	14	3	0
K8WKZ	28	28	12	12	WA6HXM	14	13	0	0
W1EJ	28	25	8	5	K8RZB	13	13	3	3
W6ABN	28	26	2	2	K6QXY	13	11	0	0
W3XO	27	25	11	6	W3IWU	12	11	12	0
WA7JTM	27	26	1	1	VP9WB	12	11	4	1
LU7DZ	27	9	0	0	WØVB	12	12	1	0
K5FF	26	25	0	0	N6AMG	12	10	0	0
NP2AE	26	21	0	0	K6ZMW	11	11	0	0
KA4AOK	26	24	7	4	WA1AYS	10	10	7	5
K4CKS	25	25	13	12	KL7JJH	10	10	0	0
W4OO	25	23	3	—	WA6IBZ	10	6	0	0
W1JR	24	24	0	0	WØSD	9	9	0	0
N3AHI	24	20	13	7	KL7HMH	8	8	0	0
WA2BPE	23	23	9	0	AL7C	7	7	0	0
W5FF	23	23	0	0	NØAIT	7	7	0	0
AE3T	23	18	9	6	W6OAL	6	5	0	0
K6PHE	23	20	0	0	WØPVL	5	4	0	0
K7GGJ	23	18	0	0	VK2ZDI	2	2	0	0
VE1BNN	22	22	4	0	DK6JL	0	0	8	3
WA3DMF	22	22	10	10	SM6PU	0	0	7	—
WB8GEW	22	19	4	4					

1 — 6-Meter Two-way Worked
2 — 6-Meter Two-way Confirmed
3 — Crossband Worked*
4 — Crossband Confirmed*
*Crossband (50 to 28 MHz) countries listed are those not duplicated by two-way contacts.

ARRL First Vice President Carl Smith, WØBWI. This ceremony was followed by presentation of the mountain of prizes amassed by the Prize Committee under the able stewardship of NØAVY.

The 1981 Conference will be in Sioux Falls, SD, from July 30 to August 1. Next year's president, WØSD, promises another outstanding get-together. Try to make plans to attend. The Central States VHF Conference is one of the high spots of the year for those seriously interested in the bands above 50 MHz.

ON THE BANDS

6 Meters — As this is being written, in mid-September, the band is in its normal transition from summer Es conditions to the normally quiet days of fall. Hopefully, fall will be anything but quiet this year. W1HDQ is one who believes that we will experience more 6-meter F2 DX over the next few months, at least. Ed notes that good results have been observed on long trans-equatorial paths late in every solar cycle since World War II. He also reiterates that north-south paths seem to be affected more by geomagnetic activity, as typified by high "A" and "K" indexes, than by elevated solar-flux readings. In fact, he recalls that some of the best South American openings have occurred with 10.3-cm solar-flux numbers in the 130s. He also points out that high-latitude DX may still be with us also, recalling that, in Cycle 19, crossband contacts with Europe were still occurring as late as 1960. So, as urged in last month's column, don't give up on 6 meters yet.

It would be well, at this point, to review a few operating precepts which were found to be worthwhile last year. First, urge the European stations that call CQ crossband to specify reply frequencies above 50.125. This gives the stations working two-way a better chance. There should be more Europeans active for two-way work this year. EI2W has been joined by EI6AS and EI9D. The latter should have the 120-watt amplifier, so kindly loaned by WB6NMT of Lunar Electronics, on line by the time this appears. It is understood, also, that I5TDI has 6-meter operating permission, as does SV1DH, using the call SZ2DH. 5B4AZ may now transmit on 50.110, still cw only, so we won't have to look for him up on 50.5. FF3SG should be back and rumors persist regarding several Africans. A number of South Africans will definitely be on. ZS6DN is the latest to join this group, which also includes ZS6LN, ZS6XJ, ZS5TR, ZS3E and others. ZS6DN has high power and a good location. This brings me to the next operating guideline. Once a station has been worked, please don't call him again day after day. Let some of the lower-power, or more-distant, stations have a crack at him. And let's not forget the new national calling frequency of 50.2 recommended at the Central States VHF Conference. If we use this spot for attempting to make contact with local and single-hop stations, the low end of the band will be much clearer, giving everyone a better chance to work the weak DX.

At deadline, word reaches me that ZD8TC worked PY1RO and KP4EOR September 16 at about 2100Z. It is also reported that he and several ZSs have been hearing European video as well as harmonics of communications services. In addition, ZS3E has reportedly heard what sound like southern U.S. accents around 49 MHz. On September 10 from 0100 to 0230Z, WP4ACV contacted LUs 3EX, 8DIN, 9AEA and 8MBI.

Another late piece of news comes from W2BN. Dave informs me that, on the morning of September 17, he and K2YOF, with the help of W2MZV and others at the United Nations, put 4U1UN on 6 meters for the first time. The FT-650 donated by W2BN and halo 650 feet above the street were effective in giving stations as far away as Virginia the new country. W2MZV, who is the usual operator of the station, expects to be active on 6 meters from 1300 to 1700Z Wednesdays and Saturdays. I am informed that only QSLs with s.a.s.e.'s will be answered.

2 Meters — EME for everyone? That's about what K1WHS promises with his new array consisting of 24 Cushcraft Junior Boomers. Dave says the monster produces a gain of about 26 dB. In the first few days it was up, K5UGM heard signals off the moon from K1WHS using only a single 4-element F9FT. Dave later heard his own echoes with a 7-element hand-held beam! He is sure anyone who can produce about 600 watts into a 10 dB-gain antenna will have the capability of working him via moonbounce.

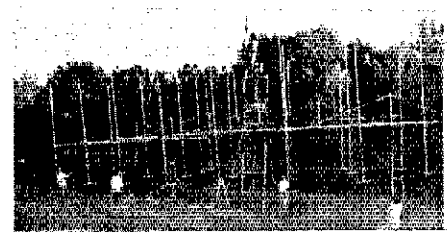
Another moonbouncer, WAØLPK/KL7, says that he expects to be in Alaska through May 1982. Jim finds that no one else up there seems inclined to attempt 2-meter EME, considering the 80- to 120-mi/h winds which blow through the Anchorage area during some months of the year. So those needing the state had better make schedules while they can.

Recall, that in the column for November 1979 I cited, as a yet-unattained vhf challenge, the working of all 48 contiguous states on 2 meters *without* the use of moonbounce. Few imagined how short a time it would be before someone would do it. That someone is WØSD. At the Central States Conference, Ed displayed the cards (all but the last one had yet to arrive from K1WHS; that one has now been received). I am sure that everyone congratulates WØSD on accomplishing a most notable feat.

1-1/4-Meters — "M.s. on 220 MHz is only slightly more difficult than on 144 MHz." That's the comment made by KØDAS Robins Iowa. Rod got his 1-1/4-meter antenna up for the uhf contest and was loaded for bear by the time Perseids rolled around. He ended up completing m.s. contacts with K4PKV North Carolina and W5FF New Mexico. In the case of the latter station, Rod says that the QSO was accomplished on one 20-second burst. During a good tropo opening, August 24, KØDAS landed Michigan stations WB8IKC, WA8VPD, W8IDU and WA8EUU, as well as K8DW and WA8JHW Ohio, along with W2PGC western New York. He is looking for skeds and can be reached at 319-393-8022 or through his *Callbook* address. The set-up at KØDAS includes a pair of 4CX250s running 1 kW and a homemade 13-element loop Yagi. From North Carolina, K4PKV reports Perseids successes with WØVB Minnesota, WBØTEM Iowa and WB9SNR Illinois, in addition to KØDAS. Dick feels that two-hour schedules would be appropriate for this band rather than the shorter ones employed on 2 meters. He mentions that others active on 1-1/4 meters in his section of the country include K4GL South Carolina, WD4HIS Georgia and K4EJQ Tennessee. K4IXC Florida and WA4CQG Alabama are expected to be on soon. Dick also reminds one and all that Tuesday evening is activity night for this band. He also notes that he has templates for a single 4CX250 amplifier which he will send to anyone providing him an s.a.s.e. with 28 cents postage. He says it puts out a good 500 watts with about 1 watt of drive.

K1WHS writes from Maine that his 1-1/4-meter Perseids set-up consisted of 130-watts to four Cushcraft boomers. Dave had success with Illinois stations W9UD and WB9SNR. Plans include upping power soon.

The number of reports of 1-1/4-meter activity received this month is, as was said in the lead to this column, indicative of the interest now being shown in this fine band. Try it; you'll like it!



The new 2-meter EME array going up at K1WHS. See text for description.

70 Cm — Perseids schedules were attempted by K2RIW on Long Island with W5UKQ Baton Rouge, Louisiana and K1FJM/4 near Miami. Pings were heard by both stations but unfortunately, no contacts were made. Some of Dick's other activities, with his array of sixteen 19-element Yagis, involve continuing schedules with K4CAW, 480 miles (775 km), and WA8HGX, 526 miles (848 km). With the first station, all attempted skeds have been successfully completed, with ssb copy ranging from 20 to 100%. Signals have turned out to be more consistent in winter than in summer. Peaks are not as high in the colder months, but neither are dips as low. Aircraft enhancement is noticeable quite often. Sked times are 1930 local time Tuesdays, Thursdays and Saturdays, and 0730 Saturdays. The WA8HGX schedules are held at 1930 Eastern time Fridays with a similar success rate. In addition, K2RIW reports several good tropo openings August 26 and 27 and September 4 and 6. All of these sessions were with the northern Midwest and resulted in contacts with two Wisconsin stations, WA9JFM and WA9DOT. With these contacts, Dick's state total now rests at 27, all accomplished without EME. During the evening of September 6, signals from W9ZTH built up to 38 dB above noise. At this point the Illinois station switched to ATV and Dick received an almost snow-free picture over the 743-mile (1198-km) path. This is thought to be a new DX record for one-way amateur fast-scan TV.

That other stalwart 70-cm operator, K2UYH Trenton, New Jersey, has been running some tropo skeds of his own. At 2330 Eastern time every night, Al attempts to work K9KFR over a 567-mile (915-km) path. Signals average 339 on cw with good ssb copy about one evening per week. KD8Z in central Ohio often joins in at the finish. In addition Al calls CQ every night at 2230 to the southwest looking for Carolina contacts. Over the Labor Day weekend, K2UYH took his portable 70-cm EME station to West Virginia. WB2DIN/8 reports that, operating under the call W8AEC, the group, which included W8AEC, K2UYH, K2TKN, KA8CPI and himself, provided the rare state to nine stations including three Europeans: G3WDG, I5MSH and OH3TL.

23 Cm — WB5LUA, near Dallas, continues to work new states on 23 cm. On August 26 Al provided the initial contact for K5MWH Springdale, Arkansas, and racked up a new state for himself, too. Mike's set-up consists of 10 watts from a 2C39 tripler feeding a 45-element loop Yagi at 55 feet. The transmission line is 3/4-inch CATV hardline, and the receiver provides a measured noise figure of 2.9 dB. Since there are no other 23-cm stations in Arkansas for K5MWH to work, Al plans a trip there soon to give Mike his own state. On August 24, WB5LUA reports a tropo opening in which he contacted K9KFR Indiana over a path of 839 miles (1353 km). Unfortunately, the band closed before W5HN could also make the contact. This would have added another 21 miles (34 km) to this long path. Al speculates as to whether or not this may be an overland record for 23 cm. WB5LUA notes also that three stations are active in Baton Rouge, Louisiana: W5UKQ, WB5LBT and W5DC, all of whom have Sota transverters producing about 1 watt.

From western New York, W2PGC reports that he is active and looking for schedules. Sam has 20 watts and a 39-element loop Yagi. On the evening of August 25, he landed a new state by working three stations in Illinois, as well as two in Michigan.

K6ZMW terms his record in the September VHF QSO Party his "best performance yet from southern California." Using 23-cm only, Joe racked up 13 contacts in six sections. His most exciting contact was with N6CA/7 in Utah for what is believed to be the first 23-cm work between the two states. He also heard the signals of W6YFK SCV Section and was heard in Phoenix and Flagstaff, Arizona.

WB5LUA says that an updated version of the *1296 Raster* should be available by the time this appears. Those wishing a copy should send a 9- by 12-inch envelope, with 54-cents postage, to Al Ward, Rte. 7, Box 32, McKinney, TX 75069.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1DIY, Edgar D. Connor, New Bedford, MA
W1HKL, Albert E. Anderson, Greenwich, CT
K1IKV, Paul R. Davidson, Coventry, RI
W1JWJ, William F. Meehan, Portsmouth, NH
WB1IXB, Ronald R. Giamache, Manchester, NH
ex-W1LIY/W4CGJ, William F. Gleason, Daytona Beach, FL
W2APL, Edward A. Perry, Parlin, NJ
W2BLK, Frederick J. Waywald, Satellite Beach, FL
WA2HNO, Daniel Haase, Edison, NJ
WA2IPR, George C. West, Mt. Vernon, NY
WA2KOQ, Arthur G. Pincus, Brooklyn, NY
WA2LZJ, Charles Schooley, Sr., Groton, NY
WA2OKJ, Alice H. Kinnear, Gorham, NY
WB2PGB, Henry O. James, Bronx, NY
W2RSQ, Carl W. Cowan, Marietta, NY
WA2UKY, Charles F. Timpson, Elkton, FL
W3DEJ, Dr. David F. Hottenstein, Kutztown, PA
ex-W3EFK, G. Frank Lengel, Reading, PA
WB3LCD, James P. Gulentz, Sharon, PA
WB3LRO, Michael Waldner, Philadelphia, PA
W3MLW, John L. Gershey, Lake Ariel, PA
ex-W3PXP, Gordon L. Clark, Takoma Park, MD
W4BJM, Jules P. Miller, Boca Raton, FL
W4DJA, Frank G. Ryan, Margate, FL
W4ERN, Douglas L. Vaughn, Sewanee, TN
K4GVE, Robert E. Turner, Spartanburg, SC
K4IIO, John H. Thorn, Cocoa Beach, FL
W4JOE, Wayne H. Werff, Burlington, KY
N4JT, John W. Taylor, Stuart, FL
WA4TRR, Henry E. Meyer, Seaside Park, NJ
K4UX, Nils E. Segerdahl, Sarasota, FL
WB4WEY, Andrew H. Mauk, Raceland, KY
WA4WGU, Denver H. Snyder, Summerville, SC
W4WLE, Lee V. Melton, Albermarle, NC
W4BMM, Clifford Deerr, Cullman, AL
KA4BXQ, Benjamin L. Lucius, Columbia, SC
K4EWW, William R. Brock, Clearwater, FL
W4IHH, Troy L. Lindsey, Key Largo, FL
K4LIN, Lawrence K. Garland, Inverness, FL
K4LRW, Therese J. Houston, Springfield, VA
K4ZP, Dr. J. Harold MacArt, Nokomis, FL
K5AON, Thomas E. White, Dallas, TX
W5ASE, Daniel R. Hines, Metairie, LA
WD5BQJ, Charles A. Wells, Alexandria, LA
W5GEN, George H. King, Jacksboro, TX
KA5GIG, Robert E. Montgomery, Muskogee, OK
WA5IQU, George C. "Camp" Hays, New Orleans, LA
W5JMN, James A. Rhodes, Arlington, TX
K5LIC, Leon F. Fuller, Martin, TN
W5LWP, Tim M. Reeves, El Paso, TX
WA5PAR, J. Goldman Grant, Sr., Baton Rouge, LA
W5QKU, Oscar T. Harrison, Temple, TX
WA5QPX, James S. Naismith, Corpus Christi, TX
W5RP, Earl M. Nail, Lubbock, TX
W5UAT, Melvin W. J. Gisman, Livingston, TX
N5UN, Gary N. Cozzens, Fort Worth, TX
W5VZL, Donald Akers, Piggott, AR
WB5WLS, Fred C. Miller, Oklahoma City, OK
W5YN, William S. Ianni, Metairie, LA
K6BPL, Don G. Dearth, Chula Vista, CA
WB6EOK, Frank C. Lillie, Las Vegas, NV
W6HXX, Gordon E. Sawyer, Los Angeles, CA
W6IWG, Isabella J. McKechnie, Carson, CA
W6KDN, John M. Sigvaldson, Monrovia, CA
W6KZO, Harry R. Kubly, Atascadero, CA
W6OJF, Glenn W. Malme, Downey, CA
ex-W6RAN, Cecil W. Elliott, San Diego, CA
KB6UR, Joel A. Pritchett, Rowland Heights, CA
W6UVX, James S. Barrett, San Gabriel, CA
W6WBS, Paul G. Pfahler, Torrance, CA
KA7DHI, Robert T. Jordan, Vancouver, WA
W7EQI, Russell E. "Shorty" Rawling, Wenatchee, WA
W7EVE, Robert E. Whinery, Lebanon, OR
W7GBN, James T. Carter, Gila Bend, AZ
W7KQ, Kenneth F. Hager, Burton, WA
WB7TZT, Harlan W. Park, Sequim, WA
W7VFT, Howard T. Powell, Phoenix, AZ
W7WM, Robert L. Simpson, Yuma, AZ
WA7ZRD, Melvin A. Lake, Portland, OR
W8AZL/W9KOY, Kenneth E. Smith, Willard, OH
K8CM, Thomas A. McCann, Columbus, OH
W8DRV, Roy E. Urban, Mesa, AZ
K8EUL, Willard Chrismer, New Lebanon, OH
KA8GPZ, Donald J. Baird, Lansing, MI
W8HHZ, Donald H. Gorrell, Beverly, OH
K8KML, Charles W. Hedges, Martinsburg, WV
WB9BEP, Walter B. Monts, Jonesboro, IN
ex-K9DYP/ex-W9KDV, Homer Hucker, Irving, IL
W9HDV, Robert E. Showers, Jr., Green Bay, WI
K9MUH, Sylvester G. Renner, Urbana, IL
W9PBI, John B. Rosenbery, Oak Park, IL
W9USV, Merle E. Loop, Cedar Grove, WI
WB9VTU, William C. Hogrewe, Elgin, IL
WØAEH, Otho H. Steelsmith, Ogden, IA
WAØCND, Lourel G. Bondurant, Woodland Park, CO
WØEJU, Fred Ellis, Kansas City, MO
WØFIR, Leo Legleiter, Hays, KS
WØGJ, Ralph E. Hazel, Monett, MO
WDØGLA, Gary Ardrey, Springfield, MO
WØGNX, Woodson "Woody" Bennett, Kansas City, MO
ex-WØMRB, Tillman "Mike" C. Cope, Pleasant Hill, MO
WØNMQ, Robert G. Thoeming, Kansas City, MO
WØOMZ, Ronald D. Danielson, Sutherland, NE
WØSHJ, Jack H. Sheffer, Berthoud, CO
WØVC, Frank W. Nicholas, Mankato, MN
WØVYX, Thomas Boydston, Lincoln, NE
WØWCF, Lewis B. Shaw, Durango, CO
KL7DR, Wayne O. Wheeler, Anchorage, AK
VE1BLH, Stafford H. Mosher, Summerville, NS
VE2BVQ, Albert Tremblay, Chicoutimi, PQ
VE7ABB, Thomas L. Letcher, Trail, BC
VE7AIX, James H. Jacobs, Oliver, BC
VE7UH, Rubert K. Grant, Victoria, BC
VK3BQ, Maxwell Howden, Victoria, Australia
VK3CZ, Arthur Berry, Warburton, Victoria
YN1AS, Anastasio Somoza, Managua, Nicaragua

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

25 Years Ago

November 1955

☐ With his "Budget 7-Mc. Vertical Antenna," Pete Cherwinski, W2JTJ, wins his niche in the Hall of Fame. His ". . . breakthrough of the economic barrier" was accomplished, as a caption says, through "A lot of thought and fibation (in) the construction of this vertical." Eminently practical, and with full constructional details given, the beer-can vertical is a classic.

☐ Mobile reception of 50-Mc. signals is obtained by using a crystal-controlled converter between the antenna and the tunable b.c. receiver. The converter featured on the cover and described by Vern Chambers, W1JEQ, is unusual in that it has *double* conversion, first to 6.5-10.5 Mc. and then to the b.c. band. Plug-in crystals and broadbanded interstage transformers are used in the compact 3-tube unit.

☐ For 2-meter QRO, Ed Tilton, W1HDQ, describes "A High-Powered Tetrode Rig for 144 MC." The pair of plate-modulated 4-125As in the final are driven by a push-pull 6360-6524 string tripling from 48 Mc. Forced-air cooling and a parallel-lines output tank circuit are included.

☐ In "Single Sideband with the BC-610," R. H. Mitchell, W5JDWT, tells how he converted the war-surplus a.m. workhorse to a QRO two-stage linear for a Central Electronics 10-B exciter.

☐ The "Super-Selective Converter" of John Tregay, W9YQL, offers an interesting approach to improving inexpensive receiver performance. The converter is tunable, with plug-in oscillator coils for band changing. A tuned r.f. stage is used on 14 and 28 Mc.; on 7 and 3.5 the antenna is switched to the input of the mixer. A homemade double crystal-lattice filter at 1525 kc. in the output of the mixer feeds the converter output to the S-20-R receiver at the filter frequency.

☐ "Pi and Pi-L Design Curves," by R. C. Miedke, WØRSL, gives easy-to-use charts for home design of vacuum-tube output tank circuits.

☐ Bruce Packham, W3UWV, describes his "Transistorized Control Unit" using three diodes and a CK722 transistor to control a relay. Voice control and sound-operated keying are the major uses.

☐ In the Recent Equipment section, the B&W 390 TR Switch is described, an electronic antenna-transfer switch for c.w. and sideband. A triode-connected 6AH6 pentode and a broadband ferrite-cored transformer are the main ingredients. — *Byron Goodman, W1DX*

50 Years Ago

November 1930

☐ One of *QST*'s most popular designs graces the cover and is described in the lead article. "A Complete Push-Pull C.W. Transmitter at Low Cost," by George Grammer, W1DF, tells how to build a three-band rig around a pair of '45s, an '80 rectifier, and other broadcast-receiver components. The $45 transmitter using the tuned-plate untuned-grid configuration became famous as the "TNT" circuit; it stood many an impecunious ham in good stead during the depression years.

☐ In contrast, "A Modern 50-Watt Radiophone Transmitter," by Howard Chinn and Paul Heudricks of M.I.T.'s Round Hill Research Labs, includes just about everything an up-to-date amplitude-modulated rig could have. A '10 triode crystal oscillator is followed by a '65 tetrode buffer that drives the 211 output stage. The final is Heising-modulated by parallel 845s. A three-stage speech amplifier includes provision for either double-button-carbon or condenser microphone input.

☐ In "Volume Level Indicators," Guy Omer Jr., W9EBF, reviews commercial broadcast techniques and suggests such methods might be used by hams to monitor their signals and minimize over-modulation. QST

Answers to Washington Mailbox Quiz, page 65.

1) c	11) a
2) a	12) c
3) b	13) b
4) a	14) b
5) d	15) c
6) b	16) d
7) c	17) d
8) d	18) a
9) c	19) b
10) d	20) c

YL News and Views

Conducted By Jean Peacor,* K1IJV

YLRL's 42nd Year

The Young Ladies Radio League (YLRL) has announced their election results and new slate of officers for what will be their 42nd year. On January 1, 1981, Ione O'Donnell, WA2DMK, of Newcomb, New York, will be YLRL's president.

Ione is married to Jim, W2MZ, and they are the parents of three harmonics — Jamie, David and John. She first became licensed in 1971. In 1972 Ione joined YLRL, which she has served as DX correspondent for three years, secretary for two years and this year's vice president. She is a past president of SAYLARC, has been secretary/treasurer of the Greater Adirondack Repeater Association since its inception in 1976 and serves as net control of the Adirondack Blue Line Service Net on 147.93/33 every Friday night, something she has done for the past four years. YLRL's 42nd year is in most capable and experienced hands.

Officers who will serve with Ione are: Vice President Kay Eyman, WAØWOF; Secretary Sandra Mae Heyn, WA6WZN; Receiving Treasurer Jerrie Stonier, K6INK; Disbursing Treasurer Gladys Zickler, WB2RWT. District Chairmen: 1st — Judy Townsend, WA1TZX; 2nd — Bernice Hanrahan, W2UGY; 3rd — Sylvia Soble, W3SLF; 4th — Jo Frances Melton, WB4NKO; 5th — Dorothy Davis, WD5AHE; 6th — Jeanie Parker, WA6UVF; 7th — Leola Beatty, K7GAT; 8th — Jodie Steggarda, N8ALJ; 9th — Marilyn Backys, WB9TDR; 10th — Saxon Roush, WDØELR; KL7 — Cynthia Henry, WL7ACV; KH6 — no nominee; VE — Tess Hardie, VE3HIR.

Ione O'Donnell, WA2DMK, YLRL's 42nd president.

All licensed YLs are eligible for membership in YLRL. Members receive a bi-monthly newsletter, "YL Harmonics." Dues are $4 per year, due March 1. Dues for DX YLs are $4.50 for $7.50 if airmail delivery of "YL Harmonics" is preferred). They should be mailed to the Receiving Treasurer Ruth Jank, K5OPT, 100 N. Winston La., San Antonio, TX 78213, until the officer change on January 1, 1981.

PROFILE OF YLRL'S FIRST PRESIDENT, K4LMB: "ETHEL SMITH'S STORY"

"It all began in 1935 when my dad brought home an 'all wave' radio and I heard about Amateur Radio for the first time. I went to school the next day talking about my new discovery and learned that there were a couple of those 'hams' right in my own school. I tracked them down and came home with a *License Manual* and a *Handbook*. I never stopped until I had my own license."

Ethel was licensed as W7FWB in 1936 and immediately became a traffic hound. As soon as the required year was up, she joined AARS, the forerunner of MARS, and became net control for the Washington State Second District AARS. In 1939 she wrote the now-famous letter that started YLRL and became the first president of that organization. WW II interrupted her activities. She went to work for the Signal Corps at Presidio, San Francisco. She later switched to the Navy and worked in radar at Quonset Point Naval Air Station, then at the Seattle Naval Air Station and later transferred to the Naval Research Laboratory in Washington, DC. She completed 28 years of Navy Civilian Service at the Navy Scientific and Technical Center and retired in 1969.

As soon as the war was over, Ethel became active on the air again, this time as W3MSU in DC. She was a charter member of the Foundation For Amateur Radio and served as secretary for several years. She was president of the Washington Radio Club, Washington Mobile Radio Club, Northern Virginia Radio Club, and the Washington Area Young Ladies Radio Club. In 1957 she moved to Virginia and became K4LMB. She became Section Emergency Coordinator for Virginia from 1966 to 1969 and was an assistant director of the ARRL Roanoke Division from 1967 to 1974. She was awarded the ARRL Roanoke Division Service Award in 1972.

In 1974 she took on the job of executive secretary of the national Quarter Century Wireless Association and in 1977 was elected secretary of the QCWA Board of Directors. She was reelected to a second term in 1979.

Ethel is consistently on the air and generally prefers cw. (She can keep up with the keyboard boys.) Her latest interest is in working with the organization of the Quarter Century Wireless Women Chapter of QCWA. Her present station is a Drake TR-7 to an ATB-34 beam, with dipoles on the lower bands. Listen for K4LMB during the YL and QCWA contests or perhaps rag chewing on the low end of 40 MHz.

*Country Club Dr., Monson, MA 01057

Ethel Smith, K4LMB, YLRL's first president.

JAPAN LADIES RADIO SOCIETY

The Japan Ladies Radio Society (JLRS) recently held its 23rd annual General Meeting in Fukuoka City, Kyushu. About 250 people (both members and their men-folk) attended the soirée held on the eve of their meeting. Mr. S. Hara, JA1AN, JARL president, and Mr. M. Inami, JA6AV, JARL vice president, were among those in attendance.

President of JLRS is Mrs. F. Abe, JA1AEO. She is the mother of three daughters, all of whom are hams. There are many such ham families throughout Japan.

Japan has approximately 20,000 licensed YL stations in operation today. JLRL is growing as a result. JLRL works closely with JARL, participating in many of their activities. To quote Mr. Hara: "We can say that hidden woman power is very strong in all countries."

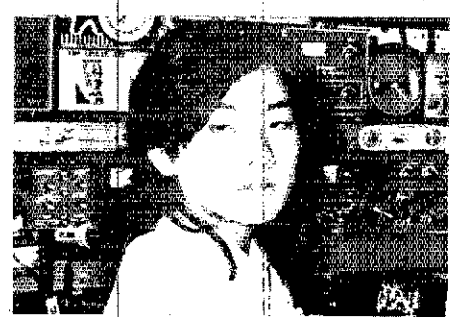
JA1EYL, JA1YL, JA1AN, JA1AEO and JH3SQN.

NANA IHARA, JI1VLV

Nana Ihara, JI1VLV, of Tokyo, holds Japan's First Class amateur license. She is a 17-year-old high school student who received her first Amateur Radio license at the age of 12. Nana is a member of YLRL and a Life Member of ARRL.

In four and a half years, Nana has worked 245 countries (222 confirmed). Of these contacts, 99% were cw QSOs, as Nana is a cw enthusiast. A most active ham, she can often be found on either 21 or 14 MHz between 2100 and 2230 UTC and 0700 and 0900 UTC.

If you have a VK, VE, W, KH6 or YB call, when you contact Nana ask her about her travels to your country. As a 17-year-old world traveler, she's been there.

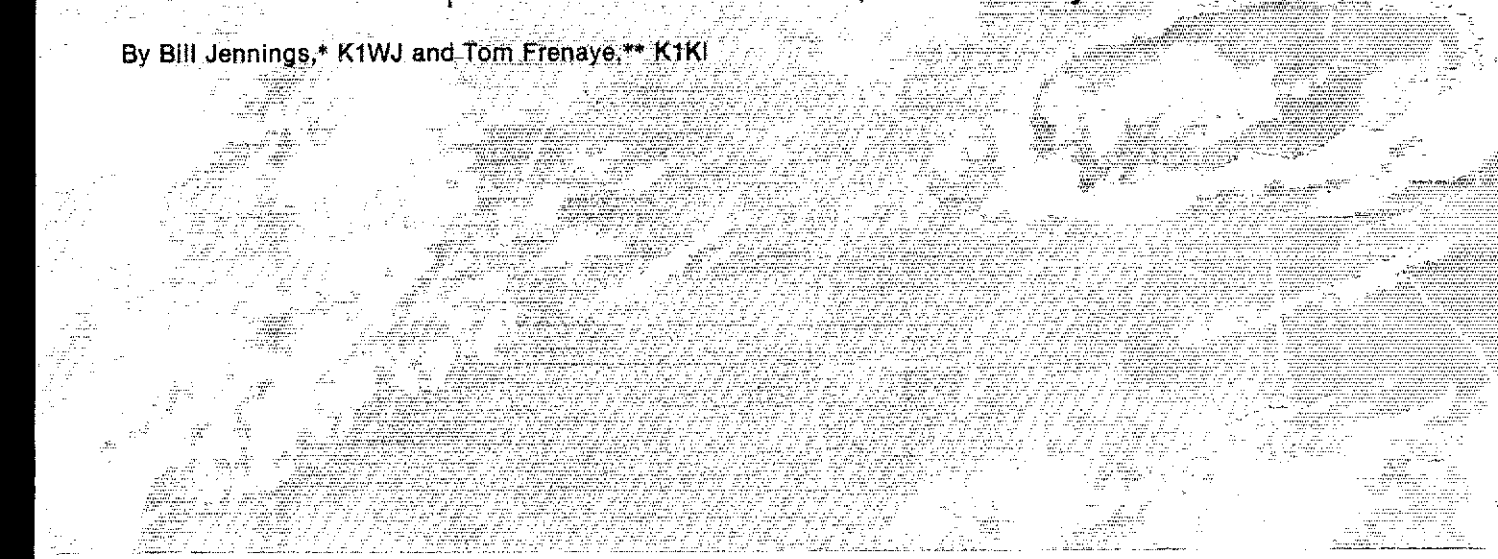


Nana Ihara, JI1VLV.

Results, Field Day 1980

When Better Operators Are Made, Field Day Will Make 'Em.

By Bill Jennings,* K1WJ and Tom Frenaye,** K1KI



June 29, 1980, 0300Z. WX satellite photo courtesy U.S. Weather Service and St. Charles ARC, WBØHSI/KØBM (2A).

There's been a lot of research done in recent years on the communications techniques of animals other than man, himself. Although more emphasis has been placed on studying the communications systems of the higher life forms than on how insects talk to each other, anyone that has even been out on Field Day will readily attest to the fact that the mosquito, of all the insects, probably has the most efficient communications system. After all, once one of the pesky little rascals has found you, how long does it take 6 or 8 million more of them to home in on the free meal? Not long at all. Somebody's got to be spreading the word. But who, and more importantly, how?

We were fortunate this year, while out at the Field Day site, to run into Moe Skeeto, the food and entertainment editor for the mosquito national newsletter, *The Stinger Times*. Moe is fluent in English and agreed to help translate the newsletter for us.

Seems that the current issue of *The Stinger Times* was called the "Special Thanksgiving Edition." Moe explained that ever since 1933 (which, by the way, was the year in which Field Day was first held), Mosquito Thanksgiving falls on the fourth full weekend in June. "Funny," we piped in, "but that's the traditional Field Day Weekend."

Moe smiled, then quipped, "If someone drove a 'free lunch' van to your house on the same date each year, wouldn't you have reason for thanksgiving? To leave unmolested all those Amateur Radio operators, who take to the mosquito's natural habitat each Field Day, would be like stoning the Welcome Wagon," Moe observed. We had to agree.

*Communications Assistant, ARRL
**Assistant Communications Manager, ARRL

Moe brought to our attention a yearly feature in *The Stinger Times*, called "The Mosquito's Guide to North American Field Day Operators." Broken down by call area and complete with tips on habits of Field Day operators, best times to feed and with appropriate numbers of "stars" awarded to indicate quality.

The little buggers sure seemed to have their participation, welcome or not, in Field Day pretty well organized. Made us think. Field Day is a lot of different things to a lot of different folks. Field Day is: an emergency preparedness exercise, a contest, a club get-together, a camping trip, a mini vacation, a 27-hour drinking bout, et cetera, et cetera, et cetera. Most important of all, *Field Day is what you make of it*. Remember too, that while you're doing your thing on Field Day, there are others, not necessarily participants, and not necessarily human, who are trying to make Field Day into one giant smorgasbord.

The fourth full weekend in June, 28 and 29 June to be precise, saw 25,451 operators put 1731 Field Day efforts on the air. Everything from boats to balloons, homes to forests, and swamps to sand dunes was used as Field Day sites.

With nearly a 100% survival rate, Field Day operators again showed their mettle in dealing with some of Mother Nature's anomalies. Some FD operators in the U.S. Northwest had to sweep/wash up to several inches of volcanic (Mount St. Helens) dust from their proposed FD sites (the log checker knows who you are by the gritty feel of your FD entry sheets). There was killer heat in the South and Southwest, which saw the thermometer rise to over 100° F. Tornadoes and torrential rains hit the Midwest. And certainly as atypical of Field Day were the FB weather conditions found in other areas of the United States and Canada.

For those who chose to play FD as a competition, the contest gods were to smile on their efforts. The Wireless Institute of the Northeast/Yankee Clipper Contest Club, W2RQ, effort in the 15A class managed to break the all-time FD QSO record with 10,673 QSOs in their logs. A continent away from the W2RQ FD site, the Southern California Contest Club, N6VI/6, 8A battery, was busy setting an all-time modern Field Day total point record. When the smoke had cleared, there were 3857 "A power" QSOs in the N6VI logs, which, with appropriate multipliers and bonuses, ciphered out to 27,625 points.

While some groups were running big QSO totals, maximizing rates or whatever, still other Field Day participants were taking time out from their FD activities to provide communications for local public service (road races, jog-a-thons and the like) events and unplanned local emergency-type operations. On Field Day there were club meetings held, barbeques attended, radio equipment built and repaired, obstacles overcome and other activities too numerous to mention.

Field Day is indeed what one chooses to make of it. In retrospect, after all is said and done, it's probably safe to assume that Field Day '80 was a resounding success for all involved.

A sampling of Field Day reports received here at ARRL hq. follows.

The Ten Four Good Buddies (WB4ASW 1A)

Last year we used the call WB4AIN. If you are wondering what happened to WB4AIN, just look on page 101 of October 1979 *QST*. The culprit is the second picture from the top,

on the right side of the page. Soon after that issue of *QST* arrived, the proverbial spurious emissions hit the final amplifier blower! Seems that our ladies were somewhat less than thrilled with a picture that caught them not quite at their best. (The picture was taken on Sunday morning after a rainy night at the Field Day site. Two of the women were pregnant at the time and all three were mired in a state of gloom!) An FCC monitor or even an irate neighbor who has TVI hath no fury like a YL caught with her worst side showing.

Needless to say, the ham shack was moved to the dog house and the future for FD '80 looked bleak! As the darkest hour approached, a ray of light shone through. A compromise was reached. A new picture of the YLs would be taken and sent to *QST* with the FD '80 results. If it were printed, the slate would be wiped clean and we would be out of the dog house. As for poor John, WB4AIN, he was so intimidated by the whole affair, that he never did show up for Field Day. It was John, you see, who snapped the infamous photo. Rumor has John operating on 500-kHz cw on a tramp steamer sailing around the horn of Africa.

As for the FD weekend itself, we had intense heat followed by driving rains, which ruined an otherwise great weekend. An R4-B receiver was lost when a gust of wind blew a lot of water into our operating position, inundating the receiver. The water also covered the 110-volt wiring, which caused the operators to vacate the van before they were lost also. . . . So much for FD '80. We are all hoping that FD '81 will be as good, and with your help, we may just be able to bring the shack back into the house. — *WB4HNH*

[Dynamite photo, Bill, but we can't help you out now. Just not enough space for all good photos — Ed.]

Owensboro ARC (K4HY/4 1A)

It began as any other Field Day, hot, humid and disorganized. Still, after an uneventful set up, and after an unfamiliar rig was finally mastered, contacts flowed at a reasonable, if not outstanding, pace. Supper was good, the evening cooled off, the early night shift of operators settled in and a couple of the guys packed out, maybe just a little concerned over the lightning to the northwest. After three years away from Field Day owing to scheduled public service events, the Owensboro club was back in harness.

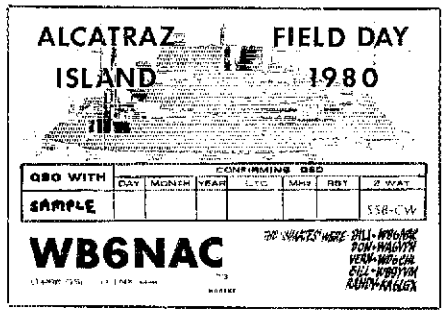
A few thunderstorms far to the north and west were of little concern, even when a severe thunderstorm warning was issued for a county 30 miles away. Finally: "You know, that weather cell's going to pass right over us; let's shut down a few." We did and it did.

An hour, 2-1/2-inches of rain and a whole lot of wind later, only the tower miraculously stood (despite a direct lightning hit) — nothing else at all. Pints of water were poured out of the rigs, dipoles sagged to become trip wires, the tents were all down, some reduced to nylon strips, their aluminum poles best resembled the pretzels that we had munched earlier in the evening. Even though the generators purred on, any thought of restarting was dampened by radar reports of more foul weather and a call-up of amateurs to their weather watch-stations by the Department of Emergency Services.

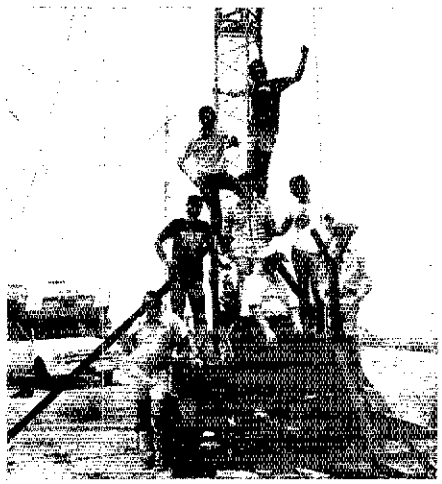
We watched, got zapped again, ate a 3 A.M. breakfast and went to bed. More storms at 6 A.M. The fire department called. Could we please see to preparing for possible evacuation of two flooded rest homes with over 200 patients? Okay. We rolled out again, this time for real. The evacuation decision was delayed until 9:20 A.M., with amateurs coordinating; the fire department, Red Cross and rescue squads evacuating stranded home owners. Over five inches of rain had fallen by now. Evacuate. Incredible logistics, amateurs performing well.

By 4 P.M. everyone was heading home.

The Massillon ARC brought out their "secret weapon" for Field Day this year. That's him in the top row. Big Bird (no not the "Dipole Duck"). In the top row, l to r are: WA8NZE, WD8IKC, the Bird, W8AU WB8OBW, K8WD, K8HSO and KA8CJZ. Bottom row, l to r; WD8IJZ, WD8MIJ, WD8PCG, K8EKG and WB8OWM. W8NP/8.



If you worked WB6NAC, you worked the Alcatraz Inmates (2A battery) on Alcatraz Island. For s.a.s.e. to WB6NAC a handsome QSL like the one above can be yours to commemorate your QSO.



Two-thirds of the Southern California Contest Club FD Group, N6VI/6, poses for this "family portrait." From the top and left to right are KA6CPL, N6FE, N6MI, AA6RF, AE6E, N6VI, AD6C and N6MU. Check out that 27 kilo-point score in 8A battery.

Someone noted that Field Day was officially over. Another noted two canoes, a sailboat and water skier on a flooded street. One last gasp at 7 P.M., to bring one of our generators to yet another rest home that was without power.

We hope for better luck on next Field Day.

Southern Illinois ARS (AA9D/9 2A)

The Southern Illinois ARS Field Day '80 started and ended as have many in the past. The following is an account of what happened in the interim that caused our members to order T-shirts proclaiming "I survived SIARS Field Day 1980."

Each year about March or so, when someone says "what are we going to do about Field Day," the first decision to be made is what our main thrust will be. In 1979 we decided that points should be our main goal, as we wished to show the rest of the state that a small club from Southern Illinois *could* take first in the state for its class. In 1980, however, we decided to make as our main goal something that was virtually absent the year before; community awareness of Field Day, the ARRL and Amateur Radio in general.

As FD morning was upon us, we felt that our selection of Evergreen Park in Carbondale coupled with the coverage of four TV stations, seven radio stations and two newspapers was going to bring our operation into the public eye, and we were not disappointed. Our 2A (plus Novice) setup, using two tents and a travel trailer, attracted much attention. As tents were erected, trees climbed, dipoles strung and generators started, the first strains of the CQ FD music broke the stillness of the park. As the afternoon progressed and the technical difficulties were eliminated we got on with the business of making contacts and explaining our operation.

We had been expecting some thunderstorms, and around 2300 we got them with a vengeance. For the next hour contacts were painstakingly scratched out between the static crashes and the thunder. At sometime after midnight the wind picked up and the cw op was heard on the tactical frequency calling for assistance to get himself and gear out of a fallen tent. The phone station continued for a few more contacts before evacuating its gear to the safety of a car and the Novice-station trailer.

After securing our gear we examined the situation and realized that we had not just experienced a thunderstorm but survived a twister aloft that passed within 300 meters of our camp. Fully one third of the trees in the park were damaged and many large locusts and maples were uprooted completely. The tree supporting the cw station dipole split and a 10-inch limb missed the tent by 6 feet. We realized that back in town our communications skills would be needed in earnest if they had fared no better than we had.

Leaving two operators at the FD site to keep an eye on the gear and to report further weather developments from that location, the rest of us headed for town. On the way we called the Carbondale city police on AA9D/R autopatch to determine their needs. Our first assignment was to report on a tree that was reportedly down across U.S. highway 51, blocking access to the city from the south. For the next several hours we provided information and communications for the city as needed, including the reestablishment of communication with nearby Williamson County.

. . . And this little piggie went to Field Day. The Northern Ohio ARS really puts out a fine feed for their Field Day crew. How does that old newspaper saying go? "When dog bites man that's not news, but when ham eats ham that's a story?" K8KRG (4A).

As police and communications activities returned to normal and the sun was rising on a new day, we began to get a feeling for the amount of devastation that this storm had brought to the Murphysboro-Carbondale area. Six mobile homes were overturned, the roof was torn off of an apartment complex, and the face of a downtown warehouse was stripped away. Countless trees were blown down, some smashing rooftops, others tearing out power and phone lines. Notwithstanding all of this violent destruction, no deaths were directly attributed to the storm in our area. Before leaving town we rode out to the repeater site to check for damage and found it unharmed. Arriving back at the FD site, we fired up a generator and got a station back on the air for a few more hours Sunday morning but found it hard to be competitive in the aftermath of the night's excitement.

Looking back it is ironic that an event that was referred to as a "simulated emergency communications exercise" in our public service announcements turned out to be anything but simulated. That emergency communications were maintained is a credit to the members of the SIARS, Southern Illinois hams in general and the interagency cooperation that existed. It is interesting to note that hams involved by nature of their work made this cooperation easier. The Jackson County ESDA communications officer, the Illinois State Police dispatcher, the telephone company supervisor of repair and the owner of a commercial broadcast station that stayed on the air on emergency power to keep the public informed, were all licensed amateurs.

We are now considering locations for FD '81. One of our members has offered the use of an airconditioned farmhouse near here that his family maintains as a vacation home. It is complete with a veranda, barbeque pit and a barn to house the power generators. In the past this site has been criticized as not being in the spirit of Field Day. Considering the events of FD '80, it looks awfully good right now. — *WD9EBQ*

St. Charles ARC (KØBM 2A)

Field Day 1980 started no different than any other year. KØBM would operate in the 3A class and put a Novice station on the air if possible. For towers we had a 65-, a 40- and a 45-foot portable tower. We set up at the same site as in previous years, at a farm in an open field in St. Charles County, Missouri. The day was a real scorcher with humidity, the highest so far this year. The temperature would hit 99° F with a humidity of 92% at 11 A.M. Not exactly the ideal operation in the open. Our club, SCARC, operates a weather net from the U.S. Weather Service at St. Peters, Missouri. We go into operation anytime a severe thunderstorm warning or tornado warning goes into effect. In 1979 the club placed fifth in the 3A competition so most of us were "going for broke" this year. We all joked that "we're dead if the weather goes bad and we get called in."

By 3 P.M. clouds were building up to the west but some sun could be seen peeking through the clouds. Occasionally the sun would disappear and all would comment "how cool" it was. At 4 P.M. clouds were built up to the west and south, with the north closing in rapidly. First came the winds, then the rain hit. Thank heavens for solid-state gear, for the rain got everything wet. Rain was coming in level with the ground. You could not see any of the other operating stations. The towers, with 6 elements in the air on some, and guyed only with ropes and iron poles in the ground, were straining. Around 5:30 P.M. came the phone call: "Weather Service has level-5 and -6 storms on radar; your club is requested to come to the Weather Service." Immediately we all thought that if what we just got hit with was not the bad stuff, what was coming? Members of the club went to activate the Weather Service permanent amateur station. We have an office set aside just for our club station, WBØHSI. It is very close to the radar room and the satellite photo room. First thing we did was get an immediate update from the radar operator as to the location of the heaviest storms. At this stage we were only tracking level-5 or -6 storms. This is the highest level the St. Peters office tracks. We then got on the 2 meter repeaters that covered the areas of concern to get "on scene" reports. We were getting wind reports of 70 mi/h (based on the size of tree limbs that were being ripped out of trees). We later did get confirmation of 75 mi/h winds. We then started informing many of the other Field Day operations, out in the open, that they either appeared to be safe for the moment or to shut down, disconnect antennas and head for dry ground. Lightning was everywhere. We did get unconfirmed reports of stations getting hit and operators seeking medical attention. Hail started, golf ball size or bigger, and then more and more rain. By 8 P.M. our site had been hit hard several times. One entire station — tent, table, chairs, books, papers, everything — was in one big pile under water, in mud. Some members of the club felt the 20-meter station was out of it for the contest. That night, storms were forming in eastern Missouri and continued on to the middle of Indiana. Satellite photography confirmed "real hot stuff." We had build-ups that topped 75,000 feet. They may have gone higher but the radar just doesn't register higher. Numerous funnel clouds were reported. Damage was occurring all across the greater St. Louis area — trailer parks, mobile home parks, motel roofs, trees, cars flooded by the rapid rise in water in the low-lying areas. We had reports of 7 inches of rain in four hours.

As each major storm left the area information was passed on to other clubs of what ju
went through. Information was passed to radi
and TV stations from the important "o
scene" reports. The Greater St. Louis publi
was listening and the Greater St. Louis are
amateurs were doing the talking. Around mi
night our site was hit again by a major storm
Again, entire operating tables were thrown
the ground and tents were leveled. But two
the stations were able to stay on the air — th
Novice station and the 15-meter station. B
2:30 A.M., the last of the storms had gon
through; but they continued into southern I
linois causing extensive damage and loss of lif
Again, many amateur's stations were in th
direct line. With all of the damage that our clu
site caught, after the final storms left the area
we were able to get all three stations, a
generators and everything back on line in le
than 30 minutes. We never lost a tower, anten
na or any operating gear.

Field Day finished again in the same h
weather, but Field Day 1980 meant so muc
more. We had been pushed by the elements
respond to an emergency weather situation
Ours was an operation that did prove tha
amateurs can respond on short notice, get o
the air, get needed information and possibl
same some lives doing it. One cannot talk lou
enough about the people at the various Fiel
Day sites; those who held onto their ground
pass weather information as it was happening

Club/Nonclub Portable Call-Area Leader

1A	*2A*	*3A*	*4A*
K1BA	W1RM*	W1IS	W1TR
KC2X	W2LZ	W2SEX	W2RI
W3AA/3	K3EF	K3SSC	W3BN
KO4A	N4BP/4	W4UC	K4EG
W5VBO*	K5NK/5	K5DX	KA4P/5
WB6ITM/6	N6RZ	AA6DX/6	K6YT*
K7FD/7	AA7A	K7AUO	W7IO/7
W8NP	W8NR	K8MN	K8KRG
W9TG/9	AA9A/9	K9NO*	W9HE
KØWX/Ø	KØNA/Ø	WØGN	NØES
VE2CBS	VE2CQ	VE7CC/7	VE3NSR

5A	*6A*	*7A*	*8A*
K1MUJ	W1KKS	W1OC	W1EDH
K2AE	W2VL	—	K2AZ
N3RD	KB3JA	W3SK	W3SL
W4CUE	K4BFT	AJ4L	W4IY
W5ANR	W5MS/5	K5CB	—
K6AA*	W6HE*	W6CX*	N6VI/6*
W7YN	WB7QIW	K7LED	—
WD8LLD	W8LC	W8VPV	W8QLY
W9TK	N9NB/9	—	W9AXD
WØEQU	WØMG	NØBNW	—
VE7FG	VE3DC	VE1EV	VE3OW

*indicates overall class leader

One- or Two-Person Portable Call-Area Leaders

1B	*2B*
K1JX*	N1ACJ
W3MR/2	N2GC
K3VW	WA3KEY
N4KE	N4FD
AF5B	WB5KIJ/5
WA5OEY	N6SO
W7NQ	K7BBO/7
KB8N	WB8JBM/8*
W9NAX	K9IL
NØNO	KAØCGY
VE3VA	—

*indicates overall class leader

Entries/Operators per Field Day Class

Class	Entries	Operators
1A	229	2041
2A	387	5953
3A	299	5387
4A	184	3856
5A	113	2434
6A	59	1495
7A	24	643
8A	21	734
9A	6	328
10A	7	296
11A	2	66
12A	1	38
13A	2	114
15A	1	34
21A	1	30

Class	Entries	Operators
1B	143	233
2B	39	77
1C	24	34
2C	2	6
5C	1	8
1D	71	91
2D	6	16
3D	4	31
5D	1	11
1E	37	91
2E	6	38
3E	1	14
4E	2	18
Check logs	14	14
Late/Incomplete	44	660

FIELD DAY 1981
June 27-28

Weather that produced, for seven straight hours, tornado winds, hail, heavy rain and strong lightning. We all wanted to win the contest, but we all sacrificed. St. Charles Amateur Radio Club didn't win the contest. We won something more. We won the knowledge that we *can* respond if necessary. — *KØBM*

Carrollton Wireless Society (K5NL 1A)

To say that Murphy played a part in our 1980 Field Day operation would be to make a gross understatement — he *ran* the show! Witness the fact that our FD scores are arriving at Hq. a few days late.

Here then, with a plea for mercy in accepting our late scores, is an abridged account of how the Carrollton Wireless Society, operating as K5NL (Kissing 5 Naked Ladies), waded through the muck Murphy slung at us.

In 1979, the CWS was born out of a desire to operate Field Day in a big way when the other local clubs (except the Delta DX Assn.) showed no interest in putting on a good show. It was born about two weeks before the big day and was tremendously successful for a slapdash operation. This year, the gang figured, we'd have plenty of time to plan and gather stuff and plan and gather we did. This year's planning paled to last year's slapdash.

As erstwhile organizer of this operation, I was supposed to be on hand for the setup. A few weeks before FD I received a thick, cream-colored envelope with fancy engraving. How can you turn down a weddjng invitation gracefully by saying you have to go sit on the Mississippi River bank in the park to operate radios?

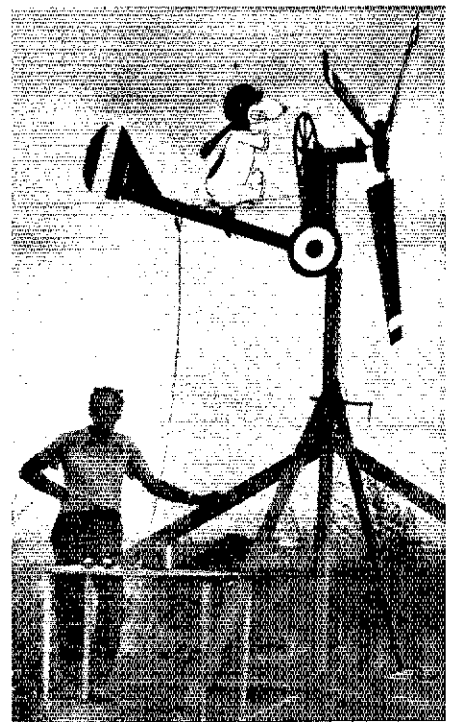
This year, I made a point of mailing press releases to all of the major TV stations and those radio stations with a news staff. I followed up with phone calls Friday before FD. Nobody promised any press coverage, but most indicated they would see what could be done. I arrived at our Field Day site in Audubon Park, having squirmed through the ceremony and having gulped a perfunctory glass of champagne, only to be told that WWL-TV, Channel 4, had just left. I was tickled. I inquired into what he had shot (the reporter, with his camera, that is) and to whom he had talked. The champagne bubbled and fizzed and turned to battery acid in my empty stomach when I learned that the reporter and his crew and packed up and left without taking a single picture. No one had the radio on! They had stopped operating to get the big antenna up (a quad) and the fellow (also a ham) from the TV station wanted to see somebody talking on the radio. The reporter had said he would be back "if he had time."

Saturday evening I went off for a bite to eat and came back to "you missed it" once again. One of the gang had climbed the tower to make an adjustment in the antenna and he and tower had almost sailed over. The tower stayed up; he climbed (feet not touching the rungs) to safety.

Through the night and into Sunday we operated. Cw was the main mode in the late-night hours with K5NL himself (Joey Morales) twiddling the keyer. Daylight came with no particular problems and I headed off for a few hours rest, announcing that I would return for the final couple of hours. I have noticed that sleeping during or immediately after Field Day is very interesting: One can hear numbers and phonetics while sleeping, even when there are no radios around!

I returned around noon Sunday and was told "you just missed it" once again. The generator had given a raucous concert of glacks, twazzles, clangs and tings and had died. A dead generator and still time to go! The Kenwood had a dc-dc supply so a car battery became our power source. For the final moments we were

Jack, WA6TRZ, logs for daughter, Kaye and friend at the *Worldradio* Staff ARC FD site. It's traditional for the N6WR gang to bring along to FD youngsters from several youth groups (Demolay, Job's Daughters and Rainbow Girls) and introduce them to Amateur Radio. N6WR (1A battery).

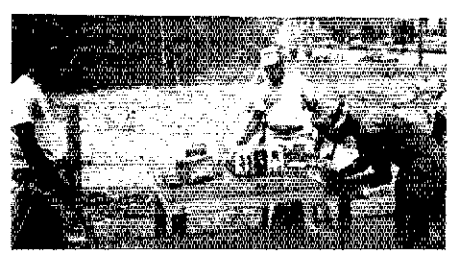


Wind power at the Palo Alto ARA, courtesy of W6BFH and "friend" to the tune of 14-vdc at 7 amps. K6YT (4A).

without our electric fan, our "secret" CQ-calling tape machine and other comforts, but we were back on the air — we shook our fists at Murphy for a final time. Our final contact was made at 2059:45 and we signed clear at 2059:59 UTC. A spontaneous cheer went up.

All things considered, we had done okay. We had been unable to hear or hit the satellite. Everyone forgot about the special W1AW FD message. The TV reporter never did come back and none of his colleagues had showed up either. My poor quad was droopy and my transceiver was abused. But everyone had a great time. We made five contacts using nothing but the sun as a power source. We introduced ham radio to people who had never heard of it. We made a mess of contacts and drank at least 37 gallons of bargain-brand soda pop and a lesser quantity of premium beer. We had challenged other clubs and their performance showed the results. We had won over Murphy — or had we?

So here I am fellows, hat in hand, eyes cast downward, toe digging in the mud, pleading for clemency. Great sahibs of the League, have mercy or the members of the Carrollton Wireless Society will kick my hind end from



The OMIK Electronic Assn., W8DWJ, making those final adjustments before the start of FD. Pictured from the left are: WB8LAC, WD4RIP, WA8LOI and W8CEV (4A).

here to the French Quarter and back again. Patience and mercy, oh great ones, for this may be the last year of "Kissing 5 Naked Ladies"!

Next year for Field Day I may get my comic book collection out of the attic and crawl under the covers for the duration. — *WA5WJZ*

[Bob, we can accept a late entry (late by a few days at most) with a good reason, but anything mailed more than a week after the deadline probably will not make it in time to make the listings. — Ed.]

VE3AUI (+ VE3GAM) 1B Battery

Storms! Windy weather! Kite flying! Meals! Long nights! Thank goodness it's all over.

Bill, VE3AUI, and I have set up a Field Day station for the past three years at a friend's home near London (Ontario). This year we were going to try something different, our power being generated from wood gas.

Burning wood gives off a gas which, when fed into a gasoline engine, will provide for sufficient combustion to keep the engine running just like expensive gasoline would, but without the expense. Ian Kennedy (ex-ZE1BC, ZS9K, etc.), whose land we use for FD, would build the generator in time for the start of Field Day.

The first attempt was built in a barrel from chicken water tanks. It just wouldn't work. The fire was stoked up and the lid placed on, but no gas was produced. Any match set near the output pipe was quickly extinguished.

A second version, made more airtight with a smaller air inlet and a brick firebox, was decidedly more successful. It was built from a drum fitted with a firebox, a small air inlet and two pickup pipes. The fire was built up, the air pump (a hair dryer) started, and the lid was put in place and ready.

To our surprise, a lit match now ignited the gases coming from the outlet hose. We felt that success was within our grasp.

The outlet hose was then held to the intake of the carburetor of the gasoline engine, a few pulls of the starter rope and the motor sprang to life. It continued to run for about a minute, and when the engine finally died, the three of us were jumping up and down in joy — a technical triumph for amateur engineers, welders and amateurs.

No, we didn't use this contraption for Field Day. We didn't get it working until late on Saturday so we couldn't use it to charge our batteries. We had to depend on the wind generator.

All in all, it was a pretty exciting weekend and maybe next year, we won't have to depen on the wind for our power. — *VE3GAM*

AB3A/MM (5C)

Field Day on a 42-foot yacht is different Operating as a class 5C we thought we coul make an all-time high score for the mobil class. . . . Well, maybe next year. For on thing, a lot of operators whom we worke made us repeat our status twice or mor because they didn't believe that we had actuall crammed all that gear plus antennas onto moving vehicle (I began to think they wer right just as soon as it came time to dismantl everything). But our biggest problems wer good ole Murphy at work. As Murphy woul have had it, the heat and humidity were ghast ly! To top it all off, the 6.5 kW generator wa right below the floor of the cabin (as was th rest of the engine room) where two of our fou hf rigs were. The heat seeped up through th floor making the already warm cabin un bearably hot and sticky. It is the opinion of thi group that we have probably run one of th "hottest" FD stations ever — though this ha nothing to do with the score.

In spite of the heat in the cabin, we were also one of the very few people to have had aircon ditioning in a portable or mobile station. Do not think for a minute though that we were nice and cool — we weren't. The airconditioner only managed to "moderate" the cabin temperature down to 90° F. But even this "luxury" Murphy wouldn't let us have. At 3 A.M. local time the generator decided that an icebox, a refrigerator, the airconditioning, five rigs, the engine battery recharger and the lights were too much. The generator regulator smoked just enough to make us unsure of using it any more. We decided to haul up the anchor and dock for repairs. After six or seven futile attempts at starting the engines, we discovered that we had drained our bank of batteries down to 9 volts! It was decided then that we had had enough for one night so we sacked out until 5:30 A.M. By then the generator/engine room had cooled enough so that we could work in there. A little while later Tim, N3AQH, Ken, N3AQG and Oliver, WB3KLI, got one of the engines started, giving the necessary power to start the other. We decided to dock nearby, at a friend's landing, because going back to the marina meant dismantling two antennas to make the required clearance for navigating under a bridge. Instead we sent Aaron, WB3GSC and Ken, N3AQG back to the marina on a 6-foot motorized dinghy which we had the foresight to bring. After half an hour of trying to start the little thing we found that it would only run wide open, and throttling it back would stall it! So, with a rebel yell, two of our crew members went off into the wild blue yonder to contend with enormous speed boat wakes and pray that they had enough gas to make it back. Forty-five minutes later they returned, having exhausted their last drop of fuel just as they reached us. With them came the parts we needed to get back on the air. By then, however, our lead had vanished and our hopes of regaining it were small.

Other problems included sea sickness which continually affected Aaron, WB3GSC, to the point where he spent 3/4 of his time sleeping in order to fight it off.

As for the band conditions — well, they weren't what we had expected. Cw was only good for 20, 15 and 40 meters. Because of all the RFI, only one out of three keyers worked. This cut back cw operations more than we


Seattle has just been nuked . . .

Issaquah ham radio operators dial up 'disaster' theater

by DAVE GERING

Publicity for the Issaquah ARC (2A battery), AF7N. (Reprinted with permission of the *Journal-American*, Belleview, Washington.)

KA7HBK thinks that he has found a successful deterrent to a "Murphy invasion" in a World War II souvenir machine gun. Gonna have to strengthen those defenses for FD '81 as Murph sneaked in and threw a hex on their transmitter and attempts at natural power. N7AYG (1B).

would have liked. In addition to this, 40 cw was such bedlam that no one but Tim, N3AQH, was even capable of making any contacts. Curiously enough (Murphy again) our 160-meter marine vertical which loaded for 40 and 80 didn't work as effectively as it did once before. In fact, it was hopeless on all but 80 phone. Other bands were excellent.

We are all very thankful toward Ken Williams, N3AQG, and family for generously allowing us use of their yacht. Despite all the difficulties, we all admit that this has been a wonderful Field Day. Wait 'till next year! — *AB3A*

Administrative Happenings

We'll wind up our report on FD '80 with a few comments on some of the "Dos and Don'ts" for submitting your Field Day entry.

We've ranted and railed in the past on the subject of submitting a complete entry. A complete entry consists of a summary sheet, a dupe (often called check) sheet for *each* band (and mode) and appropriate proofs of bonuses. This year, 137 entries were received that were missing some vital piece of information (we couldn't find a classification) or in most cases the dupe/check sheets were missing. We endeavored to send these entries back to be corrected. Most were. With so much time and effort expended in getting ready for and actually participating in Field Day, it doesn't make sense to skimp on doing the associated paperwork. If possible, don't lay the burden of doing the paperwork on one person. Two people could at least check each other's work. The *complete* Field Day rules and guidelines appear every May in *QST*. Might be worthwhile to have a detailed discussion of the FD rules at a club meeting prior to FD. If any points are unclear, get hold of us here at Hq. — that's what we're here for.

Bonuses. The natural power bonus was reinstituted with some fairly innovative power supplies in use, including wood gas, solar, wind, steam and wood alcohol. The WIAW bulletin bonus, new in 1980, is more than just an easy 100 points. If ever needed, the bulletin could be used to pass information on a timely basis before and during Field Day. It is interesting to note that only 77% of those FD stations that were eligible for this bonus bothered to copy (by any means) this WIAW bulletin.

Scores. Pretty much as in the past years. Next year we anticipate listing the battery-only scores, for A- and B-class stations, in with the regular (generator) listings. Commercial power stations will still be listed separately. Sound okay?

They really go wild for Field Day in Virginia. Dee, WA4KAQ, searches for raw meat, a mate and an available rig, not necessarily in that order. The Portsmouth ARC, W4POX (5A).

Suggestions. All suggestions, comments and criticisms (constructive, please) are solicited on any or all aspects of Field Day. A letter to ARRL hq. will do the trick. What say?

A special TNX to Contest Aide Arlene Duguay for her efforts in typing these scores and putting up with the log checkers.

Finis. That about wraps up the report on Field Day 1980. We'll offer a hearty "*well done*" to all who participated. If you didn't make it this year — you're forgiven, but don't let it happen again (HI!). C U All on Field Day 1981.

SOAPBOX

Planned to blow their sox off on East Coast with 4-el wire beam on 80 meters but couldn't find broken feed line in the dark! (W6JI). Ever see the three stooges trying to carry a 5 kW generator in three different directions at once? By the time we resolved the issue, we lost a half-hour of operating time (N9CR). First time for the "fire drill" which added new excitement to our FD exercise. Inverted V was up 60 feet in 12 minutes (N5AIL/K5IU). Would you believe the local park rented the same area to two groups, ours and a wedding party of 200 people? A real "Murphy Wedding"! (KJ6R). The *first* mishap was discovering that we had forgotten the microphone, 60 miles from town! (KB4CG/5). One retired new Novice stated he had learned more practical radio in the FD operation than in all the studying and courses he had taken since his interest in the hobby began (K5WK). We had quite a Field Day turnout for a first-time try, including Congressman Jim Lloyd, WA6RQL (K3ZJ/W3USS). My applause for the 24-hour-before FD set up rule. I just hope next year's event falls on a full moon also — a lot of the set up took place during Friday night. Again, we paid dearly for not keeping the dupe sheets up. It's quite obvious other groups paid even dearer as some call signs were continually scratched from the log later (WB8DQP/WB8JBM). How about a multiplier for dodging thunderbolts? Where did all those VE3s come from? (K3DNA). The natural power setup worked very well with lots of sun, except when there was some "ham" made sun (VE2BOS/VE2CQ). Well, we won't win for points but we weren't keeping score on the fun, and we did enjoy more than one exercise in emergency preparedness when the propane to cook dinner ran out (N6BWY/AB3W). There's always some guy who mysteriously appears in the middle of the night to operate cw, not to be seen again until some future FD. This year was no different and he was one of those superb cw operators who makes it look effortless (K9LF/K9IW). Guess the high point was the weather — 109°. Maybe it'll rain next year! (N5XU). Unfortunately the weekend clashed with Canada's First of July long weekend (VE7NA). Recipe for FD: 1/2-dozen VE2 hams, one kindly SWL, one log, one rig, some wire (tent optional). Add one prayer for nice WX, one teaspoon of good RSTs, two cups of inevitable QRM/QRN, seven cups of coffee, one heaping tablespoon of high energy and determination. Sprinkle generously with humor and camaraderie. Simmer for 24 hours. Satisfaction guaranteed (VE2EGQ).

FEEDBACK

Kindly note the additions and corrections to the 1979 Field Day Report, found starting on page 99 of October 1979 *QST*.

Change the class A call areas so that W7FR/7 is shown as the overall class point leader in the 4A category. N0ES/0 is the 0-land call-area leader in 4A, KA4P/5 should have been listed as the leader in points in the fifth call area in the 5A category. The 8-land call-area leader in the 2B category is N8AQK *not* N8AGK.

From the "Sorry we blew it department:" In the 5A Class, The Schaumburg ARC was using the call sign W9TK/9, *not* W9KT/9. Apologies also to the Orillia ARC. They ran two separate FD operations using the same call, VE3ORC/VE3. Their 1A battery was correctly credited at 150 points, but they also ran a 4A generator-powered station that made 439 QSOs, ran 100-watts input with 12 people participating, for a total score of 1678 points. In the 1A battery class, the call sign listed at 1870 points for the Seldom Heard Radio Keying Society should be W3IA/3 *not* W3TA/3.

Information received since the FD report for 1979, correcting mistakes and omissions on several entries accounts for the following: N2ALB/2 (+KA2ENK) was the Southern Tier AR Troupe, operating in the 2A class with 589 QSOs, running 200 watts, 17 operators with a total score of 1826 points. The K2DEG non-club group with 3310 points in the 3A class should have been listed in the 3A battery category, moving into the number seven position. The check sheets arrived late for N8AS/8 (+WD8EGD), The Milford ARC. Their linescore should read 2066 - B - 22 - 6298. The Monroe County Radio Communications Assn., WA8MTX/8 with 3567 points in the 5A class should have 3467 points in the *4A* listings. The check sheets for the Tahoe ARA, AF7I/6 (+KA6FTY), came in a little late also. AF7I's linescore would be 1395 - B - 28 -3298 in the 4A class. The Elmira Area Amateurs, N2HG/2, listed at 2792 points in 5A, inform us that the 400-watts dc input listed for their phone operations was really PEP, thus giving them the times 2 multiplier for 200 watts dc or less input, meaning a change in score to 4984 points. A slip of the pen on the FD summary sheet lead to AA6EE being listed as AA6E in the 1D category.

SCORES

Class A stations are clubs or groups operating portable, with more than two operators. Score listings are grouped according to the number of transmitters in simultaneous operation at each station. The scores list club or group name, total number of contacts, letter indicating power classification (determined by the dc input power where A is 10 watts or less, B is greater than 100 watts but less than or equal to 200 watts, and C is greater than 200-watts input), number of participants (if known), and total score — listed in descending order from highest to lowest score.

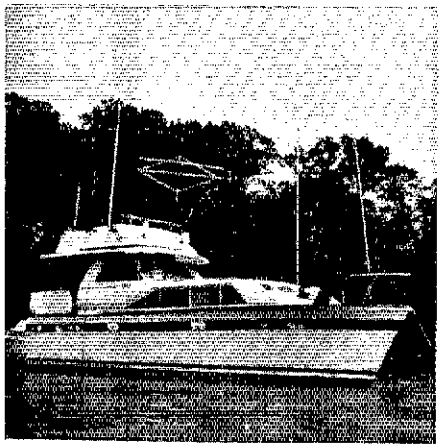
Class B stations are those portable stations manned by one or two operators. Where two persons participated, the call of the other operator (if known) is shown following that of the amateur whose call was used. Figures following the calls indicate number of contacts, power (same as class A), and final score.

Class C are mobile stations. These are listed by call (number of operators), number of contacts, power (same as class A) and final score.

Class D are home stations using commercial power sources. These are listed by call, number of contacts, power and final score.

Class E stations are home stations utilizing emergency power sources. The listings include call, number of contacts, power and final score.

Asterisks (*) denote stations which did not begin setup operations until 1800 UTC on Saturday.



Talk about a classy Field Day set up, the Easy Rider, the pleasure craft of N3AOG on non-Field Day weekends, sprouted five new antennas to accommodate 80 through 10 meters. AB3A (5C).

Who? Why the "unknown operator" of course. With bags over his eyes rather than under them, WA4PRI tries to make a few OSCAR QSOs, while WA4IVF, in the background, is running up the rate on 2C cw. The Brush Mountain Repeater Assn., KX4V. (2A battery).

"Ashes to ashes . . ." The Central Washington ARC, W7GB/7. (2A) had to turn out to wash over 1/2-inch of Mount St. Helens volcanic ash from their FD site. Left to right are: K7PK, W7WMO and W7GB.

Club/nonclub portable

1A - Battery

New Mexicans Engaged in Radio Discussions
W5VBO 662 A- 3-7015
Rhombic Raiders
K@WX/@ 719 A- 3-6910
Morris - Minnis - Barthelow & Goldman
WB6ITM/6* 818 A- 5-6895
Boat Anchor FD Party
K1BA* 617 A-10-6470
North Jersey Contest Club
KC2X 681 A- 3-5830
Massillon ARC
W8NP* 601 A-14-5610
Beacon RA
W3AA/3 548 A- 8-5140
Arrowhead RAC - Duluth,MN
K@IJL 471 A- 4-5110
Supreme Order of Undisputed Radio Contest Experts
W@AA* 478 A- 6-5080
Colorado Traffikers
W@GO/@* 475 A- 4-4715
QRPOOPED ARC
K7FD/7 795 A- 3-4175
Argonuts
K7CI 370 A- 3-4000
Murphy's Wife
K8BX 378 A- 4-3880
Michigan QRP Club
W8LCU* 347 A-10-3870
New Mexico State ARC
W5GB 371 A- 6-3520
The Tucson Trio
AK7Y 461 A- 3-3435
N7GG Contest Group
N7GG 303 A- 4-3430
Quarts
KC4A* 466 A- 6-3365
Fossil Creek Wireless Society
WA5TGF 315 A- 5-3250
Non Club Group
VE3IRT* 266 A- 6-2945
Non-Club Group
K5SOR 623 B- 5-2870
Armageddon ARC
N8AGU* 324 A- 5-2850
Georgia CW Assn
AA4TT 656 B- 3-2824
Hart House ARC
VE3UOT 258 A- 4-2715
Haggis Bashers
VE3AJ 251 A- 6-2710
Dirty Birds
K3MT* 608 B- 5-2362
University ARC
KB7AA 314 A-10-2345
Utah ARC
W7SP* 674 B-34-2310
Bellows Hellowers
KH6ILR 783 B-12-2306
RCA ARC of Indianapolis
N9RJ 265 A-12-2230
Keyed Mosquito's
K7RK/7 214 A- 3-2155
Low Gainers
K@HTC* 272 A-15-2020
Gunnison ARC
W@GYV/@* 671 B- 8-2020
Blacklick QRPers
KB8AQ* 189 A-10-1945
The Three Mousketteers ARC
VE7STG/7* 196 A- 3-1800
Newton, Iowa RC
W@DX 162 A- 5-1765
Canton ARC
W8AL 407 B-18-1666
Non-Club Group
K8ZZU 222 A- 4-1525
Non-Club Group
KA1HG 647 B- 4-1518
Senior AR and Chowder Society
W6PN 128 A- 8-1480
Miami County ARC
KC@M/@* 146 A- 8-1475
Huron ARC
W@NOZ 520 B-15-1450
Lumpy Island Royal Flotilla
KR@EA* 386 B- 7-1402
The Little Pistols
WB5NGB 205 A- 3-1330
Washington County ARES/RACES
K9SK 431 B-14-1320
S.C.A.R.S.
KB7R 441 B- 4-1296
Richmond ARA
K9QAN 107 A- 8-1270
The Sleepless Senders
K2NH/2 103 A- 3-1060
Huntington High School ARC
WB2TKV 308 B- 4- 926
Fidelity ARC
K1NQG 189 B- 7- 902
Last Mountain RC
VE5LM* 124 A- 7- 895
Club Radio Amateur De Granby
VF2CRG 146 B- 6- 884
Marshfield Area ARS
W9FYP 317 B-17- 834
Hamilton - Southeastern Middle School ARC
K9VHF 252 B- 4- 804
Wordradio Staff ARC
N6WR* 271 B- 7- 790
Push Up Mast Benders
K9ZMZ 307 B- - 780
Elmore County ARC
N7AYL* 104 A- 3- 720
Northland ARA
WD@HTC 150 B-10- 614
Arkansas Valley ARC
N@FS* 193 B- 6- 586
Desert Rats
WA6DDM/7* 163 B- 4- 488

1A

Yuma Arizona Hot F D Team
N7CL 1325 B- 3-4400
Itchy Underwear FD Group
K5IU* 1123 B- 7-4260
Motor City Contest Club
KKCC* 1305 B- 7-4120
Mad River R C
K3LR* 1116 B- 5-4004
Fubar ARC
K9VV 1111 B- 3-3930
Idaho Falls Mavericks
W7RH/7* 1253 B-10-3878
Ozark Contesters
W5TNT/5* 916 B- 7-3864
The Thibodaux ARC, Inc
W5YL* 1078 B-30-3794
Sorel-Tracy RC
VE2CBS 794 B-15-3776
Bozo and the Lids
W9TG/9* 861 B- 6-3562
Varian Alumni and Field Day Club
AC6T 820 B- 4-3268
Glen Gates Gang
W9MO/9* 895 B-12-3208
Bell AR Contest Club
N5HD 754 B- 7-3204
Soothing Libations Consumer Corps
W8XU/9* 781 B- 8-2970
Idaho Contest Conspiracy Group
K7TM/7 812 B- 6-2952
Kiamichi Kontest Klub
W5RBQ/5 1143 B-10-2952
Pikes Pique ARC
W6JI* 630 B-12-2920
Murphy's Law-yers
N6JF 838 B- 6-2890
Lebanon AR Klub
K@DEW 737 B-15-2838
York County ARS
K4YTZ* 1026 B-12-2820
Candlewood ARA
W1QI* 792 B-18-2810
Caledon Sidehill Gougers
VE3FOX/3* 807 B- 6-2762
BDG
WA1DDD 728 B- 3-2734
Non-Club Group
K6ZH 683 B- 4-2704
None
WA4SFQ/4* 1170 B- 4-2640
Tin Lizzy Club, North Metro Chptr
AD8R 1032 B-16-2636
Ten Four Gud Buddies
WB4ASW 768 B- 6-2574
Old Pueblo RC
W7GJV 784 B-12-2562
Terrace & Kitimat ARC
VE7DRW* 779 B- 9-2538
Eastern Jackson County - County Hunters
W@QWS 769 B- 3-2474
Treaty City ARA
W8UMD* 1148 B-20-2450
Maui ARC
KH6RS 814 B- 8-2430
West Bees
N@BKL 1001 B- 5-2412
Texas Heatstrokers
Richardson Solar Division
N5TP 805 B-13-2410
Rockdale ARA
AF5C* 988 B-11-2384
Callaway ARL
N@NT 562 B- 9-2314
Union Parish Contesters
K5MC/5* 504 B- 3-2312
The Wild Pigs
KH6HD 839 B- 3-2280
Signal Hill ARC
K9HP/7* 656 B-11-2228
Non-Club Group
W@PSN* 461 B- 4-2228
Sterling Heights Independent Team
W8YO* 693 B- 7-2218
Indian Hill ARC
K9LIS 452 B-20-2214
Non Club Group
AK@T 969 B- 4-2190
Opelousas Area ARC
W5TKV* 886 B- 8-2178
Satellite ARC
W6AB 874 B-12-2174
Winona ARC
W@NE* 692 B-10-2126
Non Club Group
AG5T* 960 B- -2120
Stanly County ARC
W4LZT 752 B- 6-2104
Carrollton Wireless Society
K5NL* 758 B-10-2098
Green Hills Field Dayers
W3MN 473 B- 3-2092
Union Metropolitaine Des Sans Filistes De Montreal
VE2UMS* 421 B-12-2084
Miami Valley AR Contest Society
W8OK* 740 B- 3-2054
Tri-County Repeater Assn
W8YEK* 782 B-16-2050
Spectrum Radio Group
W9YD/9* 746 B- 4-2026
Sunset ARA
K3IL 563 B-11-2016
Madison County Marvels
W@SH 464 B-25-2004
Ogden ARC
K7SDN* 980 B-15-1978
Fort Herkimer ARC
KB2BK 413 B- 8-1950
Non-Club Group
N6GC 512 B-14-1946
West Bank Breakfast Group
N5EH 829 B- 8-1934
Signal Propagators ARC
KB4F 678 B-15-1906
W1WP
W1WP 473 B- 3-1900
Nanaimo ARA
VE7NA/7 508 B-12-1898
Denton County ARC
W5NGU 531 B-22-1860
Chuwels Mountain Boy's
VE7AAE 632 B- 3-1846
Salty Dog Field Day Club
KB7FZ* 759 B- 3-1818
Chateauguay ARC
VE2CAR/2 431 B-11-1758
Anaconda ARC
W7CRC 552 B-11-1734
Seacoast Wireless Assn
AJ1M* 589 B-10-1702
Belden Employees ARS
N9AG/9 1101 C- 6-1687
Broken Arrow AC,Inc
W5DRZ/5* 526 B-14-1662
Rockets Raiders
WB8UCW* 658 B- 5-1644
Central Illinois DX & Contest Club
K9SC 490 B- 7-1582
Kennedys Krazy Klan
K8TK 1124 C- 4-1582
Cabarrus ARS
W4PNY 544 B-15-1564
Gulf Coast ARC
WA4GDN 470 B-20-1562
Red River Valley ARC
WB5RDD 515 B- 9-1554
ARC Carrollton
KG5E* 560 B-12-1550
K7DXD Field Day Team
K7DXD 616 B- 5-1532
Emerald ARS
WA7FQD 403 B-13-1526
South Florida Ham-sters
WD4AUO* 633 B-10-1496
Hilltop Transmitting Assn
W3ZGD 445 B- 6-1490
Pictou Co ARC
VE1JV 376 B-15-1434
Bristol ARC
W4VS* 363 B- 9-1402
Exxon ARS - Tiger Chapter
WB5TPK 635 B-10-1395
Holt & Company
K1TH/9* 448 B- 3-1378
Soc for Preservation of A.R. In Kodiak
KL7F 1090 C- 4-1347
Operation Grease Monkey
VE2XB* 377 B- 8-1340
Penn-Mar RC
W3MUM 348 B-25-1340
Memphis GE ARC
KE4F 309 B- 5-1336
Non-Club Group
WA8YXI 399 B- 3-1320
Weekend Warriors
WB@STC* 306 B- 4-1316
Hastings ARC, Inc
W@WWV* 448 B-12-1296
Westside ARC
W5ARO 463 B- 7-1290
1319th Airborne Antenna Assn
AJ9N* 410 B- 9-1286
Confederate Signal Corps
K5ZC 459 B- 6-1272
Baltimore ARC
W3FT/3 363 B-15-1272
The We Tried FD Group
N8ASZ* 334 B- 4-1260
Jonesboro Rpt Group
W4HAY 390 B- 6-1250
Tamaqua Area Sideband ARA
W3TI* 325 B- 4-1244
Wolf Pit Mtn F D Expedition
KB4PV 448 B- 3-1232
Tri-County Relay Assn
WB6NXK/7 505 C- 3-1227
B.C Ofl Country ARA
VE7OIL 969 C- 9-1169
North Island ARS
VE7ARK 462 C- 6-1106
York Repeater Club
VE3YRC 631 C- 7-1096
Plateau ARA
W8GH* 446 B-15-1092
West Nobr Tech College
W@AFG* 381 B-12-1088
Greenwood ARC
VE1WN 294 B-10-1082
Douglas County ARA
K4PI 262 B-14-1074
Wake Tech ARC
WB4TOP 208 B-15-1072
Upper Crab Creek Brass Pounders
W7IBN* 324 B- 4-1056
Ramsey County ARC
WD@FFQ 375 B-12-1050
Non Club Group
VE7DX/1* 842 C- 4-1040
Queen City Emergency Net
W8VVL/8 244 B-25-1032
Central Vermont ARC
W1BD 345 B- 3-1028
Central Ohio Contest Club
K8TM/8 214 B- 5-1028
Warrensburg Area ARC
WD@AYC 463 B- 6-1026
Theodora Roosevelt ARC
K@NO* 447 B- - 994
Baton County
K8PTZ/8 275 B- 5- 980
15M QRP Club of Ind
WD9IRW* 194 B- 3- 976
Pinley Park ARC
K3GP 276 B- 8- 968
145.660 Simplex RTTY/ Phone Group
WD4JKM 649 C- 7- 949
STARC
KB6NF 417 B- 6- 934
Tippecanoe ARA
W9REG* 359 B- 8- 918
Coon Valley AC
N@BD/@* 320 B-14- 896
Hopkins County ARC
WB4JRO 243 B-15- 890
Greater New Orleans Amateur Radio Club
W5UK 371 B- - 882
The Does
VE7AED/7 326 B- 5- 878
Sacramento ARC
W6AK 388 B- 3- 876
No Name
VE2OJ 264 B- 5- 874
Non-Club Group
WB7PEJ* 333 B- 4- 858
Non-Club Group
KB5LE* 347 B- 6- 856
Luce-Mackinac County ARES Team
W8GBR/8 229 B- 6- 830
Amateurs for Better Communication RC
WA9QIG* 321 B- 6- 824
Lima Area ARC
W8EQ* 174 B-12- 812
Young Pueblo RC
KA7DRI 129 B- 8- 810
Non-Club Group
K3HP 350 B- 3- 800
Nocona ARC
WB9ORE 248 B- 5- 796
Mason County RC
K8DXF* 292 B-18- 784
Union Metropolitaine Des Sans Fillistes De Montreal
VE2CUM* 180 B-11- 760
Owensboro ARC
K4HY/4* 184 B-15- 744
Burling ARC
W1FB 216 B-16- 732
Spark
WB@JBY 211 B-10- 722
Highland Park HS ARC
WB9LDH 342 B-16- 712
Allandale ARC
WD8PNG/8* 175 B- 3- 696
Paducah ARES Club
K54V 159 B-6- 644
Hiawatha (Kan) ARC
K@NL/@* 209 B- 4- 618
Bastrop ARC
KE5L* 199 B- - 598
REJ Society
K7DB* 163 B- 4- 588
Cimarron Valley ARA
WD@EJE* 377 C- 8- 577
Pinawa Amateur Group
VE4AED* 299 C- 3- 546
Principia College ARC
KA9BJ 68 B- 7- 540
EADA - Deerfield, Ill
KB9CZ 282 C- 6- 482
Non Club Group
KA2DII 187 B- 3- 474
Kansas - Nebraska RC -
Beloit Section
W@DSY* 135 B- 3- 470
Talawanda H.S.ARC
WB8PTN* 112 B- 8- 444
Minneapolis RC/Handi-Ham
W@CKF 136 B-18- 438
The Electron Club of Denver
W9ICH* 152 B- 8- 424
Twin Bridges Amateur Group
WA5ZSH/5 134 B- 3- 396
U. Pgh ARC
W3YI/3* 117 B- 3- 378
Principia High School ARC
W@VM 34 B-10- 376
Tillamook Radio Communication Club
K7@RS* 267 C- 5- 367
Johnson County RC
WA4DFS* 82 B- 7- 364
Mosquito Swatters
K9LF 101 B-10- 302

1A - Commercial

Northwest St. Louis ARC
K@AXU/@* 1180 B- 3-2682
Dyer County ARC
K54Y* 327 B-10-1148
Field Day Troopers
WA@GNO/@ 542 B- 4-1142
Lamoine Emergency ARC
AG9Y* 480 B-10-1048
Texas Southmost ARC
K5DG* 222 C-14- 427

2A - Battery

Conn Wireless Assn
W1RM*(KA1BUQ) 1220 A-16-12,050
Fenno Hill RC
N6RZ* 1422 A- 5-9645
Hollywood ARC, Inc
N4BP/4* 1067 A-20-8765
Meriden ARC, Inc
N1AN*(+W1NRG) 933 A-20-8420
Bicentennial ARC
K5NK/5(+KA5EAY) 866 A-75-6895
Walton Radio Assn
W2LZ* 529 A- 6-5890
Glastonbury ARC
K1EI 512 A- 8-5425
Great River ARC
K@YH(+KA@DMV) 773 A-20-4580
Manatee ARC
K4GG(+N4BKD) 627 A-25-4202

Assoc R A of Southern New
England
(W1AQ*(+WA1VEL)
1048 B-22-3676

AARA
W3VA* 1004 B-16-3648
Hobbinsdale ARC
KØLTC/Ø*(+KAØAPX)
1159 B-12-3602
Spiltrock ARA
(K2RF/2(+WA2KZF)
926 B-18-3574
The Alcatraz Inmates
WB6NAC*(+KA6LGX)
486 A- 5-3160
Possum Trappers QRPp Group
K5IK 282 A-65-3120
Issaquah ARC
(AF7N*(+KA7GKP)
354 A-14-2830
Lockport ARA, Inc
W2RUI 301 A-15-2570
Burlington Amateurs
W9QT/9* 353 A- 7-2085
Quad County ARC
K3PS* 185 A-16-2040
Granite State ARA
W1TF(+KA1CKD)
501 B- 8-1754
Field Day's Finest
(N9DD/9* 227 A- 4-1605
Eastside Community School
ARC
(WD4EUL* 259 A- 7-1595
Benson Ridge Group
WB9SJU 154 A- 3-1325
Oak Park ARC
(W8MB 642 A-15-1320
Walker Co ARC
KC4EE 355 B- 8-1270
Bush Mtn Repeater Assn
(KX4V(+WD4LNN)
273 B- 6-1264
Alexandria RC
W4HFH 71 A-20-1160

ZA

Arapahoe RC
(KØNA/Ø* 2451 B-21-7512
Heart of America RC
(WØRRI(+KAØAGC)
2395 B-16-7320
Flywaight DX Group
(N4TN(+WA4SCL)
2160 B-30-7024
West Virginia DXA
(W8NR 1814 B-11-6580
Prince Rupert RC
(VA6AA/A 2198 B- 4-6518
North Arknsas ARS
K5UG(+KA5EIA)
1908 B-20-6428
Non Club Group
(AA7A 1983 B- 6-6332
Central Kansas ARC
(AKØR*(+KAØANR)
1911 B-20-6260
Southern Calif Amateur Net
(N6KN* 2189 B-10-6234
Ft Wayne RC
(W9IL*(+KA9QKG)
1820 B-27-6024
Kanawha ARC
(W8GK*(+KA8BMH)
1921 B-27-6008
Minnetonka Misfits
KØKX 2390 B- 3-5748
Ozarks ARS
KØFA(+KAØGNG)
1837 B-22-5742
Wisconsin Valley RA
(W9SM/9 1610 B-25-5694
Columbia ARA
(K3EF*(+WB3GDA)
1730 B-25-5646
Livingston RAC
(K2GG(+KA2HJH)
1769 B-22-5586
The ARC of the Ohio State
Univ
(W8LT 1845 B-18-5550
Motor City RC
(W8MHM(+KA8DSJ)
1626 B-24-5550
Mobile ARC
(K4ZM(+KA4LFT)
1610 B-47-5030
Radio Amateur Technical
Society
(N9CR 1737 B-17-5522
Ohio Valley ARA
(W4EU/8* 1671 B-12-5450
Red Stick DX Assn
(AA5O 1422 B-10-5448
Mecklenburg ARS
(W4HFH*(+KA4EFL)
1758 B-28-5436
Aviation RC of Rockwell
International
(W8TEZ(+KA8HEO)
1715 B-19-5420
Motorola Engineers -
Chaumburg
(K9RO/9(+KA9HKX)
1753 B-12-5400
Story County & Ames ARC
(NØGA(+WDØUMJ)
1637 B-25-5372
Mid-Mo ARC and Novil
(NØSS(+KAØDLD)
1553 B-30-5338
West Valley ARA
(W6PIY(+KA6ESC)
1700 B-28-5334
Tri City ARC
(N1YL* 1378 B-25-5252
Kingsport ARC
(W4TRC/4*(+WA4MOS)
1566 B-34-5158
Wallingford ARS
(W1SY 1398 B-15-5146
Indian River ARC
(K4YS* 1476 B-40-5054
Clevier County ARC
(K4XU/4 1456 B-10-5048
Lyndhurg ARC
(K4HEX(+N4CMJ)
1515 B-40-5028
Tailgate ARC
(K7QA*(+KA7GZC)
1600 B-14-4922
Northeast Georgia ARC
(AA4U(+WB4GYF)
1557 B-22-4916
Radio Amateur Megacycle
Society
(W9DY 1201 B-15-4866
Cedar Valley ARC
(WØGQ(+KAØILX)
1376 B-16-4654
Wichita ARC
(N5FX 1229 B-25-4578
Edison Radio Amateurs Assn
(K8VA(+KA8JSI)
1395 B-19-4574

Gallatin Ham RC
W7ED 1403 B-18-4560
McDonnell Douglas
Astronautics West ARC
W6VLD/6 1726 B-16-4558
Logan County ARC
N8RR/8*(+KA8GMR)
2077 B-19-4502
Conyers AR Group
N4CI(+KA4OVX)
1436 B-21-4404
Central Missouri RA
KAØE(+KAØHDO)
1239 B-12-4388
Clinton and Highland County
ARC
KB8ED 1299 B-12-4378
South Kansas DX Assn
WØWU 785 B- 7-4372
Brandon ARS
K4TN(+WB4BIM)
1351 B-25-4360
Central Washington ARC
W7GB/7 1286 B- 7-4324
Western Illinois ARC
W9AWE 1330 B-30-4306
N4AA Group
N4AA 1476 B- 4-4300
Fraternal Order of Radio
Contest Enthusiasts
KØTG 1224 B- 3-4274
Non-Club Group
K9SA(+WB9VIQ)
1191 B-20-4268
Goddard Amateur Club
WA3NAN(+WB3JKE)
1227 B-15-4260
Ski Country ARC
WØFG(+KAØCKI)
1309 B-18-4204
San Jose IBM ARC
AD7X/6 1671 B- 9-4204
Tampa ARC, Inc
W4DUG/4* 1229 B- 5-4148
Telco ARC
W6MPH* 1813 B-10-4052
Mitre - Bedford ARC
W1FM(+N1AIO)
1186 B-11-4040
Iowa - Illinois ARC
WØLAC(+KAØFAJ*)
1224 B-18-4012
Mesquite Horned Toads - Ham
Assn of Mesquite
AK5X(+KA5FOT)
1236 B-20-4972
Cedar River Skeeter Slappers
WØIZ 1171 B- 9-3954
C.R.A.Q.
VE7CQ 878 B-16-3924
Cincinnati Milacron ARC
W8RSN*(+WD8SDL)
1239 B-25-3908
Motorola ARC of Arizona
N7RF(+N7BCH)
1097 B-20-3904
Greater Fairfield ARA
WB1CQO 1256 B-35-3904
Tamu MSC Radio Committee
W5AC/5(+KA5HSA)
1356 B-19-3892
Virginia Beach ARC
N4HQ(+N4CTB)
1036 B-30-3840
Valley ARA
W4XD 1179 B-22-3790
Sussex County ARC
N2WM(+KA2EIA)
1002 B-20-3776
Tupelo ARC
K5JG 1241 B-20-3758
Northern Virginia RC
W4PAY(+KA4BKA)
1057 B-17-3732
Prairie Dog ARC
WØOJY 1189 B-25-3682
KSU ARC/Manhattan Area
ARS
WØQQQ/Ø* 1014 B-15-3670
Overlook Mountain ARC
N2LL 1071 B-16-3656
BARS
W4DU(+KA4JMU)
1198 B-25-3614
Randallstown ARC
N3IC/3 1185 B- 7-3594
Iowa City ARC
WØIV 1208 B-25-3592
Lake Area A R Klub
K5PC 1264 B-28-3570
Tombigbee ARC
K5BX(+KA5FBX)
1053 B-20-3558
W/K ARC of Greater
Milwaukee
AA9L(+N9AFR)
1037 B- 9-3546
Brazosport ARC
N5FN(+KA5GEX)
955 B-27-3514
Kelly's Heros
K9WWT/9(+WD9ETJ)
909 B-15-3484
Eastern Mich ARC
K8DD*(+KA8QFJ)
934 B-17-3472
Tuscaloosa ARC
W4XI 990 B-42-3470
Shenandoah Valley ARC
W4RKC 957 B-12-3470
Butte ARC
W7FU 2286 B-23-3453
Jackson County ARC
W5WA* 1134 B-22-3456
Murton ARC
W9EEB(+KA9EQE)
972 B-20-3428
Yellowstone RC/Beartooth
ARC
K7EFA/7 1029 B-40-3426
Valley ARC
WØH 1095 B-10-3406
Charlotte ARC
W4CG* 989 B-20-3364
Gore Range ARC
NØAFO(+KAØEQM)
937 B- 6-3350
Rockingham County ARC
W4JF(+KA4KOP)
923 B-27-3348
Greater Bridgeport ARC
W1VW 1027 B-20-3304
Green Bay Mike and Key
Club, Inc
K9EAM(+KA9AIV)
1177 B-16-3304
Heart O'Texas ARC
WD5IAF 1260 B-30-3300
Rideau ARC
VE3BPC/3 878 B-14-3296
Flambeau ARC
N9CE*(+KA9HPQ)
992 B-15-3284
Grand Mesa Repeater Society
and Western Slope ARC
KØGJ 890 B-25-3280

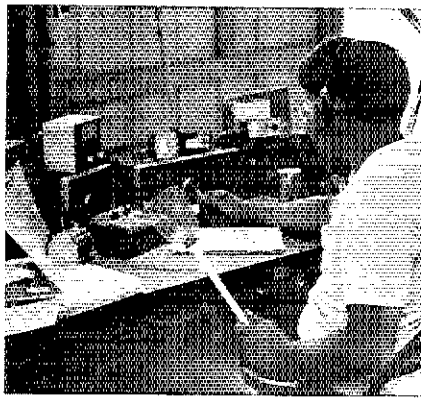
Northeast Missouri ARC
WØCBL*(+WBØZHB)
883 B-17-3278
Racine Megacycle Club, Inc
W9JDU 1022 B-25-3252
U.C.L.A. ARC
W6YRA* 1314 B-13-3224
Brewton AR Union
N4PV(+WA4VTL)
824 B-12-3204
Attoka County RC
WØEG* 1140 B-15-3202
San Angelo ARC
W5QX(+KA5BMU)
912 B-30-3194
Sharon Organization
Representing Radio Youth
N1AJ 901 B-12-3194
South Lyon Area AC
N8AR* 965 B-16-3166
Southern Maryland ARC
K3NSS/3 1080 B-47-3152
East Bay Amateur Wireless
Assn
N1RI(+KA1EIA)
830 B-15-3132
Ole Virginia Hams
N4FS 934 B-20-3126
Holbrook Allstar Wireless
Gang
W1PE(+WB1CCF)
933 B-10-3110
Dallas ARC
W5FC 1036 B-15-3100
Rip Van Winkle ARS
W2FSL(+KA2GAC)
1001 B-40-3098
Very Fine Operators
N6KG/6* 795 B- 8-3074
Sheboygan County ARC
W9RF/9(+KAØAZA)
1048 B-20-3074
Hiawatha Valley ARC
KB9NN 920 B- 6-3056
Alamogordo ARC
K5LRW 1180 B-21-3026
Hemp Radio Network
AB6H(+WB6ORX)
1349 B- 7-3002
Findlay ARC
W8FT 903 B- -2992
Humboldt ARC
KØGP/Ø*(+WBØRKO)
916 B-25-2988
Holland ARC
K8DAA 948 B-14-2986
Kachina ARC
K7KI(+KA7ARZ)
1209 B-20-2976
North Central W Va Field
Day Assn
K8TW(+WD8EOG)
857 B- 7-2970
Bunker Ramo ARC
WB6OBQ/6 930 B- 7-2960
Gadsden ARC
K4JMC 903 B-23-2944
Central Wis Radio Amateurs
Ltd
W9NN* 799 B- -2918
Coconino County ARC
W7YSY 778 B- 9-2910
Medina 2 Meter Group
KØTV/Ø(+KAØHZB)
801 B-38-2894
Grande Ronde RA
W7KVV(+KA7BAK)
746 B-12-2874
Three Rivers ARC
WØUKN 1111 B-20-2864
Evendale ARS
K8LUC/8 770 B-32-2864
Morris County ARES &
RACES
W2UH(+WB2YGT)
851 B-30-2862
Brightleaf ARC
W4AMC 720 B-16-2832
Ellsworth Amateur Wireless
Assn
W1TU(+KA1CIB)
733 B-12-2820
Middlesex ARC
W1HEB/1 971 B-15-2808
Western Carolina ARS II
W4LSI(+WD4JOT)
800 B-17-2798
Telegraph Hilltoppers
N8BFU 1227 B- 5-2798
Fauquier ARA
K4MZ(+WD4JDI)
726 B-16-2788
Fenton Area Ama
WA8UXN 711 B-26-2786
Garden City ARC
W8WI(+N8BIY)
1109 B-11-2772
2 Mile High Group
W9LSD(+KAØGPO)
741 B-16-2758
Texas Instrument ARC
K5OJI 846 B-14-2748
Honolulu ARC
KH6WO 941 B-25-2728
Penn State ARC
K3CR/3(+WN3VAW)
796 B-10-2714
Racal - Milgo ARC
AK4Y* 859 B-10-2706
Forsyth ARC
W4NC 789 B-25-2672
Hub City ARC
NØAHL(+KAØFIF)
998 B-16-2656
Central Columbia School
District ARC
WA3UDD(+KA3EYW)
765 B- 6-2644
Da Shed-House Gang
WD4ODF 821 B-18-2630
Warrick ARC
KB9JC* 913 B-23-2628
Explorer Post 204
WAØOYR 674 B- 9-2598
Morongo Basin ARC
K6OS/P(+KA6BWL)
697 B-15-2580
Alfred Packer Memorial ARC
WB1DXR 675 B- 3-2570
Chippewa ARC
WB8AAA/8 600 B-15-2536
Oswego County ARA
W2RGS 710 B-20-2530
Carnline AI Group
K5DL(+KA5ALE)
505 B- 6-2520
Viking ARS
WAØCJU 656 B- -2476
Borderline ARC
N7DF 743 B- -2476
Ford AR League
K8UTT 703 B- 8-2468
Beer's Brew
N9BB* 1034 B- 8-2456
Stonewall Jackson ARA
K8DF/8 620 B-10-2432

Putnam Emergency AR League
K2AV 642 B- 7-2432
Washington Mountain RC
W1MEW(+KA1EME)
699 B- 7-2430
Saline County RC
W9ZX(+KA9HPF)
1008 B-25-2420
Stateline RC of N Y & N J
K2LSA/2 838 B-12-2418
Rappahannock Valley RC
K4TS*(+WD4MRX)
825 B-14-2416
End-of-the-Line ARC
KBØBK 699 B- 6-2400
Ottawa Valley Mobile RC
VE3RAM 672 B-12-2390
Columbus AFB Group
WD5BOL 824 B- 9-2384
Radio Amateur Transmitting
Society
W4POP 621 B-11-2384
Sand Hills ARC
WØMI*(+KAØEPT)
720 B-20-2374
Cofars Group
K6FI 515 B- 7-2372
London ARC, Inc
XL3LON* 1033 B-25-2364
Radio Amateurs of Skagit
County
W7UF 730 B- -2356
Libertyville and Mundelein
ARS
K9IW 729 B-30-2356
Explorer Post 373
W9COS 1022 B-15-2344
Onalaska Wireless Assn
KA9BJO* 815 B- 3-2338
Beaumont AR and Repeater
Club
WØRIN(+KA5CKY)
552 B-20-2336
Granite State Hilltoppers
AF1T(+WA1VKO)
853 B- 4-2334
Non-Club Group
N3AM 591 B- 4-2294
Starke County ARC
K9VCM 604 B- 7-2280
Missouri Valley ARC
WØNH* 816 B-28-2278
York North ARC
VE3YNA 582 B-30-2272
Oshkosh ARC
N9NE/9 600 B- 8-2252
Carbon ARC
K3II/3 613 B-15-2244
Jackson County Repeater
Assn
KV4K 571 B-14-2242
C.R.E.S. ARC of Western
Elect & Bell Labs
WBZPF/8(+KA8F7B)
760 B-16-2238
Larkfield ARC
W2NNJ/2 697 B-75-2234
Motorola Schaumburg ARC
WØVV* 599 B- 5-2234
Indiana Bell ARC
K9FG 618 B-18-2222
North Kitsap ARC
W7CDD/7 669 B-11-2216
Greenville AR FD Group
WB3INS 661 B- 5-2200
Fort Pierce RC
W4AKH(+WA4SMZ)
681 B-22-2188
Wells County (Ind) ARC
N9GS(+KA9EJO)
658 B-20-2188
Non-Club Group
K3ONW 522 B- 5-2180
Otsego County ARA
W2TKE 629 B- 6-2178
Lower Yellowstone ARC
KB7BO*(+KA7GXF)
720 B-16-2176
Jefferson ARC
W5GAD/5* 571 B-22-2162
Newark ARA
K8LJ 680 B- 9-2160
Wiregrass ARC
N4SY*(+KA4CGR)
752 B-16-2152
Dnclub
WB1DRE(+WB1EHO)
470 B- 3-2138
Decatur ARC
W4AFD(+KA4CKR)
577 B-20-2134
Non-Club Group
K5MHZ/5 683 B- 4-2130
The 21.4 Association
K3KL/3(+WB3HDI)
519 B- 6-2130
Socorro ARA
W5FZ 589 B-10-2126
Pentagon ARC
K4AF(+KA4NAV)
735 B- -2122
Lockheed E.R.C. ARC
W6LS 498 B-25-2104
ARC of Savannah/Coastal
Area Repeaters Society
W4HBB* 657 B-22-2090
Clark County ARC
W9WWI(+WB9WDW)
580 B-15-2090
Tri-Count Ham Club
WBØSMW 798 B-30-2088
Lake Shore ARA
W3ALO 988 B- 6-2076
Red Cross ARC, Indianapolis
RC, ARES
W9LGQ 832 B-38-2074
The Denver RC
WØTX 761 B-25-2064
AR Explorer Post 73
WBØYMO*(+KAØGVY)
775 B-11-2062
Enid ARC, Inc
W5HTK 615 B-10-2054
Eastern Ohio Amateurs Assn
N8NR 536 B-12-2054
Indianapolis Power & Light
ARC
K9FC 680 B-12-2048
South Platte ARS
WØXK 871 B-13-2042
Imperial Valley ARC
K6OCT(+KA6LNG)
629 B- 9-2002
S.C.A.R.S.
N4ZV*(+KA4MNT)
582 B- 7-1984
Kentucky Colonel ARC
AB4Y* 682 B-15-1978
Mt Vernon ARC
KBEEN(+WB8AYM)
485 B- 7-1972
Lake Geneva Repeater Group
WB9ICF 636 B-10-1958

River Cities ARA
KK4Y*(+WD4NYC)
481 B-15-1958
Norfolk Naval Station ARC
N4ABD(+KA4MNY)
531 B-12-1934
Central Carolina ARS
K4JUO(+KA4HJR)
800 B- 7-1926
Friendship ARC
W3GR 535 B-12-1906
Peach Mountain Group
WBØN/8 458 B- 5-1902
Synton ARC
W9YH* 584 B-10-1900
Parsons Area ARC(KS)
WØRT/Ø(+KAØCUQ)
605 B-16-1888
Turtle Mountain ARC
VE4LB/4* 503 B- 9-1856
Adams County ARC
K9UR* 529 B-10-1830
Explorer Post 73
W8TF/8(+KA8BIM)
503 B-14-1826
Club de Radio Amateurs de
Saint Hyacinthe
VE2CAM 490 B-12-1820
Minot ARA
KØAJW 510 B-20-1818
Steubenville (Oh) and
Wellrton (W Va) ARCs
N8JP 579 B-29-1816
Rebels
WBØVDE 477 B- 6-1812
Lake Success RC
W2YKO 654 B-15-1810
Explorer Post 599
WA7SKJ 802 B- 9-1804
Kings County RC
W2RAK* 375 B-16-1800
Hualapai ARC
WA7LAZ 575 B-24-1786
Wichita ARC
WØSOE 573 B-10-1728
North Augusta - Belevedere
ARC
K4FR 428 B-17-1764
Kamloops ARC
VE7UT/7 705 B-15-1764
RAC of Knox County, Inc
W4BBB 394 B-14-1760
Jackson County ARC, Inc
WD8JNU 688 B- 8-1754
Fort Belvoir Field Day Crew
K4WCC*(+KA4KPC)
464 B-12-1750
Forx ARC
NØND 923 19-C-1733
Fulton County ARC
KB8XQ* 473 B- 4-1730
Base ARC
VE3CYB 574 B-30-1728
Key City ARC
N5XU(+KA5FRE)
477 B-15-1724
Southern Illinois ARS
AA9D*(+KA9EWX)
469 B-12-1724
Fall Claire ARC
K9FCA 675 B-15-1694
Conoy Valley Wireless Club
VE3CVW/7 498 B-15-1684
Butler County VHF Assn,
Inc
WBØCI* 581 B-15-1662
Metropilitan ARC
AD5M 876 C-12-1660
Thompson ARC
VE4TRC/VE4
506 B- 3-1654
Pend Oreille ARC
KB7LQ* 563 B-10-1650
Elkhorn Valley ARC
WØOLL* 673 B-10-1646
ARS of Tennessee Tech
WA4UCF* 474 B- 7-1616
None
WD9HMF 681 B- 7-1592
Vermillion ARC
AAØU 447 B- 9-1590
Southeast ARC
K8EMY(+WD8QAZ)
387 B-22-1590
Huber Heights ARC
N8TDA 366 B-10-1590
Boothill ARC
NØALN* 472 B-18-1586
Livonia ARC
K8UNS 477 B-26-1584
Grand Island ARS
AJØA(+KAØFAJ)
522 B-14-1580
Clower Leaf Farms ARC
WD4ILO 396 B- 4-1576
Pleasents County ARC
W8UU(+WD8NHN)
333 B- 7-1564
Non-Club Group
N6KW 392 B- 6-1546
Tennessee Hilltoppers
WB4OTX/4 402 B- 9-1536
Tonemont ARC
VA3FVF(+KAØFWD)
526 B-14-1484
Bullitt ARS
N4ZW* 397 B-16-1472
West Side RC
VE3UU/3 322 B- 4-1468
Murray State University ARC
KJ4W(+WB4PEW)
433 B-10-1460
Osthemo ARC
K4TIW 396 B-13-1440
Fayette ARA
KB8GQ 452 B- 8-1438
Boothville ARC
WD2AOX(+KA2HWR)
352 B- -1438
Suburban RC
KØRX* 546 B-33-1430
Great Plains ARC
WBØWDJ*(+KAØEMX)
369 B-12-1424
Hanscom AFB MARS Group
WIGMM 548 B- 5-1396
Rankin County ARA
KB5OIX* 592 B- 7-1384
Cumberland ARC
K3IEC 432 B-10-1372
Rome RC
W2OFQ 475 B-15-1370
Lake Cumberland ARA
N4AI* 460 B- 6-1359
Albuquerque Amateur
Arboreal Archers
WD5IBS 367 B- 3-1356
Bishop ARC
W6TD* 372 B- 7-1342
Rutherford County ARES
N4BBB(+KA4JDH)
390 B- 7-1338
Farmington ARC
W8NBN 666 B-22-1332
Henry County ARC
K8TII*(+KA8ATI)
285 B- 9-1330

Dave, KA1BUQ, Novice operator for the Connecticut Wireless Assn. W1RM (2A-battery).

Charlie, VE3LUR, got down to some serious FD operating for the VE3FLP group (2A).



Jeff, K8ND, prepares himself for possible aerial attack. W8TK/8 (1B)

Oswegatchie Valley ARC
WA2NAN(+KA2ECR)
347 B- 5-1291
Sun City ARC
K5WPH 545 B- 4-1290
Hubert's Heros
KB5PJ/5* 371 B- 8-1286
Loveland Repeater Assn
W0OSK 538 B-17-1276
Triangle ARC
W4LEN(+KA4PJQ)
306 B-12-1272
Young Raving Idiots
K0YRI 343 B- 3-1254
Wilsonville Wireless Wizards
N4YZ(+KA4GPZ)
311 B- 6-1250
Mt Baker ARC
K7SKW 902 C-43-1246
Goshen Ind ARC
K9TSM 945 C-15-1245
Nassau County ARC
WB2WWP 365 B-35-1236
Upper Valley ARC
N8ED 359 B-10-1230
Saratoga ARA of Redwood School
WB6HIA 366 B-10-1224
Three Rivers RC
WB0HCW 479 B-12-1222
A R Team of Northeast Texas
WA5YVL 410 B- 7-1220
Univ of Sask ARC
VE3US* 238 B- 5-1214
U S Center ARC
N0LL 301 B-12-1212
Michigan Bell ARC
WA8RUF/8 603 B- 6-1206
WR9AMA FD Group
W8KMX/9 481 B- 4-1168
Fairmont Area RC
WB0JAK/0 446 B-12-1168
Pecos Valley ARC
K5WK 244 B- 9-1158
Montgomery ARC
W4AP/4 472 B-10-1144
Montrose ARC
W0INS(+KA0AIA)
274 B- 8-1138
Metter ARS
W4TYM 342 B-10-1114
Rock River RC
W9TCH*(+WD9IGM)
311 B-10-1114
Black Flagers
WD8ODO 243 B- 7-1098
Storm Lake ARC
WB0AVW/0* 389 B-12-1094
El Paso ARC
W5ES 394 B-30-1088
VE3LUG - VE3LUN - VE3LUR - VE3FLP
VE3FLP 258 B- 4-1082
Gonzaga Prep Ham RC
KA7AMN(+KA7AKX)
383 B-15-1072
Pals of WB8NSL
WB8NSL/8 462 C- 3-1068
McKean County ARC
W3VV(+WB3CXC)
254 B-11-1068
Lake Martin ARC
W4AEM 333 B-12-1066
Jackson ARC
W4TM* 301 B-21-1058
IA-MO ARC
KC0V/0* 425 B- 7-1050
Oklahoma City AR & Electronics
WA5ZAA 244 B- 8-1042
Humboldt ARC
N4EH* 1012 C-22-1018
Miami County ARC
W8FW 356 B- -1012
Dekalb County ARC
W4RNX 228 B-12-1010
Western Electric Guilford Center
K4DE 286 B- 6- 994
TEARA
K2RB 202 B- 6- 986
Wilderness Trail ARC
KI4B*(+KA4MZY)
488 B-30- 975
Capilla Peak RFI Assn
K5FSB 773 C- 5- 973
Emerson Electric ARC
W0PEV* 276 B-20- 962
Logan Coalers
WD8IGN* 212 B- 6- 952
West - Com ARC
VE1WRC 333 B-11- 948
Warren County AREC
W0RPK*(+WB0MBZ)
244 B-15- 910
Free State ARC
K3IVO* 354 B- 7- 908
Big Thicket ARC
N5BHB*(+KA5AEK)
227 B-20- 906
MTA ARC
W6CFX 302 B-20- 904
Mesabi Wireless Assn
K0MK* 341 B-12- 900

Ohmless Operators Protection Society
KB8QI 232 B- 4- 898
Wicked Old Losers
WA2WOL/2 280 B- 4- 886
Oak Park - River Forest
WB9SLU* 208 B- 6- 870
East Shore ARA
KB5GX/5 277 B-11- 858
Covington ARC
K4TGU* 225 B-10- 850
Hettwer ARC
WB0SHD 264 B-10- 828
Over the Hill Gang
W7EVI 244 B- 8- 826
Denison ARC
KB0FFT*(+KA0HIG)
184 B- 6- 822
435 Club of South Texas
WA5ZIB/5 282 B- 5- 792
Portage ARC
KB8ND* 190 B- 7- 790
Reeltoot ARC
WA4AID* 233 B-10- 778
Vineyard Amateur Modulating Practically Independent Radio Exciters Society
K1UR/1 189 B- 7- 774
Wheatstraw ARC
WA5IPE/5* 177 B- 3- 754
Coast Cowboys ARC
WD5HER* 261 B- 4- 726
Mid-Range ARC
W0EL 205 B-12- 724
GO ARC
K5GD 252 B- 5- 682
North Shores ARC
K6HAI 171 B- 7- 678
Bismarck ARC
W0ZRT 319 C-10- 632
Chilliwack ARC
VE7AFA/7* 172 B-10- 616
Non-Club Group
WB2INZ* 173 B- 4- 546
Hernando County ARA
K4ZC 95 B-16- 530
Southcentral Conn ARA
W1GB* 174 B-20- 486
Non Club Group
W1EYC 61 B- 3- 348
National Capital A R Rover Crew
VE3SHQ* 117 B- 4- 334

2A - Commercial

Spartanburg ARC, Inc
K4JLA*(WD4RNU)
1138 B-25-3816
Boiled Owls of NY
W2AX/1 1897 C- 9-2737
McDowell ARC
W8LYK 413 B- 7- 826
Knickerbocker ARC
WA2OFG*(+WA2UMW)
112 B- 5- 256

3A - Battery

Tektronix Employees RAC
K7AUO*(+KA7GRV)
1155 A-18-9680
Anne Arundel RC
WJVPR/3(+WB3KIW)
858 A-30-7165
Oakland County ARS
W8TNO(+WD8QJD)
791 A-20-7025
South Mich ARC
W8DF(+KA8JKC)
733 A-55-6660
Ringgold RC
W4ABZ 885 A-22-6575
Williamsburg Area ARC
K4RC*(+KA4IUM)
1197 B-30-4722
Oregon Tualatin Valley ARC
W7XI(+KA7FPP)
1365 B-15-4068
Fusion ARC
W2PU 382 A-11-3950
Lassen ARC
K6SM 385 A-28-3590
Keuka Lake ARA
K2GK(+KA2IJV)
937 B-13-3394
Sweetwater County ARC
WB7AMP 293 A- 7-3285
Tahoe ARA
WB6NQU/7 1139 B-24-3194
West Seattle ARC
W7AW 302 A-12-3100
Santa Clarita ARC
W6JW 713 B-20-2676
Milford ARC
K8YDK 534 B-18-2550
West Volusia ARS
KB4TJ* 258 A-10-2315

Central Oregon QRP
N7AGD 288 A- 5-1970
N.P.A.R.C.
WB8CTC* 169 A- 6-1525

3A

Northern Illinois FD Soc
K9NO(+WD9EJE)
3454 B-12-11,776
Texas DX Society
K5DX(+WB5WHR)
3491 B-22-11,316
Albuquerque DX Assn
N5RR 3074 B-15-10,274
Jones County ARC
W0GN* 1389 B-16-8474
Austen ARC
W5KA 2768 B-100-8244
ARA of the Tonowandas
W2SEx(+WB2WUB)
2390 B-29-8056
Five Flags ARA
W4UC 2930 B-25-7988
B.C.Contest Club
VE7CC/7 2495 B-14-7650
DEC FD Club
W1IS 2290 B-13-7650
Norwood ARC
K1JMR(+KA1DOR)
2234 B-22-7630
Redwood Country Contest Club
AA6DX/6* 2765 B-11-7568
Milford ARC
K8MN 2247 B-26-7254
Delmont ARC
K3SSC(+K3KIU)
2258 B-31-7216
Stockton ARC
W6SF*(+KA6FYB)
2251 B-80-7038
Jackson ARC
W5PFC(+KA5IHK)
2478 B-27-6578
Southern Peninsula AR Klub
N4DJ(+KA4INB)
1754 B-35-5936
Cherryland ARC
W8GI(+KA8HIB)
1892 B-35-5880
Syosset High School AR and TV Club
WA2JAS 1797 B-18-5842
St Charles ARC
KØBM(+WBØVEL)
1804 B-27-5804
Pikes Peak RA Assn
NØDV*(+KAØGFA)
1807 B-60-5678
High Freq's of Arizona Contest Club
WB7DDQ/7(+WA7NIY)
1931 B-12-5664
Southeastern DX Club
W4NT 2095 B-18-5594
Gopher Creek Group
VE4GF 1468 B-18-5510
Old Barney ARC
N2OO(+W2INN)
1642 B-30-5504
Shreveport ARA
K5TL(+KA5EST)
1481 B-94-5472
Southern California Amateur Transmitting Society
WB6LRU(+KA6CUC)
2344 B-21-5418
Johnson County RAC
WØERH(+KAØCRT)
1672 B-35-5346
Litton Data Systems ARC
K6FM(+KA6EGA)
1778 B-24-5300
Trident ARC
N4EE* 1709 B-63-5290
Surrey ARC
VE7AVM/7*
1814 B-14-5180
ARINC ARC
W3ZH 1740 B-16-5082
Old Natchez ARC
K5OCM(+N5AVN)
2211 B-19-5048
Azalea Coast ARC
K4UWH 1619 B-15-5008
Santa Barbara ARC
K6TZ(+WA6DQK)
1621 B-51-4944
Westpark Radiops
W8VM 1460 B-16-4922
Mississippi Coast ARA
KE5X(+KA5GVG)
1978 B-45-4878
Allen Country ARC
Technical Society, Inc
N9GT/9(+N9BAC)
1675 B-22-4770
Laurel ARC
W5VKR/5 1844 B-32-4768
Platinum Coast ARS
N4IN(+WD4NRF)
1663 B-26-4746

Citrus Belt Amature RC
W6JBT 1420 B-12-4620
New Providence ARC
K2JV/2(+KA2CBB)
1189 B-23-4572
Big Island ARC
KH6B 1798 B-24-4538
Bellflower ARA
WA6SFM/6 1313 B- 6-4528
Billerica ARS
N1RR(+WB1GST)
1249 B-26-4468
Hughes Fullerton Employee Assn ARC
K6QEH 1307 B-18-4456
Northern Ill Contest & Drinking Society
KØHV 1436 B- 7-4420
Saline County ARC
N5EL 1367 B-27-4334
MARCOM
K3CZ 1124 B- 9-4330
Douglas County ARC
KØRW 1469 B-30-4324
Too Hi Field Day Party
KB7G 1351 B- 5-4288
Idependant FD Club
NØII 1293 B-18-4118
Redwood Coast ARC
W6OS 1267 B-10-4116
Blossomland ARC
W8MAI 1125 B-50-4106
Utica ARC
K2IQ 1393 B-20-4086
William Penn RC
W3FPC 1200 B- 8-4080
Springhill, La ARC
N5II(+WD5GLG)
1547 B-13-4070
Albany ARES/RACES
KB2CV/2(+WB2TDG)
1173 B-11-4046
Great South Bay ARC
K2QD(+WA2HTC)
1189 B-24-4016
Huntington County ARC
W9EI(+WD9FSM)
1096 B-15-3976
South Georgia ARC
WD4LRD*(+WD4ERN)
1289 B-20-3970
Delaware - Lehigh ARC
W3OK* 1542 B-22-3950
Goose River ARC
WØPU 1300 B-13-3948
Poway ARS
N6QQ 1298 B-30-3916
Broward ARC
W4AB 1124 B-43-3882
Acton-Boxboro ARC
W1EKO(+KA1EEI)
1010 B-25-3872
Raleigh ARS
W4DW/4*(+KA4OXQ)
1097 B-25-3850
Estero ARC
W6KW* 1011 B-16-3790
Brainerd Area ARC
ADØS/Ø*(+KAØATL)
1213 B- 4-3780
Arrowsmith ARC
VE7EMO/7 1059 B-20-3750
Enfield RA Group
N1SR(+KA1CEB)
1142 B-18-3708
Alvin Community College ARC
K5IW(+KA5DGR)
1392 B-20-3706
Twin City Hams
W5EAI(+WD5EAE)
1084 B-25-3612
Communications Club of New Rochelle
W2XV/2(+KA2FHC)
1104 B-35-3592
Harry Diamond Lab RC
K3TC 1013 B-11-3576
Arlington ARC
N4GA/4 1253 B-20-3572
Quad City ARC
N9OK(+KA9HNR)
935 B-21-3542
Saratoga RACES
AG2X(+KA2EXY)
1114 B-22-3540
St Louis ARC
KØLIR 1101 B-17-3424
Middle Country ARC
W2WW(+KA2EMH)
871 B-13-3418
VE2CVR
VE2CVR/2 877 B-12-3388
Des Moines RA Assn
WØAK(+KAØINB)
1084 B-15-3358
C.W.I., Group
W9WI 933 B-12-3344
Elkhart Red Cross ARC
AD9V 1020 B-10-3314
Lapeer ARC
K8PW/8(+KA8FIE)
1184 B-24-3302
Kankakee ARS
W9AZ* 836 B-22-3272

Redwood Empire RA
KD6DM 1269 B-11-3264
Waterton ARS
WØNT*(+KAØHHB)
1170 B-14-3260
Wis Rapids ARC
W9DQA/9 1357 B-27-3246
Bethel AR Klub
KD8M 1106 B-18-3246
Chemung Area AR Ops
N2HG/2(+KA2ETD)
1041 B-30-3244
Muscle Shoals ARC
W4JNB 1069 B-12-3242
Grayson - Fannin ARES
KD5G(+WD5JCF)
838 B-12-3234
Pennsylvania ARC
WA3RCA/3
1042 B-20-3214
Moosehorn ARC
KL7IEJ*(+WL7AED)
1287 B-18-3184
Casper ARC
W7VNJ* 959 B-25-3166
Champlain Valley ARC
W2UXC 980 B-25-3154
Humboldt ARC
N6XT 1098 B-20-3128
Club AR Sud - Quest, Inc
VE2CEV 975 B-15-3100
Gabilan ARC
N6LW 1034 B-18-3088
Calgary ARA
VE6NQ 886 B-36-3060
Great Falls Area ARC
N7AGP/7(+KA7ATB)
956 B-25-3028
Coastside Amature RC
WA6TOW*(+KA6IND)
1262 B-18-2976
Magilla's Gorillas
KB2MG* 1045 B- 7-2952
Central Georgia ARC
AA4WS(+KA4KAN)
822 B-17-2948
Band Dit-Dahs
K2UW 887 B-13-2942
Bedford County ARS
K3NQT 830 B-12-2896
Mon Valley ARC
KA3DJM/3*(+KA3CQA)
1111 B-10-2896
Newport County RC
W1SYE/1 948 B-12-2886
Smoky Mountain ARC
W4OLB/4(+WA4CNW)
964 B-24-2876
Tri-Town RAC, Inc
W9VT(+KA9FSK)
881 B-60-2872
Centerville ARS
K8XY 863 B-20-2866
Irving ARC
WC5KF 961 B-43-2830
Wellend County ARC
VE3WCA/3* 811 B-16-2822
Fulton County ARC
W9JOO 711 B- 5-2794
Greater Norwalk ARC
N1II 814 B-10-2792
Green Country Chapter 10-10 Net
W5NNL(+KA5EKA)
938 B-16-2788
Vero Beach ARC
W4OT 1021 B- 8-2722
Pioneer ARC (Ottawa)
VE3NA 755 B-15-2700
Allegany Highlands ARC
W2SAM(+KA2HJC)
765 B-15-2692
Valley RC of Eugene
W7PXL 812 B-14-2656
Detroit Metropolitan RC
W8UMI 814 B-10-2624
Green Mountain Wireless Soc
N1VT(+WB1HHH)
1025 C-25-2562
Briar Patch Mtn ARC
N4VL 1046 B-15-2504
Falls Radio Amateurs
K9RHH(+KA9IGC)
914 B-20-2488
Lehigh Valley ARC
W3OI* 911 B-14-2484
Virginia ARA
W4FEG(+KA4ELQ)
761 B-11-2472
Tri-County ARC
W9MQB 700 B- 8-2428
Shiawassee ARA
WB8QQG*(+WD8JJM)
811 B-15-2404
Copper Country RA Assn
W8CDZ 447 B-20-2392
Southern Oregon ARC
K7LIX*(WB7UGU)
576 B-15-2384
Bluff ARC
WDØAXV* 805 B-10-2372
Delta County ARS
K8ZAS 655 B-15-2364
Piqua ARC, Inc
W8SWS 852 B-20-2330

NRL ARC
W3NKF/4 854 B-19-2328
Hyland Communications Assn
WA1LGQ 752 B-15-2316
Blue Ridge ARS
W4NYK 599 B-15-2306
Moose Jaw ARC
VE5MA* 624 B- 8-2294
Middletown Dial RC
W8BLV*(+N8AFU)
547 B-15-2282
Island County ARS
W7PN* 605 B- 8-2280
Wilderness Ham-Radio Operators
K@SG(+WB@TND)
610 B-10-2272
PHD ARA
WA@UGU 753 B-31-2268
Colonial Wireless
N1AU* 618 B-15-2252
North Suburban Wireless and North Star Hibanders
K@WH 750 B-15-2250
Southwest Missouri ARC
W@EEE 766 B-31-2242
Intercity ARC
W8WE 574 B-26-2230
S.L.M.A.R.A.
K8JM*(+KA8IBK)
693 B-20-2218
Muskegon Area Amateur Radio Council
W8ZHO(+KA8IOO)
737 B-30-2212
Kings County Repeater Assn
K2GJ* 704 B-34-2210
Northern Colorado ARC
W@UPS 733 B-12-2206
Old Post ARS
W9EOC 796 B-30-2204
Port City ARC, Portsmouth, NH
W1WQM(+KA1EEF)
526 B-15-2196
Catalina RC(Hughes Aircraft)
K1TU/7(+KA7BXA)
636 B-20-2168
The Staten Island ARA
W2CWW/2 611 B-15-2164
Lake Country ARC
AE5B/5 644 B-14-2142
Pocono AR Klub
W3PM 711 B- 8-2134
Southington ARA
W1ECV 728 B-15-2124
EDD ARC
N6SU 623 B- 6-2122
Rogers County ARC
N5TM* 666 B- 8-2108
Dufferin ARC
VE3FS 657 B-14-2106
High Plains ARS
N7CG*(+KA7GQM)
641 B-18-2062
Oakville ARC, Inc
VE3HB/3 592 B-10-2050
Ashtabula County ARC
AI8S(+KA8HLY)
859 B- -2018
Great Bay RA
WB1CAS 646 B-20-2010
Highknobbers
W3JW/8 835 B-12-1998
South Huron ARC
VE3DAR 553 B-10-1978
East Kootenay ARC
VE7IP* 759 B-12-1970
Minn Valley Hammers
K8@HN* 641 B-13-1964
Wantagh ARC
W2VA(+KA2JEU)
587 B-15-1938
North Bay ARC
VE3NBC 749 B-29-1902
Lincoln Trail ARC
WA8EJ 581 B-24-1896
NW Arkansas ARC
K5AS(+KA5EVR)
444 B-22-1894
Pawtuxet Valley Group
W1GOG 387 B-15-1880
Murphy's Radio Class
W6MK 638 B-132-1854
St Cloud RC
W@BF 483 B- 6-1842
Mankato Area RC
W@WCL/@(+KA@EEK)
499 B-15-1830
Pioneer ARC
W@RCH 446 B-20-1828
Limestone ARC
K4KJO 368 B-12-1804
North Hills ARC
N3MB 558 B-19-1774
Chattahoochee Valley ARC
KY4H 739 B- -1756
10/70 Repeater Assn
K2TK/2 1081 C-28-1742
Winnipeg ARC
VE4BB 428 B-1720
Oroville ARS
W6AE* 628 B- -1720
Rockport Area Hams
WB5OLT 401 B-10-1714
Qanville ARS
W4XQ/4(+KA4KEG)
534 B-10-1712
Austin Area ARC
W@AZR/@* 615 B-22-1694
Hilton ARC
W2CXV 550 B-10-1688
Cochise ARA
KB7ND 545 B-12-1686
San Mateo RC
W6LMN 426 B-32-1686
Parland RC
VE5PRC* 518 B-10-1680
Southern Counties ARA
K2HR 586 B- -1676
Non-Club Group
KB8RC/5 515 B-16-1672
Shuswap ARC
VE7GK 424 B- 8-1670
Argonne ARC
W9QVE 318 B-12-1670
Kenton ARC
W8VMV 685 B-15-1668
Hodges RC
WA5BXO 530 B-11-1662
Tri-County ARC
KB@CC(+KA@ILO)
446 B-10-1650
Non Club Group
WA5INR 421 B- 3-1644
Bowie ARC
N3GR 276 B- 7-1616
Lincoln County ARC
K7PG 551 B- 9-1604
River City ARCs
KE6F 495 B-11-1598
Harvard FM Repeater
K1LOG 446 B-21-1598
Williamson County ARC
KA5T 435 B-12-1598
Adirondack ARC
K2KO(+KA2BIX)
322 B-16-1588
Petaluma DX and Experimenter Society
WB6EGE/6(+KA6AHK)
572 B-12-1586
South Bay ARA
K6OI 421 B-26-1578
Ashby Radio Group
N1ATA* 541 B- 3-1568
Santa Clara Co ARA
W6UW 578 B-15-1552
Hannibal ARC
W@KEM(+KA@FAI)
466 B- -1550
Grays Harbor ARC
W7ZA 576 B-10-1538
North Texas Turkeys
KE5T* 472 B-12-1478
Atchison Radio Amateurs
W@BEV 421 B- 5-1458
Harlan Co ARC
K54K 384 B- 7-1440
Bay Area ARC
K8KUI 377 B- 8-1434
Algonquin RC
W1BK*(+K1ZFH)
436 B-15-1434
Adams & Brown ARES
KA8EKH 339 B- 3-1432
Thumb ARC
W8AX/8* 431 B- 6-1424
5LURP
KB8TG*(+W8SMD)
486 B- 8-1410
Lakes Area ARC
N5BJ 454 B-12-1396
Desert Waves ARC
WA6HRE/7 397 B- 7-1396
Totem ARC
VE7ES/7* 334 B-10-1394
Chas E Newton ARC
K4HYB 432 B-10-1390
Matanuska ARA
KL7JFU 427 B- 8-1390
Burnaby ARC
VE7BAR 719 C- -1378
Non-Club Group
N2VW 409 B- -1378
Dillon City ARC
WD4EDM/4(+KA4JRB)
455 B-12-1364
3M ARC
WB@BQG/@ 528 B-11-1356
Athens ARC
W5CR* 387 B-10-1356
Monsanto ARA
WB@BBN -414 B-10-1344
Non Club Group
N8GM 407 B- -1342
Alamo DX Amigos
WB5ZKO 387 B-18-1336
Emporia ARS
KC@U* 280 B- 8-1318
Lewiston-Clarkston ARC
W7FM/7* 1013 C- 7-1313
West Essex FD Group
K2AJV(+KA2FNV)
255 B- 5-1292
Libby AR Klub
WA7PDC/7 232 B- 7-1286
Jamestown ARC
W@FX 346 B- 9-1272
S A R C
VE5AA 361 B- 7-1264
San Fernando Valley ARC
W6SD 626 B-10-1252
Jefferson County ARC
KA2H* 420 B-10-1240
Defiance County ARC
K8WON* 283 B- 5-1234
Newriver Valley ARC
K4BFO* 309 B-10-1224
Sturdy Memorial Hospital ARC
K1ZZJ 787 B-13-1214
Carson ARC
KB6GN/6*(+WB6ROQ)
360 B-12-1212
North Peninsula Electronics Club
W6PMK*(+KA6ISK)
262 B-12-1204
Tri-County ARC
KB5OU 255 B- 3-1178
Rockbridge ARC
WD4RIE(+KA4NAW)
375 B-10-1170
Lilac City Radio Amateurs
K7YY 497 B-11-1162
Colorado State Univ ARC
W@QEY 547 C- 8-1147
Over The Hill Gang - Ruston Area ARC
W5WG 464 B-12-1142
Easton ARS
WA3GVI(+KA3DWG)
536 C-13-1131
Collier County ARC
WB4ZEU* 263 B-23-1122
Shy-Wy ARC
W7FT* 304 B- -1108
East River ARC
W8MOP/4*(KA4OCP)
253 B-15-1108
Clinton Co VHF ARC
K9DQS* 228 B- 8-1098
The Farout ARC, Kettering, OH
WB8SMC(+WN8NTY)
241 B-14-1091
Walla Walla RAC
W7DP(+WA7LKF)
292 B- 9-1066
Non Club Group
WA8WPJ/8 338 B- 4-1026
Indian Foothills ARC
WB@WMM* 273 B-11-1024
Telephone RA Pioneer Society
W3ILC 250 B-14-1000
Loyalist City ARC
VE1LC/1* 228 B-10- 980
Steele County ARC
WB@HKG 194 B-12- 972
Crawford County ARC
WA9ISV/9 467 C-15- 965
Non-Club Group
K2HE 531 C- 9- 951
Key West ARC
W4LLO(+WD4KUL)
174 B-11- 950
Fargo Repeater Assn
W@ILO/@ 173 B-12- 946
Hurtin' for Certain RC
K1DII 246 B-11- 938
The Ordinary Dudes
WB5MJK 227 B- 3- 938
Valley of the Moon ARC
WB6DWY(+WD6BOR)
246 B- 6- 916
Northeast Ala ARC
KA4CXI 307 B- 6- 914
Skyview RS
K3MJW/3 219 B-13- 914
Chicago ARC
W9CAF 224 B-15- 908
Non-Club Group
AD7F/7* 244 B- 6- 888
Non-Club Group
WB2PKV/2 463 C- 4- 876
Hams of Western Labrador
VO2WL 218 B- 4- 860
Flathead Valley ARC
K7LYY*(+KA7HXY)
213 B-10- 860
Quaboag Repeater Assn
WA1ORT* 172 B-10- 844
Cedar Mtn ARC
W7PT* 249 B- 3- 798
National Trail ARC
K9UXZ* 180 B- 9- 798
Ozone ARC
WD5CCC(+WD5GNT)
136 B-17- 794
Jefferson Barracks ARC
K@ZFK 193 B-13- 786
Shawano Area Amateurs
WA9BZW* 358 C- 5- 758
Clear Creek ARS
W@NPO 122 B- 9- 744
Elmwood Park ARC, Inc
K9YHB/9* 163 B-10- 734
Benicia ARC
WD6BBI* 109 B- 8- 730
Jackson County ARC
KE8T* 212 B-10- 724
Brush Country ARS
KC5L 196 B- 7- 692
George Lambertson ARC
W4MQV* 176 B- 9- 690
Oggdensburg ARC
WA2UIR 104 B-11- 666
Gulf Area YL Klub
K5SKF 295 B-10- 654
East Texas ARA
N5BBC 324 B- 8- 648
Tri-City RAC, Inc
W@VQN* 248 C-30- 648
Hardee AR Operators
W4MMU* 67 B- 6- 644
Ebonaire ARS
W2HJV 159 B-12- 618
Bloomington ARC, Inc
W9INL 74 B- 7- 574

3A - Commercial

Central Jersey AR Group
N2FC 619 B-15-2032
Loudon County ARC
W4WVJ 401 B- 6-1042
Tu-Boro RC
W2BMW* 328 B-21- 678
A G Bell Pioneer RA
W3CCW/4 264 B- 4- 614
Alameda County RC
K6CSL/6 192 B- 6- 516

4A - Battery

Beach Cities Wireless Society
K6ZP 962 A-16-8115
North Shore ARC, Oshawa, Ont
VE3NSR 671 A- 38-7410
Associated Amateur Wireless Society
N9TW/9 456 A- 7-5010
Lower Columbia ARA
W7DG 431 A-25-4075
Fort Armstrong Wireless Assn
AB3Q(+K3FOW)
500 A-10-3925
Naval Postgraduate School ARC
K6LY*(+KA6EUQ)
1007 B-25-3258
Non-Club Group
K9HZS(+N9BBW)
953 B- 8-2940
Wexaukee ARA
WA8IPJ 358 A-10-2740
Kansas Nebraska RC
W@TQ* 373 B- 6-1636

4A

Palo Alto ARA
K6YT(+KA6IZZ)
4863 B-46-14,472
Foothills ARS
K6YA/6(+WD6CIO)
4563 B-43-13,684
Natchaug ARC
W1TR(+KA1D5X)
3341 B-35-10,084
Poughkeepsie ARC
W2RI(+KA2DMW)
3159 B-45-10,004
Nashua Area RC
K1HI/1(+KA1BBI)
3133 B-30-9494
Kettle Moraine Radio Amateurs
W9HE* 2489 B-25-8164
Alamance ARC
K4EG(+KA4NBT)
2797 B-37-8060
Cherryville Repeater Assn
K2NJ(+KA2HOL)
2332 B-31-8056
AR Transmitting Society, Inc
W4CN 2088 B-40-6700
Carthage ARS
N@ES(+WD@DDU)
1660 B-19-6588
Northern Ohio ARS
K8KRG(+KA8IYM)
2014 B-150-6486
Ozaukee RC
W9LO(+KA9DDN)
1782 B-24-6356
Metuchen YMCA RC
K2YNT(KA2DXT)
1987 B-45-6344
Northwest ARC
W9LM(+WB9PTA)
1868 B-35-6252
Ampex Employees ARC
K6QEZ* 1632 B-14-6188
Ottawa ARC
VE3RC* 1789 B-30-6162
Midsouth VHF Assn;
Raleigh Club; Midsouth ARA
KA4P/5(+KA4OAW)
1882 B-100-6060
Columbia ARC
W4PT/4 2133 B-30-6060
Palomar ARC
W6NWG(+WD6FWE)
2369 B-22-5998
Joliet ARS
W9OFR 1772 B-23-5856
Gwinnett ARS/Scientific-Atlanta ARC
N4TM(+N4CUJ)
1374 B-23-5646
Arizona ARC
W7IO/7(+WB@URY)
2028 B-50-5588
Salem ARC
W7SAA* 1714 B-60-5572
Genesee R A
K2OS(+KA2GOH)
1732 B-50-5412
Hopatcong Emerg Radio Operating System
KD2I(+KA2GNF)
1847 B- -5328
Rochester ARC
W@MXW*(+N@BCB)
1521 B-50-5294
RCA Astro Electronics ARC
WB2JQR(+KA2IMR)
1514 B-20-5294
Inter County ARC
W2DMM 1803 B-17-5220
Reading Radio Club
W3BN(+KA3BHQ)
1657 B-30-5060
Riverside County ARA
W6TJ(+KA6JPF)
1846 B-18-5054
Garland ARC
K5QHD 1976 B-40-5028
Broome County Allstars
N2HR 1553 B-28-5026
Cowichan Valley ARC
VE7CVA/7*
1522 B-22-4984
Raritan Bay Radio Amateurs
K2GE/2(+KA2JBI)
1246 B-25-4958
Warminster ARC
K3KT(+KA3ETE)
1441 B-30-4942
Elgin ARS
W9IKN 1520 B-23-4908
Chesapeake Bay RA, Inc
WA3SFJ*(+KA3CQE)
1391 B-26-4776
Central Michigan ARC
W8MAA/8 1311 B-25-4722
Reservoir ARA
K8MP(+KA8IAI)
1402 B-30-4718
Fullerton RC
W6ULI 1501 B-35-4578
West Ga Radio Society
N4DX 1315 B-15-4468
K.V.A.R.C.
W@CET(+KA@BNL)
1650 B-50-4390
Irwin Area ARA
WB3JSI 1384 B-21-4346
Orange Park ARC
K4SP/4 1396 B-15-4326
Antotook ARA
K1JK(+KA1ENL)
1336 B-22-4292
Pilgrim Amateur Wireless Assn
K1BL 1637 B-21-4290
Maryland Mobileers ARC
K3WD 1509 B-16-4288
Albany ARA
K2CT 1457 B-35-4280
Midland ARC
W8KEA*(+KA8HUY)
1371 B-14-4190
Boeing Employees ARS
K7NWS/7(+WB7TUU)
1431 B-35-4096
Suffolk County RC
W2DQ(+KA2GAJ)
1265 B-14-4062
Parkersburg AR Klub
K8UC(+WD8QHN)
1135 B-18-4020
Sioux Falls ARC
W@ZWY(+KA@HZW)
1156 B-40-4016
Peel ARC, Inc
VE3PRC 968 B-14-3970
Columbus ARC
K4KS*(+KA4CHA)
1382 B-20-3938
Martin County ARA, Inc
K4ZK 1408 B-37-3928
Branch County ARC
WD8KAF* 1472 B-23-3890
North Bay ARA
K6LI 1153 B-16-3884
McDonnell Douglas St Louis ARC
WA@CGV/@*(+KA@ACI)
1280 B-28-3862
Greensboro-Guilford Co ARES
N4XB 1222 B-41-3808
Lake Geauga ARC
N8BC 1201 B-14-3760
Whitman ARC
W1XE(+K1TZC)
920 B-10-3754
Pasadena RC
W6KA 1427 B-25-3754
Central Valley RC
W6OV 1184 B-15-3690
Otter Creek Repetiion
W5KI 957 B-15-3658
McHenry County Wireless
K9XI(+KA9FHL)
1309 B-30-3634
Hazleton ARC
W3SJI(+KA3CAU)
942 B-25-3622
Auburn ARA
W2PI/2 821 B-20-3522
Middle Tennessee ARS
W4UOT/4 1017 B-25-3520
Livingston AR Klub
K8PJ(+KA8IHB)
930 B-12-3488
Van Wert ARC
W8FY(+KA8KEQ)
1174 B-28-3446
South Bay AR and Southern District ARES
K6QHQ 688 B-16-3434
St Clair ARC
K9GXU 880 B-18-3414
Two Rivers ARC, Inc
W3OC 1060 B-23-3406
Yuba-Sutter ARC
N6DM 1378 B-30-3358
Marshall RC
W@BMJ(+KA@IER)
1141 B-32-3346
Cascades ARS
WB8CSQ 887 B-15-3336
Algoma Amateur RC
VE3SOO* 994 B-15-3332
Everglades ARC
W4SVI(+KA4GHH)
618 B-17-3306
Rio Hondo ARC
W6GNS 1365 B-50-3294
Rock Creek ARA
K2TM 981 B- 7-3246
B.R.A. & P.A.W.A.
K1ME 1138 B-25-3214
Miami County ARC
K9ZEV(+KA9GZY)
866 B-12-3202
Muncie Area RC
K9NN/9(+N9AID)
989 B-22-3184
York RC, Inc
W9PCS/9 1124 B-18-3178
General Dynamics Rec Assn, RC/Ft Worth
*AK5R 1045 B-26-3162
Peoria Area ARC
W9UVI/9 1085 B-15-2994
Monessen ARC
W3CSL/3* 911 B-26-2928
Bluegrass ARS
K4KJQ 985 B-30-2888
Chippewa Hills ARC
W8ZKL 957 B-20-2794
Falmouth ARA
W1HQH*(+KA1CYT)
730 B-15-2774
Northern Ky ARC
K4CO 821 B-10-2768
Big Rapids ARC
K8SF 955 B- 9-2768
New Bern ARC
WD4JMS(+KA4AFE)
791 B-25-2768
Marin ARC
W6SG/6 794 B-15-2758
Central Oregon RA
K7TO/7 934 B-14-2722
Elkgrove ARC
WB9FZN(+KA9GEW)
828 B-14-2688
Waupaca ARC
AI9K 772 B-16-2662
Central Massachusetts ARA
W1BIM*(+KA1AZF)
765 B-22-2618
South Waterloo ARC
VE3SWA 887 B- 9-2616
Milwaukee RAC
W9RH*(+WB9QIE)
798 B-33-2612
West Jersey Radio Amateurs
W2JUG(+WA2QJI)
739 B-16-2582
Chelmsford ARA
W1LUS 685 B-10-2548
Staten Island AR Communicators
KA2CUS 830 B-16-2530
Seneca RC
W8ID/8 1056 B-12-2512
Confederate Signal Corps
W4VTA 989 B-34-2504
Lincoln County AR Operators
W@VH* 811 B-15-2456
Rowan ARS
W4EXU/4(+KA4ODX)
1639 C-25-2442
San Juan County ARS
K7EQ 648 B-35-2400
Non-Club Group
K5YM/5 837 B- 6-2390
Thornhill RAC
VE3RAT 930 B- -2348
Michigan City ARC
W9CSF/9 545 B-21-2336
O.M.I.K. Electronic Assn
W8DWJ(+KA8JQG)
678 B- 6-2284
Longview ARC
K5LC(+KA5GGH)
792 B-25-2214
Walton Hills ARC
WD8IRE 662 B- 7-2200
Iolani School ARC
KH6IFY 605 B-10-2184
Rogue Valley AC
W7OEK(+KA7EOQ)
524 B-30-2174
Sourland Mountain ARC
K2WM* 565 B-10-2096
Escondido ARS
N6WB 1059 C- -2095
Panorama Land ARC
K7DU 530 B-10-2038
Fredericton ARC
VE1ND 643 B-20-2012
South East ARC
W6LKO 705 B-12-1958
Uvalde Area ARC
W5TTW(+KA5FPX)
660 B-10-1950
Juniata County ARC
K3DNA 800 B-23-1896
Okaw Valley ARC
W9ATS 478 B-11-1892
Beckman Employees ARC
KB6AV 611 B-13-1820
Gratiot ARA
W8AWE 561 B- 7-1802
Sugar Creek Repeater Assn
WD9DRM* 555 B-13-1734
Abinaton ARC
AC3O* 611 B-16-1690
Albert Lea Spiderweb ARA
W@FIT 483 B-17-1686
Stoughton Civil Defense Comm Group
W1WSN 551 B- 8-1662
Egyptian RC
W9AIU 415 B-14-1656
Hope Valley Repeater Assn
KA1EE 477 B-45-1654
Hendricks County Ham Club
AE9R(+N9AIM)
401 B-15-1646
Columbus ARC
WA9LCM* 489 B-11-1642
Brazos Valley ARC
N5HF*(+KA5GLJ)
664 C-22-1628
Southwest Research Center ARC
K5KS* 744 B-10-1588
ARC of Central Wisconsin
K9FYM*(+KA9GAT)
473 B-10-1586
L'Association Radio-Amateur De La Mauricie, Inc
VE2MO* 327 B-18-1550
Pike County ARC
W9CZH* 336 B- 7-1534
Harmonic Hill Radio League
W2AAD 528 B- 9-1508
Mid Michigan ARC
N8ARI 468 B-25-1504
Pucatello ARC
WA7PWT(+WB7ECB)
383 B-15-1502
Crescenta Valley RC
W6HS 365 B-15-1458
Emmett ARS
WB7FDM* 255 B-13-1412
Nevada County ARC
K6VP*(+KA6KAO)
319 B- 8-1388
Squaw Island ARC
WA2VUB(+WA2YTM)
389 B- 9-1386
Ft Dodge ARC
W@UL* 339 B-10-1378
Teays ARC
K8ABI*(+KA8IGM)
325 B-20-1352
Pilot Knob ARC
W@NYG*(+KA@DOP)
339 B-15-1330

Lisa, KA3AQF and George, WB3FKQ, on 40-meter ssb with the Murgas ARC. K3YTL. (10A).

The hand-crank generator supplies the power for the natural-power QSOs for the Adams County ARS, KB3JA (6A).

Gene (left), N2BIM and Dan, WA2GZB, anticipating the start of FD '80 with the Sussex County ARC. N2WM (2A).

6 Pack ARC
W9GPR/9 366 B- 5-1232
Ambassador ARA
WB6ZOT/6 363 B- 4-1226
Porter County Amateur Club
N9RD* 400 B-25-1200
Prince Edward Island ARA
VE1PEI/1 672 C-20-1177
Hot Springs ARC
WA5BRF* 310 B-20-1146
Chattooga & Walker County
AC
KX4C 280 B- 9-1086
North Franklin ARS
WB2QCM* 453 C-20-1084
Golden Empire ARS, Inc
W6NHC* 321 B- 6-1084
Mountain ARC
WA4OBL 268 B-10-1080
Grady/Caddo ARES
WD5GLO(+WD5IRL)
198 B- 6-1058
Green Fox RC
KA9CVE* 178 B- 7-1058
N E Indiana ARC
W9MDC(+WD9IKW)
257 B-10-1057
Catalpa & Hazel Park RCS
W8CW 321 B-10-1048
Tri-County ARC of W Tenn
KW4V* 185 B-10-1044
Anderson County ARC
W5ORW 193 B-12- 890
I.S.R.A. Boise Chapter/
Construction Group
WB7PFQ*(+KA7AED)
169 B- 6- 874
Eagle Rock ARC
KA7DOU* 316 C- 6- 716
VE2ERO
VE2CRO 151 B-12- 702

4A - Commercial

D.A.R.D.S.
K9IJ/8 857 B-10-2218
Greater Lawrence AR
Fellowship
AG1U 677 B-16-2022
Patoka Valley ARC
W9NSO* 561 B-12-1762
Keowee-Toxaway ARC
AC4Q* 558 B-14-1736
Fountain County ARC
WD9FML 333 B- 9-1112
Edina West RC
WB0IVR* 286 B- 8- 642
Black Diamond RC
KD8X 235 B- 6- 470

5A - Battery

Stark RTTY Group
WB8RVM 761 B-26-3066
Las Vegas RAC
K7UNF 660 B-20-2118

5A

United RAC
K6AA(+KA6AAA)
4001 B-30-12,100
Western ARA
N6ME(+KA6JDS)
3734 B-40-11,388
Ak-Sar-Ben ARC, Inc
W0EQU(+WD0EWH)
3806 B-50-10,568
Birmingham ARC
W4CUF(+KA4OCR)
3667 B-68-9844
Schaumburg ARC
W9TK(+KA9FUG)
2897 B-35-9660
Frankford RC
N3RD 3033 B-20-9430
Oak Ridge ARC
K4PJ* 2778 B-53-8930
Hamfesters ARC
W9AA*(+KA9EDH)
2464 B-40-8168
Portsmouth ARC
W4POX(+KA4MPR)
2784 B-38-8122
Chicago Suburban RA
K9BY*(+KA9EPY)
2864 B-55-8102
Schenectady ARA
K2AE(+KA2ICP)
2329 B-23-7906
Eastern Connecticut ARA
K1MUJ(+WB1EAT)
2305 B-18-7672
Wayne AR Technical Soc
WD8LLD(+KA8KFU)
2377 B- -7444
Providence RA
W1OP* 2407 B-17-7084
Nevada ARA
W7YN(+KA7IDF)
2083 B-20-6618
Saginaw Valley ARA
K8DAC(+KA8ETH)
1904 B-33-6572
Anaheim ARA
K6SYU(+KA6BM7)
2126 B-35-6532
Northern Ohio DX Assn
K8CW(+KA8AKL)
1879 B-21-6524
Lake County ARA
K8BLJ/8(+KA8IPX)
1977 B-17-6514
Lincoln ARC
K0KKV/0 2191 B-30-6500
Ramapo Mtn ARC
WA2SNA* 2023 B-20-6482
South Peninsula ARK
W6CB* 2306 B- -6466
Monroe County Radio
Communication Assn
WA8MTX* 1871 B-28-6170
RASON
AI1D 1604 B-20-5778
Sub Sig ARC
K1WEW(+KA1DOP)
1709 B-25-5778
Capeway RC
K1VV 1595 B-25-5754
South Orange ARA
W6TM 2070 B-26-5658
Boling Brook ARS
W9JI 1501 B-23-5286
Livermore AR Club
W6CA 1405 B-15-4706
Radio Central ARC
K2VL 1419 B-45-4660
Fort Smith ARC
W5ANR 1556 B-26-4660
Fort George ARC
VE7FG 1414 B-17-4624
Polk County Civil Defense
ARC
W4TJM* 1347 B-25-4620
Scottsdale ARC
K7TR(+KA7AFW)
1373 B-30-4488
Umpqua Valley RC, Inc
AJ7X(+KA7AID)
1476 B-15-4290
Silver Springs RC
N4FY(+WD4DBK)
1224 B-16-4146
Delaware Valley RA
W2ZQ 993 B-40-4058
Chelsea Communications Club
AI8X 1548 B-14-3936
Kalamazoo ARC
W8VY(+WD8OEP)
1305 B-30-3798
Stu Rockafeller ARS
W8NJH(+KA8HET)
1257 B-21-3530
Santa Cruz County ARC
K6BJ(+KA6KQI)
1069 B-16-3406
Marion ARC
K8BU(+KA8CNC)
708 B-41-3286
Chestnut Hill RC
K1WW 1127 B- 8-3232
Framingham ARA
W1FY 922 B-20-3224
Foxboro Company ARC
W1XA 953 B-20-3218
Harrisburg RAC
W3JU 783 B-50-3178
Silverado R S
W6CO 956 B-15-3152
Tulsa Repeater Org
W5OK 996 B-24-3120
Fox River Radio League
W9CEQ 1214 B-40-3090
Toledo RAC
W8JI 874 B-18-3050
Tri-County RA
W2LI 919 B-25-3010
ARC of El Cajon, Inc
WA6BGS(+KA6INL)
1056 B-19-2992
Wayne County ARA
K4CYP 1056 B-35-2986
Western Carolina ARS
W4MOE(+KA4KLJ)
843 B-15-2920
Salem County ARC
K2IYO 797 B-14-2910
Willmar Area E.A.R.
W0SW 999 B-10-2878
Massasoit ARA
W1MV(+KA1EWT)
682 B-25-2848
Vintage Radio Group
N6VY 812 B- 5-2838
Wellesley ARS
W1TKZ(+KA1EAQ)
663 B-21-2836
Nutley ARS, Inc
W2GLQ*(+KA2ILD)
840 B-23-2788
Shasta Cascade ARS
KJ6R*(+KA6FXF)
639 B-50-2658
Iredell Co ARS
N4QG*(+KA4HPW)
639 B-14-2632
Spokane Dial Twisters ARC
K7LRD 920 B-31-2602
Nittany ARC
W3YA 647 B-25-2544
Tamiami ARC
W4ESY/4(+WD4AHY)
651 B-22-2514
Southern Serria ARS
N6OR/6(+KA6LSO)
547 B-10-2496
Lebanon Valley Society of
Radio Amateurs
W3EIA 768 B-20-2478
Kent City ARC
W3HZW* 471 B-10-2462
Fort Myers ARC
W4LX(+KA4AZE)
698 B-15-2378
Yellow Thunder ARC
WB9FDZ*(+WD9HHM)
586 B-20-2318
East Whittier ARC
W6VB* 752 B-15-2220
Playground ARC
W4ZBB*(+KA4IYI)
570 B- 6-2206
Kansas City ARC
K0OKI* 563 B-25-2144
Whitewater Hills ARC
W9AIP 681 B-20-2090
Foothills ARC
W3LWW 561 B-12-2056
Tri-County ARA
K6AGF* 557 B-10-2048
San Antonio Telephone
Pioneer ARC
WD5CYX 769 B-12-2038
Hall of Science ARC
WB2ZZO* 537 B-23-2036
North Fulton AR League
KD4W 566 B-15-1940
FLTAC ARC
W8DCC(+KA6KQO)
472 B-13-1932
Rantoul ARA
W9ZK(+KA9BAI)
477 B- 8-1902
Hartford County ARA
W1NEM 559 B-23-1712
Sabine Parish ARC
K5ABA 447 B-22-1710
San Gabriel Valley RC
W6QFK* 372 B-25-1694
Sierra ARC
N6PR(+WA6YUI)
469 B-10-1680
Kelleys Island Group
WD8MHR 408 B- 7-1672
Glasgow Site ARC
K3NI 299 B- 5-1666
Werroca Twin City ARC
WB4KIF* 370 B-10-1658
Northeast Michigan ARS
WD8OOM* 477 B-21-1586
Cape Ann ARA
W1RK 497 B-14-1568
Bristol County ARA
AA1Q/1(+KA1AQB)
585 C- 5-1559
Randolph ARA
WD9EXZ* 344 B-15-1544
Sooland Repeater Assn
K0TFT 425 B-34-1540
Markham E.S.D.A. Civil
Defense
WA3RXI* 443 B- 7-1486
Antietam RA
W3CWC 1078 C- -1471
Kishwaukee ARC
WA9CJN 947 C-15-1468
Tulare County ARC
WA6BAI* 195 B- 8-1380
Binghamton ARA
W2OW/2 594 C-10-1364
Highlands County ARC
WB4WDK 346 B- 9-1292
Mich - A- Con ARC
N8LT* 624 C-12-1278
High Point ARC
N4XO 358 B- -1216
Shoreline ARC
W1BCG 183 B-17-1210
Cascade RC
W7EK 296 B- 7-1144
Westchester Emerg Comm
Assn
K2AMU 305 C-20- 857
AR Explorer Post 1159
W4WRJ 161 B- - 814

5A - Commercial

PNARA
N1AV 1545 B-22-3628
Capitol Hill ARS
W3USS 1155 B-15-2954
Johnson ARS
AK4H 991 B-21-2082
Sun Parlour ARC
VE3SPP/3 594 B-14-1288
Non-Club Group
K0GFM/0 368 B- 6- 810
Faribault Area ARC
WA0SSN/0 279 B-13- 658

6A - Battery

Conejo Valley ARC
W6HE*(+KA6IPY)
1282 A-14-11,975
N.E. Iowa RA Assn
W0MG 1211 A-63-9825

6A

L'Anse Creuse ARC
W8LC(+KA8EJI)
3812 B-43-11,754
Huntsville ARC
K4BFT/4(+N9AOG)
3560 B-41-10,779
TRW ARC
W6TRW(+KA6AVF)
3164 B-37-9844
North Florida ARS
W4IZ(+WD4ETE)
3037 B-70-9526
Cary ARC
N4NC 2767 B-37-8482
Orange County ARC
W6ZE 2746 B-35-7832
Hoodview ARC
WB7QIW(+KA7FUT)
2769 B-43-7598
Whitewater Valley ARC
N9NB/9(+KA9EQN)
2263 B-16-7374
The Long Island Mobile RC
W2VL 1946 B-23-7262
Grumman Arc
WA2LQO/2(+KA2GIT)
1872 B-40-6478
Sonoma County Radio
Amateurs
WA6LFJ/6(+KA6JLQ)
1989 B-35-6378
DuPage ARC
W9DUP(+KA9DMT)
2185 B-35-6106
Northrop RC
W6CN*(+KA6HLU)
1876 B-47-6078
Manchester RC
W1KKS 1741 B-15-6682
Non-Club Group
W5MS/5 1820 B-29-5424
Klamath Basin ARA
W7VW(+KA7HOA)
1821 B-14-5384
Kootenai ARS
K7MM 1510 B-25-5336
Illiana Repeater System
K9PDI(+KA9HWA)
2008 B-35-5168
Hamilton ARC
VE3DC 1416 B-41-4998
Adams County ARS
KB3JA 1756 B-15-4830
Twin City ARC
W9KQ(+KA9GRN)
1648 B-25-4812
Clark County ARC
W7AIA(+KA7HGL)
1566 B-33-4754
Sterling Park ARC
AA4II(+KA4NZA)
1828 B-17-4706
Stamford ARA
K1GF 1410 B-24-4628
Crystal RC
W2DMC* 1470 B-10-4604
Bellevue ARC
W0WYV 1917 B-17-4534
Vienna Wireless Society
K4HTA 1379 B-20-4338
Central Michigan Contestors
K8CA 1322 B-11-4322
Indian Hills RC
WA1CS* 1372 B-12-4242
Simi Settlers ARC
K6KI 1626 B-25-4046
Academy ARC
W7WR 1473 B-14-3952
Quanapowitt RA
W1EKT 972 B-24-3900
Central Iowa ARC
AK0P 1261 B-21-3612
Niagara Peninsula ARC
VE3VM/3* 1307 B-20-3500
AVCO ARA
WB1EUN 891 B-12-3384
Sangamon Valley RC
W9DUA/9 862 B-20-3300
Associated Radio Amateurs of
Long Beach
W6RO 1083 B-30-3208
Montgomery ARC
WA3EWJ(+KA3FBD)
1041 B-25-3208
Dayton ARA
W8BI* 1026 B-31-3204
Hampden County Radio Assn
W1NY/1 820 B-60-3074
Twin Cities Repeater Club -
Ramsey County Emerg Svc
KB0BU/0 919 B-19-3020
Kennehoochee Atlanta RC
W4BTI 858 B-40-2962
Southside ARC
N0ARI 964 B-27-2880
North Shores ARC
K6HAI 743 B-20-2566
Jayhawk ARS
W0LB* 778 B-20-2548
Tioga County ARC
WB3IPW* 1013 C-30-2522
Metropolitan Repeater Assn
K4OS 723 B- 6-2520
Sheridan ARC
W7GUX 619 B-16-2506
Barstow ARC
KB6SD 816 B- 7-2465
Ocean Monmouth ARC
KC2Q* 785 B-12-2416
Sierra Foothills ARC
K6CBP 786 B-18-2372
Empire RC
N0AY 622 B- 8-2342
Iroquois Ford ARS
WB9TAH(+KA9EPO)
562 B-15-2166
Huntingdon County ARC
W3VI 486 B-15-2108
Butler County ARA
W3UDX/3 661 B-15-2100
Sky High ARC
W3CQ/4*(+KA4MBT)
401 B-14-1942
Washington Amateur
Communications
WB3JOB 502 B-13-1602

7A - Battery

Mt Diablo ARC
W6CX(+KA6ECK)
2598 A-55-18,420
Triple Zero Group
AA6GM/6 819 B- 8-3208

7A

Mike & Key ARC
K7LED 4005 B-54-11,928
Penn Wireless Assn
W3SK(+KA3DOX)
3607 B-37-11,808
Lake Monroe ARA
AJ4L(+WD4NIX)
2571 B-50-8078
South Hills Brass Pounders &
Modulators
W3PIQ 1898 B-35-6360
Cuyahoga Falls ARC
WB8VPV(+KA8QVN)
2955 B-35-6134
Parma RC
K8UZW(+WD8NCQ)
2031 B-29-5890
Datapoint Amateurs and
Technicians Assn
K5CB(+KA5GAX)
1973 B-22-5490
Triple States RAC
K8AN 1269 B-35-5218
Michigan Robins IO - X
KB8FV(+KA8JBJ)
1579 B-18-3984
Sunset Empire ARC
W7BU 1117 B-17-3240
Concord Brass Pounders
W1DC(+KA1AUK)
746 B-15-3014
Morganton ARC
KV4U/4 718 B-26-2928
Mongton Area ARC
VE1EV 685 B-30-2900
South Pickering ARC
VE3SPC/3 588 B-10-2634
Fort Verlango Mike & Key
Club
W3ZIC* 878 B-12-2580
Toledo Mobil RA
W8HHF/8 812 B-40-2570
Bill Gremillion Memorial RC
K4SEX(+KA4PDN)
848 B-21-2556
Greater Toledo ARA
K8ALB 691 B-17-2346
Roanoke Valley ARC
W4CA 945 C-35-2263
Mobile Sixers RC, Inc
W3AWA/3 488 B-12-1988
Champaign Logan ARC
WBEBG* 369 B-15-1574

Muscatine ARC
NØBNW 979 C-15-1288

8A - Battery

So - Calif Contest Club
N6VI/6 3857 A-12-27,625

8A

Morris RC
K2AZ(+KA5ENZ)
2621 B-40-9122
Gloucester County ARC
W2MMD(+KA2HSZ)
2453 B-55-8024
Woodbridge Wireless
W4IY(+KA4AAY)
2463 B-40-7816
Mahoning Valley ARA
W8QLY(+KA8HMR)
2075 B-44-7648
WPB ARC
W4HAW/4 2881 B-50-7596
Windsor ARC
VE3OW 2224 B-48-7196
Metro ARC
VE3MRC* 1801 B-23-6818
Genesee County RC
W8ACW 1727 B-90-5876
Monongalia Wireless Assn
K8WV 1344 B-20-4926
Lancaster County ARC
W4PAX(+WD4NND)
1282 B-20-4802
Middlesex ARS
W1FDH(+WB1ARF)
1359 B-35-4732
Delaware ARC
W3SL* 1356 B-37-4644
Rock Creek ARA
W3RCN 1464 B-28-4458
Rockford ARA
W9AXD(+KA9BTA)
1126 B-50-3734
Garden State RAA
W2GSA(+WB2RVL)
812 B-37-3522
Orange County ARC
N2CF(+KA2ILN)
996 B-25-3472
Laurel ARC
K3LDE 855 B-22-3418
Beloit ARC
K9EP/9(+WD9FWR)
882 B-22-2582
Silver Creek Amature RA
WD8PNF 980 B-24-2362
Metropolitan ARC
K8NOW 865 B-12-2152

9A

South Jersey RA
K2AA(+N2BAZ)
4076 B-50-12,458
R C of Tacoma
W7DK 3283 B-65-9448
North Hills RC
K6IS 2280 B-35-7958
San Antonio RC, Inc
W5SC(+WD5DUL)
2348 B-110-7148
Radio Amateurs of Greater Syracuse
W2AE 2072 B-45-6824
Tioga County ARCs
N2NW/2 1749 B-23-6678

10A

The Hogtown Hammers
W4WJ/4(+KA4KID)
3556 B-30-11,736
Murgas ARC
K3YTL(+KA3EEO)
2950 B-50-9420
Skywide ARC
VE3DRT 2392 B-33-8018
Oh-Ky-In VHF Amateur Society, Inc
K8SCH(+WD8JAV)
1345 B-70-4780
West Branch ARA
W3AVK/3* 1235 B-52-3894
Turlock ARC
W6BXN* 1143 B-26-3486
Cenois ARC & Macon Co ARC
N9ES*(+N9BEA)
717 B-35-2882

11A

Gladwin Area ARC
K8BZ 1533 B-36-5348
Scarboro ARC, Inc
VE3WE 1322 B-30-4646

12A

Four Lakes ARC
W9IZ(+WB9PDK)
2923 B-38-9768

13A

Nortown ARC
VE3NAR/3 3110 B-60-10,402
Adrian ARC
W8TQE/8 1489 B-54-5822

15A

Wireless Institute of the Northeast/Yankee Clipper Contest Club,et al
W2RQ(+KA2HYM)
10,673 C-34-15,673

21A

Englewood ARA, Inc
K2KX(+KA1FFQ)
765 B-30-4522

One- or two-person portable

1B - Battery

K1JX(+K3KU)
741 A- -8015
K3VW/3(+K3WW)
553 A- -5590
KB8N(+WA9IRV)
500 A- -5115
WA6OEY*(+WB6KQI)
762 A- -4010
W1ECH 351 A- -3600
W9NAX(+WD9GXW)
315 A- -3450
N4KE*(2 oprs)
469 A- -3390
WA6EUZ/6*(+WB6QVV)
319 A- -3390
N6DN*(+K6PJV)
391 A- -3150
AF9B*(+W9SOD)
279 A- -2990
N4YL/4*(+N4NZ)
305 A- -2960
W3TS/3(+WB3IDP)
344 A- -2740
K5PMF(+WA5RSC)
421 A- -2670
KH6NO*(2 oprs)
852 B- -2624
KB9AF*(+WB9QPG)
210 A- -2400
W7EL/7*(+W7ZOI)
211 A- -2310
K6TG* 242 A- -2310
W2UYQ/2*(+K2YAZ)
212 A- -2220
N5EM*(+K5HGB)
216 A- -2200
AG7U(+KA7FRZ)
252 A- -2095
WA2DFI/7 188 A- -2080
N2RT 174 A- -1940
WA6FUH/7(+WB6GCK)
391 A- -1855
WA9SLU(+WA9NLK)
164 A- -1840
N6CVD* 168 A- -1780
WA6YEU(+WB6BDD)
263 A- -1720
KC8P 311 A- -1655
AB5N(+KA5BSJ)
149 A- 1555
VE1ASN/1(+VE1BNM)
131 A- -1505
WA9HCZ*(+KA9CHP)
110 A- -1500
K2CQS(+KA2EXW)
275 A- -1475
WB0UXP*(+WB5WQQ)
166 A- -1465
WA0RLY(+WB0GSM)
105 A- -1350
WA4UQA/4*(+WB4UQI)
97 A- -1270
KA4KYK 232 A- -1260
N4DP/4(+W4NNU)
103 A- -1230
W0RSR/7(+WA0EDW)
144 A- -1195
K2ZT 99 A- -1190
VE2XL/2*(+VE2XS)
209 A- -1145
WB2UQM*(+NIKE)
84 A- -1040
WD8JFC*(+KA8KBE)
135 A- -1040
VE3HIE/3* 93 A- -1030
WA8REN*(+WA8RQU)
73 A- -1030
AF9Q 82 A- -1020
W7BD/5(+WA5GWH)
100 A- -1000
WB6RZH(+KA6GEQ)
344 B- - 896
WA6POC/6 221 B- - 858
WA6MIW*(+W6JHG)
325 B- - 850
WA7NWP*(+KA7HTC)
52 A- - 820
K6GLF 152 B- - 808
WB6BYH 106 A- - 805
K8PIG* 129 A- - 802
AJ6T* 70 A- - 800
W1OQ/7(+N7BVI)
58 A- - 770
KA1CXC(+KA1DCG)
378 B- - 756
W7FPX* 276 B- - 752
KA7EXM 50 A- - 700
KA6EZX(2 oprs)
286 B- - 672
WA0NSY* 59 A- - 670
VE3AUI(+VE3GAM)
233 B- - 592
K7CPC/7 49 A- - 590
AD5F/5* 59 A- - 565
AB3W/5(+KA6FYQ)
39 A- - 490
W5YM*(2 oprs)
186 B- - 484
WB7WMM 38 A- - 480
K6APW 67 B- - 468
N6JQ 45 A- - 450
W7TU 45 A- - 445
VE4AD5/3* 28 A- - 440
KA3AVM(+WB3KGQ)
41 A- - 405
WB2MBM/3* 30 A- - 400
N8AXA* 118 B- - 336
W7DHZ(2 oprs) 46 B- - 284
WB3JBF*(+WB3DNA)
34 A- - 270
KA8ICA*(2 oprs)
6 A- - 260
N4DG/6 32 A- - 260
W6FQF 19 B- - 176
K3VY 37 B- - 174
KA7FYB 27 B- - 154
K9IU/9(KB9HF,N9ARI,oprs)
23 B- - 146
WD4ODS/2 7 B- - 114
WA3LGG* 4 B- - 108

1B

NØNO*(2 oprs)
1124 B- -4798
KØUA(+KØGU)
1346 B- -3902
W8IZ(+K8HHZ)
995 B- -3432
KH6AH/KH6(+AH6VI
831 B- -3424
W7NQ(+K2ZX)
857 B- -3394
W8TK/8(+K8ND)
787 B- -3312
W7CB 1031 B- -3170
K7EZ/7*(+K6NQ)
1093 B- -3022
W8VS*(+W8DSO)
756 B- -2660
WB0NCR(+WA0JYF)
951 B- -2402
W3MR/2(+K2BK)
624 B- -2256
N2RA(+N2AE)
563 B- -2026
KB2NM*(+K2UFT)
543 B- -1992
AI9X*(+WB9NIX)
612 B- -1848
KØMAT(+WBØMUU)
480 B- -1568
VE3VA 341 B- -1550
K2LYV(+K2OID)
392 B- -1446
W6JQC 496 B- -1302
W3BGN/2 317 B- -1252
VE3HIR(+VE3EFX)
370 B- -1240
N4YX/4(+WD4DHE)
569 B- -1238
K1RIF(+N1AAX)
310 B- -1236
VE2BP(2 oprs)
250 B- -1232
WB7NNA*(+WB7QOY)
387 B- -1106
N3BL*(+WA4AWL)
317 B- -1072
KA4IDW/9* 250 B- -1056
WB9REQ 308 B- - 976
W7LTL/7*(+WA7LHZ)
333 B- - 966
KB5CA*(+WB5YJN)
423 B- - 946
NØWA*(+N9WA)
206 B- - 924
VE3LGS 171 B- - 870
N3BFL* 264 B- - 864
WØXD(+KAØBYR)
324 B- - 848
N6BQA*(+KA6CPK)
185 B- - 840
WBØRXE*(+KAØBNR)
247 B- - 840
KB4CG/5(+N4AJJ)
193 B- - 794
WA7GXD* 264 B- - 728
WA7WOJ/7* 281 B- - 662
WØYHE/Ø 214 B- - 636
KAØBPO 96 B- - 584
W6LC/6 205 B- - 536
WB8YJF*(+WB8YTZ)
108 B- - 532
WDØGZE*(+WDØHMN)
101 B- - 504
KØRJL* 201 B- - 502
W1HBP(+WB1FAW)
186 B- - 472
W9JV*(+K9GCI)
108 B- - 444
W9TA/9 157 B- - 414
VE2BAB*(2 oprs)
44 B- - 404
N7AYG(+KA7HBK)
67 B- - 368
WB2BCD/1(+WB4RJO)
133 B- - 366
KA5GLX(+KA5GLT)
91 B- - 284
WD8NHC/8(+WD8MKG)
91 B- - 282
W7DRA/7 12 A- - 148
WB4ZTE*(2 oprs)
50 B- - 100

1B - Commercial

N3AUE/3(+N3AKD)
505 B- -1222
W8JC2 318 B- - 636
WD9ARK(+WB9WHB)
201 B- - 502
WB3EHS* 202 B- - 404
KB6CC* 20 B- - 300
KA5BOU(+N5BVB)
123 B- - 246
WB2UHB*(2 oprs)
32 C- - 32

2B - Battery

N2GC(+W2X5)
504 A- -4665
WB5KIJ/5*(+WB5MTU)
283 A- -2375
WA6SAW/6(+WA6GQI)
180 A- -2000
W6JTH(+KA3BLO)
152 A- -1720
W7KJ(+W7KGQ)
180 A- -1330
N1ACJ*(+KA1BBD)
139 A- -1210
WB7QEE(+KA7EGO)
419 B- -1168
WA7FMT(+WB7BNZ)
35 A- - 550
WD9FSA(+KA9BSU)
88 A- - 440

2B

WB8JBM(+WB8LSN)
2124 B- -6720
AK8A(+AK8C)
1321 B- -3650
N6SO(+WB6AWO)
867 B- -3064
K9IL(+K9LAE)
753 B- -3012
N4FD(+WA4IYH)
997 B- -2818
K7BBO/7(+KA7UEV)
589 B- -2338
WB6LHV(2 oprs)
814 B- -1928
WB9RRU/9(+WB9RRT)
456 B- -1854
K2ZWI/2(2 oprs)
707 B- -1842
KA0CGY*(+WAØNVT)
477 B- -1544
K2TB*(+K2ITT)
382 B- -1528
NØAIE(+NØAID)
356 B- -1524
NØBKZ*(+KBØKY)
418 B- -1406
WØSKI/4(+KA7ATT)
265 B- -1360
KB5NR(+KB5WH)
474 B- -1348
WA3KEY(+WB3CUU)
330 B- -1308
N2APB(+KA2DCN)
293 B- -1148
N6ATP(+KA6DLX)
366 B- -1022
N4BOS/7(+KA7CTP)
370 B- -1012
N5BCE(+WB5HPG)
353 B- - 994
KB7AN(+KA7EKH)
309 B- - 918
N8AQK/8(+WA8WCU)
259 B- - 838
KB9PA(+WD8ABL)
198 B- - 696
KB8SV(+N8BNE)
155 B- - 570
KA4NRE*(+KA4NRF)
60 B- - 440
AFØS(+NØBHT)
53 B- - 206

2B - Commercial

KAØD(+WDØFGY)
776 B- -2070
K1AZ*(+N1JW)
730 B- -1932
KA2CWJ*(+KA2AEV)
636 B- -1838
KA9EDP(2 oprs)
190 B- - 392

Mobile

1C

W6MXO/m 247 A- -2570
WA4RBV/M 260 A- -2155
K6TQ/M(2 oprs)
455 B- -1920
K4OU/M 176 A- -1860
KH6IJS/M(3 oprs)
711 B- -1654
K7FC/M 119 A- -1190
WB7QYG/KL7/M(2 oprs)
26 A- -1125
VE3EYI/M(2 oprs)
137 B- - 542
KL7AW/MM 131 B- - 524
KA4NWS/M(2 oprs)
45 A- - 450
WB9UTY/VY1/M(2 oprs)
124 B- - 422
K2SM/M 123 B- - 418
W8VSK/M 100 B- - 400
WB6QZK/M(2 oprs)
124 B- - 348
KA5DKW/M 160 B- - 320
K6HAI/M(2 oprs)
74 B- - 296
W2HND/Ø 139 B- - 278
K7WA/M 26 A- - 260
W2TO/M 89 B- - 216
WA8QPN/M(2 oprs)
83 B- - 196
VE3IR/M 20 B- - 142
KA4NKU/AI4T/M
54 B- - 108
WD8RND/M2 40 B- - 80
K6ICS/M 15 A- - 75

2C

N6BT/M(3 oprs)
1885 B- -4912
N4NK/MM(3 oprs)
124 B- - 982

5C

AB3A/MM(8 oprs)
694 B- -1696

Home station

1D

WA5ZUD(2 oprs)
1497 B- -2994
KØUI(4 oprs) 741 B- -2964
WA4KMW 1228 B- -2492
W9LJ 486 B- -1944
VE3NG(2 oprs)
433 B- -1732
WB2UKT 448 B- -1644
WA4BTK(3 oprs)
667 B- -1630
N6GL 377 B- -1508
W7TC 356 B- -1424
WB1HIH 1022 C- -1360
W1AW(K1KI,opr)
506 B- -1350
KF5H 351 B- -1214
N5EX(5 oprs) 534 B- -1068
N9AJR(3 oprs)
325 B- -1012
WB2FGZ 250 B- -1000
WØAWB(2 oprs)
243 B- - 972
N4BHJ 252 B- - 920
W2EZ 226 B- - 904
W9NJP/8 208 B- - 762
W6OGC 199 B- - 752
KA2GL(3 oprs) 368 B- - 736
WA3SCY 346 B- - 708
W8UPH 451 C- - 634
AG5L(2 oprs) 245 B- - 510
KA4LRN/N 116 B- - 464
W6PRI 106 B- - 424
W4EAL(WA4ZZU,opr)
404 C- - 408
K4ADI 154 B- - 392
KBØD 76 A- - 380
WD9EZB 94 B- - 376
K2UZS 117 B- - 354
K9WFH 88 B- - 352
KA4AUR/N 84 B- - 336
WB1EGT 152 B- - 304
N9UG 284 C- - 284
W5UFA 136 B- - 272
WD8IXE/N 65 B- - 260
KA5HGE 63 B- - 252
KB5HP 124 B- - 248
W4IZI 60 B- - 240
W5NR 110 C- - 220
WD8DTG(2 oprs)
102 B- - 204
VE2FWE 50 B- - 200
WB5TXH 94 B- - 188
W1GX 94 B- - 188
WD4AZU 47 B- - 188
KA9BJT 86 B- - 172
W4DM 77 B- - 168
WA4TNI 69 B- - 156
WD5IRR 62 B- - 148
WA7BTZ(2 oprs)
39 B- - 146
KA9CAU 70 B- - 140
N5AF 70 B- - 140
KIZAT/NL7 33 B- - 132
KA5FVJ 32 B- - 128
K2SCU/5 93 C- - 106
WBØYLZ 53 B- - 106
WDØBBN(2 oprs)
53 C- - 106
WA5IYX 105 C- - 105
*K8UFW 42 B- - 84
WB9PFE 42 B- - 84
K5HIM 76 C- - 76
WAØAGM 27 B- - 68
WA6HAD 13 B- - 52
KA4ATK 25 B- - 50
KA7ENQ/7 4 B- - 16
WA2ARC 13 C- - 13
WB2DLA 2 B- - 8
KA7GEK 1 B- - 4
KA3DAG/N 1 B- - 2

2D

WD9FVE(4 oprs)
932 B- -2900
W9PG(2 oprs)
1448 C- -1492
WB9ZBT/7(4 oprs)
653 B- -1486
WB8SNX(2 oprs)
479 B- - 968
WB2YIP(2 oprs)
225 B- - 900
WB2TKD(2 oprs)
185 B- - 460

3D

W9FK(16 oprs)
3010 C- -3635
N5EV(10 oprs)
523 B- -1046
W3LP(3 oprs) 238 B- - 476
KA6DEB(2 oprs)
182 B- - 422

5D

WA8KDP(11 oprs)
559 B- -1214

Home station - emergency power

1E

K3RA(4 oprs)
1167 B- -3770
WØWJ(6 oprs) 321 A- -3020
W6PQ2 493 A- -2465
WØDX/5(7 oprs)
778 B- -2050
WB4AEG(2 oprs)
306 A- -2035
W3FTY 490 B- -1946
N2US 203 A- -1785
K4LJO 164 A- -1640
WB6AJZ 242 A- -1270
K8CV 93 A- - 875
K9ZO 303 B- - 826
W2LX 78 A- - 780
KBØKX 373 B- - 760
WD8PUH 188 B- - 752
WA2IFZ(2 oprs)
94 A- - 240
W9LMO 57 A- - 570
WD9CLH 134 B- - 536
KØLZJ(2 oprs)
185 B- - 534
WA4TFZ(4 oprs)
178 B- - 524
K1BZ(35 oprs)
235 B- - 508
WA6NGO 40 A- - 400
KA5BYF 79 A- - 395
K7IDX 188 B- - 376
W4NM 28 A- - 280
WD4FAB 132 B- - 264
WA1YWB 23 A- - 230
VE3TAT 22 B- - 220
WA3EEE 110 B- - 220
K7WA 19 A- - 190
KA1ISZ 45 B- - 180
WA7CJZ 50 B- - 174
WB9VJZ 37 B- - 136
WØQG 13 A- - 130
K6EA/Ø 39 B- - 96
W1SMO 15 A- - 85
WR2JAX 8 A- - 60
WB6WML 3 A- - 15

2E

W9XT(2 oprs) 480 B- -3475
K5QBN(9 oprs)
701 B- -1508
WA5KCZ(3 oprs)
369 B- -1296
N4HI(9 oprs) 1094 C- -1201
WB5OHM(5 oprs)
663 C- - 784
W4BX(10 oprs)
177 B- - 484

3E

KBØY(14 oprs)
815 B- -1962

4E

WA2YWP(7 oprs)
785 B- -2210
WBRCC(11 oprs)
392 C- - 478

Check Logs

K1KI,KA1FE,N1NN,W1HJE, K2CTK,W2UL,W3ARK, WB3KQW,W5UCY,AK7J, W7NBR,VE2PJ,VE3AWE, OH3NM

Late/Incomplete

KA2HOB,N2MH,K2WU,W3AI, W3GV,WA3LKT,W3RF,W3UU, K3VK,WA4BK,W4DM,WA4ECY, KA4FMO,N4MJ,W4NVU/4,KK4O K4OAC,K4PQL,WA4UXJ,N4VV, W4WIN,WB4YZF,N5CN,KD5C, KB5GK,W5LXS,W5PDO,WA6GFY, K6OX,KB6TY,W7SO,W7VE,W8DC, W8GQN,K8YDR,W9BFO,W9EBN, W9FBZ,K9LNX,WØCZ,WØIE, VE2CSP,VE3BA,VE3EXS,

Rules, ARRL 160-Meter Contest

It may be hard to tear yourself away from the many DX pileups on 20, 15 and 10 meters for long, but it might be worth your time to try the ARRL 160-Meter Contest this year. The contest is scheduled for mid-winter to take advantage of low noise levels and longer nighttime hours.

You'll find activity hot and heavy in the early evening hours, and as things thin out later on you may catch some good DX. Avoid transmitting in the DX window (1825-1830 kHz), listen there for the DX station to tell you where he is listening. A few lucky stations may even snag WAS during the contest period. Give it a try!

Rules

1) **Object:** For amateurs worldwide to exchange QSO information with W/VE amateurs on 1.8 MHz cw only. DX-to-DX QSOs are not permitted for contest credit.

2) **Contest period:** 2200 UTC December 5 until 1600 UTC December 7. Forty-two-hour period with no time limitation.

3) **Categories:**

(A) **Single Operator:** One person performs all transmitting, receiving, spotting and logging functions.

(B) **Multioperator:** Single transmitter only. Those obtaining any form of assistance such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange:**

(A) W/VE: Signal report and ARRL section.

(B) DX: Signal report and country name (or ITU Region if maritime or aeronautical mobile).

5) **Scoring:**

(A) QSO points: Two points for QSOs with amateurs in an ARRL section. W/VE stations count five points for DX QSOs.

(B) Multipliers: ARRL sections plus VE8/VY1 (maximum of 74) and DXCC countries (W/VE participants only).

(C) Final score: Multiply QSO points by multiplier. Example: VE3ABG works 357 stations, including 13 DX stations, and has a multiplier of 67. His score would be 753 QSO points (344 × 2) + (13 × 5) multiplied by 67 for 50,451 points.

6) **Reporting:**

(A) Official forms are recommended (available for an s.a.s.e. or one IRC from ARRL hq.).

(B) Logs should indicate time in UTC, call and exchange. Multipliers should be clearly marked in the log the first time worked. Entries with more than 200 QSOs must include cross-check sheets (dupe sheets).

(C) Postmark your entry within 30 days after the end of the contest (January 6, 1981).

7) **Awards:** A certificate will be awarded to the top scoring single-operator station in each ARRL section and DXCC country, and to the top scoring multioperator stations in each ARRL Division and continent.

8) **Conditions of entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excess duplicates and call sign/exchange errors. See January 1980 *QST*, page 90, for complete details.

Rules, ARRL 10-Meter Contest

Activity could hardly be described as average in last year's contest, with several hundred kHz filled with contest QSOs. No reason things couldn't be even better in 1980, with all the improvements people seem to be making in their station equipment.

Beginning with this year's contest the single-operator category will be divided into three parts after the concurrence of the Contest Advisory Committee and the ARRL Awards Committee. *Single operator entries* may now be made in phone-only, cw-only and mixed-mode categories.

Revised summary sheets, dupe sheets and a sample log sheet are available from ARRL hq. for an s.a.s.e. (or two IRCs for overseas airmail). Make sure you send for forms early!

Rules

1) **Object:** For amateurs worldwide to exchange QSO information with as many stations as possible worldwide on 28 MHz.

2) **Contest Period:** Second full weekend of December (December 13-14, 1980). Forty-eight-hour period, all stations operate no more than 36 hours. Starts 0000 UTC Saturday; ends 2400 UTC Sunday. Listening time counts as operating time.

3) **Categories:**

(A) **Single Operator:** One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted.

(1) Mixed mode (phone and cw).

(2) Phone only.

(3) Cw only.

(B) **Multioperator:** Single transmitter mixed mode only. Those obtaining any form of assistance such as relief operators, loggers or use of spotting nets.

4) **Contest Exchange:** (A) W/VE stations (including KH6/KL7) send signal report and state or province. (B) DX (including KH2/KP4, etc.) transmit signal report and serial number starting with 001. (C) Maritime or aeronautical mobile stations send signal report and ITU Region (1, 2 or 3). Novice and Technician stations sign /N or /T.

5) **Scoring**

(A) QSO points: Count two points for each complete two-way QSO, except four points for QSOs with U.S. Novice or Technician stations (28.1 to 28.2 MHz only — signing /N or /T).

(B) Multipliers: Fifty U.S. states, Canadian call areas (VE1-8, VY1, VO1-2), DXCC countries (except the U.S. and Canada), ITU regions (maritime and aeronautical mobiles only).

(C) Final Score: Multiply QSO points by the sum of states/VE call areas/DXCC countries/ITU regions. Example: VE6KW works 3100 stations, including 10 Novices, for a total of 6220 QSO points. He worked 49 states, 10 Canadian call areas, 53 DXCC countries and a maritime mobile station in Region 2 for a total multiplier of 113. Final score = 6220 (QSO points) × 113 (multiplier) = 702,860 points.

6) **Miscellaneous:**

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) No crossmode contacts; cw QSOs must be made below 28.5 MHz.

(C) Mixed-mode single operator and all multioperator stations may work stations once on cw and once on ssb.

(D) Your call sign must indicate your DXCC country (K6LL in Arizona need not send K6LL/7, but KL7JER in Ohio must send KL7JER/8).

(E) One operator may not use more than one call sign from any given location during the contest period.

7) **Reporting:**

(A) Official forms are recommended (available for an s.a.s.e. or one IRC from ARRL hq.).

(B) Logs should indicate time in UTC, mode, call and exchange. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-check sheets (dupe sheets).

(C) Postmark your entry within 30 days after the contest (January 13, 1981).

8) **Awards:** A certificate will be awarded to the highest scoring single-operator station (in each category) from each ARRL section and DXCC country. Top multioperator entries in each ARRL Division and each continent will receive certificates. Additional certificates will be awarded as participation warrants.

9) **Conditions of entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excess duplicates and call sign/exchange errors. See January 1980 *QST*, page 90, for complete details.

Operating News

Conducted By John F. Lindholm,* W1XX

Meaningful QSOs

A new book profiling elite political operatives (who counsel politicians aspiring to national office, and devote most of their time to enhancing their client's image in the mass media) was the unexpected source of inspiration for this month's column. In one chapter, the book tells how one of the most sought-after political advertising experts got his start in the telecommunications field through Amateur Radio. He dropped the hobby, however, when he discovered that although he was interested in discussing topics such as folk music and regional cuisine, his fellow amateurs wanted only to talk about their rigs and the weather.

Independent surveys have shown that ragchewing is the most popular aspect of Amateur Radio. "Operating News," in July 1977 *QST*, said this: "Chewing the rag is an on-the-air pastime and preoccupation as old as Amateur Radio itself, and is still the topmost activity in hamming." Unfortunately (as the soon-to-be media consultant quickly discovered), much of the information exchanged in normal QSOs is disappointing because of its superficiality. Ham radio is a marvelous resource for the exchange of ideas; yet fresh ideas are often shunned, or in short supply.

The conclusion should not be drawn that these conversations must be "heavy," since hamming is a diversionary avocation. The working strap-hanger naturally doesn't want to get into something too intense, just when he's trying to relax. But a shade of difference is often unacceptable to the unsilent majority. To wit: Two amateurs conducting a late-evening conversation on the then new and significant film "Apocalypse Now" were essentially coerced into relinquishing the repeater frequency to others who were anxious to resume the inanities of their mysterious back ailments and a chronicle of their empty days.

First Amendment scholars have said that the concept of a marketplace of ideas is inherent in a free society. To help preserve our democracy, they say that the marketplace must be robust and uninhibited (except for obscenity, which is not afforded protection by the Constitution and is forbidden by FCC regulations — §97.119). Amateur Radio provides a means for direct communication between individuals interested in discussing the important issues of our times, without having to rely on paid intermediaries (otherwise known as professional communicators) who, each evening at 7 P.M., tell us what we are thinking.

Public issues, events and aspects of popular culture can be discussed on the air, in the give-and-take manner that is traditional in a free system. So-called controversial opinions can easily be expressed on the amateur bands without compromising (as the "Op News" lead said) "the dignity and prestige that should belong to Amateur Radio." And, except for phone-in talk shows and scattered two-way cable hookups, hams have a corner on the long-range electronic idea-exchange market. Each individual is capable of contributing something constructive to a forum, assuming he or she hasn't been living in a cave for the past 10 years.

This kind of "public airing" can strike closer to our ham radio home. For example, some years ago, two SCM candidates in the Ohio section met head-to-head in a prescheduled debate on 75 meters. Thus, the League members in Ohio had something more concrete to base their choice on; they were given an alternative to just making a choice from a compressed ballot biography, or who had the shortest call sign, and the like. And it was interesting radio.

Ham radio is fun, don't misunderstand, but becoming educated is fun, too. So let's indulge ourselves to the maximum in all kinds of satisfying operating stuff — contesting, DXing, trafficking and so on. But let's temper our on-the-air activities with a little *communication*, i.e., the interchange of thoughts and opinions. After all, the fact that we can think distinguishes us from creatures lower on the evolutionary scale.

Oh yes — it's wise to keep your meaningful QSOs more-or-less restricted to regular contacts. Please don't try to engage in extensive discourse with DXpeditioners to rare atolls, at all. — *Robert Halprin, K1XA*

*Communications Manager, ARRL

5-Band WAS

Awards issued April 1980 to September 2, 1980

754 N4AYJ
755 KB3HZ
756 WDØEPE
757 KC4U
758 K9SH
759 WDØBWZ

760

760 AF7T
761 WAØARS
762 KB6FR
763 6Y5DA
764 WA7RDJ
765 KØARS
766 KB8EM
767 WØJRP
768 W4WJ
769 WB5NAA

770

770 WA1UZH
771 VE3CE
772 N6NF
773 EA8OZ
774 AF7G
775 K9HKF
776 K4HAV
777 W1VMY
778 K2YIY
779 W5URN

780

780 K1VHS
781 KA6EZU
782 WN7CSI
783 YV5TK
784 K7QLC
785 W1BWS
786 W5JW
787 WA7NNH
788 KA3BSM
789 W5QEP

790

790 CT1FL
791 W9AG
792 N4VY
793 WD8AEK
794 WAØIDK
795 WN5MBS
796 KC5P
797 K2PE
798 VE4AEI
799 WB7OHF

800

800 KZ5JM
801 WD4PVI
802 WB9LUG
803 W9VNE
804 WA5JDM
805 K8IU
806 KB8EI
807 N4EM

Listed in error in June *QST*

627 VE3ATF
639 KA5AZT
640 WA7MCK
663 WB9GCU
666 WB8TYE
693 WB9TJL
708 K2NJ
725 WB8HIW

SCM ELECTION NOTICE

To all ARRL members in the Montana, Mississippi, Iowa, Arizona, Ontario, Orange, Northern Texas, Arkansas, Kentucky and Wyoming 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 . . .).

An SCM candidate must have been a member of the League for a continuous term of at least two years and 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 5, 1980.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on January 2, 1981, returns counted February 17, 1981, and SCMs elected as a result of the above procedures will take office April 1, 1981.

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, 1981.

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 Idaho, North Dakota and West Indies sections as a result of notices in the April and May *QST*, nominating petitions for these sections 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, 1981:

Uncontested

E. Massachusetts	Richard P. Beebe, K1PAD
W. Pennsylvania	Otto L. Schuler, K3SMB
*Manitoba	Peter Guenther, VE4PG
Quebec	Harold Moreau, VE2BP
Southern New Jersey	William C. Luehkemann, Jr., WB2LCC

*Resolicitation — 18 month term of office

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 90. 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.

OSCAR Operating Schedule

DATE (UTC)	OSCAR 7 Orbit No.	Time UTC HR MN	Eqx W. Long. Degrees	OSCAR 8 Orbit No.	Mode	Time UTC HR MN	Eqx W. Long. Degrees
1 Nov.	27,277	0001	74.4	13,551	J	0120	75.3
2 Nov.	27,290	0055	88.0	13,565	J	0125	76.5
3 Nov.	27,303	0149	101.6	13,579	A	0130	77.8
4 Nov.	27,315	0049	86.4	13,593	A + J	0135	79.0
5 Nov.	27,328	0143	100.0	13,607	X	0140	80.2
6 Nov.	27,340	0042	84.9	13,620	A	0001	55.6
7 Nov.	27,353	0137	98.4	13,634	A + J	0006	56.9
8 Nov.	27,365	0036	83.3	13,648	J	0011	58.1
9 Nov.	27,378	0130	96.9	13,662	J	0016	59.3
10 Nov.	27,390	0029	81.7	13,676	A	0020	60.6
11 Nov.	27,403	0124	95.3	13,690	A + J	0025	61.8
12 Nov.	27,415	0023	80.2	13,704	X	0030	63.0
13 Nov.	27,428	0117	93.7	13,718	A	0035	64.2
14 Nov.	27,440	0017	78.6	13,732	A + J	0040	65.5
15 Nov.	27,453	0111	92.2	13,746	J	0045	66.7
16 Nov.	27,465	0010	77.0	13,760	J	0049	67.9
17 Nov.	27,478	0104	90.6	13,774	A	0054	69.1
18 Nov.	27,490	0004	75.5	13,788	A + J	0059	70.4
19 Nov.	27,503	0058	89.1	13,802	X	0104	71.6
20 Nov.	27,516	0152	102.6	13,816	A	0109	72.8
21 Nov.	27,528	0051	87.5	13,830	A + J	0113	74.0
22 Nov.	27,541	0146	101.1	13,844	J	0118	75.3
23 Nov.	27,553	0045	85.9	13,858	J	0123	76.5
24 Nov.	27,566	0139	99.5	13,872	A	0128	77.7
25 Nov.	27,578	0039	84.4	13,886	A + J	0133	78.9
26 Nov.	27,591	0133	97.9	13,900	X	0137	80.2
27 Nov.	27,603	0032	82.8	13,914	A	0142	81.4
28 Nov.	27,616	0126	96.4	13,927	A + J	0004	56.8
29 Nov.	27,628	0026	81.2	13,941	J	0009	58.0
30 Nov.	27,641	0120	94.8	13,955	J	0013	59.3
1 Dec.	27,653	0019	79.7	13,969	A	0018	60.5
2 Dec.	27,666	0113	93.2	13,983	A + J	0023	61.7
3 Dec.	27,678	0013	78.1	13,997	X	0028	62.9
4 Dec.	27,691	0107	91.7	14,011	A	0033	64.2
5 Dec.	27,703	0006	76.5	14,025	A + J	0038	65.4
6 Dec.	27,716	0101	90.1	14,039	J	0042	66.6
7 Dec.	27,729	0155	103.7	14,053	J	0047	67.8
8 Dec.	27,741	0054	88.6	14,067	A	0052	69.0

Orbit predictions by Project OSCAR, P. O. Box 1136, Los Altos, CA 94022. 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 and 1900 UTC Sundays on 21.280 kHz).

O 7 progresses an average of 28.7374° W per orbit in a period of 114.9419 minutes.
O 8 progresses an average of 25.8018° W. in a period of 103.2000 minutes.

O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesday and Friday — Mode A + J. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D. Mode A + J is simultaneous operation of both transponders.

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

Formulas for calculating approximate downlink frequencies. x = downlink frequency.

OSCAR 7

Mode A: x = uplink frequency − 116.450 MHz ± Doppler shift
Mode B: x = uplink frequency − 578.100 MHz ± Doppler shift

OSCAR 8

Mode A: x = uplink frequency − 116.458 MHz ± Doppler shift
Mode J: x = uplink frequency − 581.106 MHz ± Doppler shift

Note: A minus sign in front of the downlink frequency indicates that the passband of the satellite is inverted in that mode. This means that signals transmitted up to the satellite at the low end of the uplink passband will appear at the high end of the downlink passband.

Additionally, upper-sideband signals transmitted on the uplink will appear as lower-sideband signals on the downlink.

Mode J Club

Become a member of the Mode J Club. Complete eight Mode-J contacts. QSL cards are not required. Just list the call sign of each station worked, date, orbit number and station equipment used. Send this information along with $3 in U.S. funds, a one-time charge to cover the certificate and newsletter costs, to Mode J Club, c/o Larry Roberts, W9MXC, 3300 Fernwood, Alton, IL 62002.

OSCAR 8 QSL

To receive an OSCAR 8 QSL card, send a copy of the telemetry from the 29.402- or 435.095-MHz beacons. Please send your report, along with an s.a.s.e., to ARRL hq.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq.

Strays

This unicycle leaves both hands free for operation of N9AA mobile 9. B. Dale Rethmeyer, of Indianapolis, Indiana, shows us that he is a well-balanced operator. *(N9AA photo)*

WANT THE LATEST NEWS?

☐ At 0300 UTC, radio station WCC, in Chatham, Massachusetts, runs off about an hour of news in flawless cw at 20 wpm. Frequencies are 4331, 6376, 8586, 8630 and 12,925 kHz. No commercials and nice practice for upgrading — what more could you ask for? — *Thomas Leary, WØVTP, Omaha, Nebraska*

WHAT A WAY TO START

☐ Charles Bush, KA4BUG, of Smyrna, Georgia, had just put up his 40-meter dipole and was checking it out with his new rig. He happened to choose 21,355 kHz for his first operation. His very first QSO was then made with Tom Christian, VR6TC. What a way to start! — *Bob Duggan, N4IA, Atlanta, Georgia*

I would like to get in touch with . . .

☐ speech pathologists, audiologists, deaf-education teachers and the like, who are working with the mentally retarded, mentally handicapped and developmentally disabled, to start a net for discussing conventional and innovative techniques of teaching language and communication skills. Lionel Hines, WB2FQU, 374 Wadsworth Ave., New York, NY 10040.

☐ anyone who would like to play the Avalon Hill game Alexander the Great over the air. Larry Neve, Jr., KA9EXY, 3483 Highway O, Saukville, WI 53080, Tel. 414-284-3016.

☐ anyone who can provide pre-1945 memories, stories or historical data from Hallicrafters employees or owners. Ed Romney, N4DFX, Box 5247, Spartanburg, SC 29304.

Public Service

Conducted By Robert J. Halprin,* K1XA

How Can My Net Join NTS?

Some folks attach special significance to being part of the National Traffic System (NTS). Ever since the System's inception in 1949, a warm kinship has developed among its many participants. NTS has attained a fine reputation and earned high marks over the years for excellence in the handling of third-party written traffic. This is not to say that perfection has been achieved. Delays and garbled messages occur on NTS nets as they do on other nets. But NTS affiliation is sought by many.

Membership in NTS does not endow any special privileges over the so-called independent nets. Many nets are independent by choice and this does not in any way discredit such nets or their operations. NTS affiliation does not necessarily suggest greater aptitude for traffic handling that cannot be exhibited by the independents. The major difference is an organizational one, whereby NTS nets fit into a binational matrix of interconnecting and interwoven nets to effect an orderly flow of traffic from origin to destination.

Since every NTS net must fit into the overall scheme, joining the System is not like joining the Elks or Moose. Membership has some limitations and all nets do not qualify. Higher echelon nets, for example, do not have complete freedom of choice of net meeting times. This is necessary to accomplish proper sequencing of nets. Also, local or section Net Managers must be officially sanctioned by the elected ARRL Section Communications Manager (SCM), who bears the responsibility for conduct of such nets in his section.

Let's look at some common examples of questions from those in the traffic game who want to join NTS.

Q. I'm the net manager of the Pennsyltucky Sideband Net. We have check-ins from neighboring states and handle traffic to those states very efficiently. Why won't my SCM designate us as a section NTS net?

A. The net you describe is not functioning as an NTS net. The System functions on the basis of orderly, not hit or miss, flow of traffic. You net may very well be able to handle traffic more quickly into surrounding states, but the System calls for a section net in *each* of those states (or sections). An NTS participant recognizes this and checks in only to *his* section net. Traffic bound for surrounding states will filter down through the System to those individual state (or section) nets for delivery. Encouraging out-of-section check-ins drains both traffic and participants from neighboring nets. All should be encouraged to support one's own section net.

Q. The Mid-America Traffic Net covers all states west of the Appalachians and east of the Rockies. We like to handle our traffic at 4:30 in the morning. Why can't our net be an area NTS net?

A. Sorry, area NTS nets cover prescribed regions and meet at prescribed times to interface properly with lower echelon nets. An area NTS net is the most constrained timewise, for it must interface with a number of nets for a systematic flow of traffic. The Mid-America Net sounds FB, but it is definitely not an NTS net.

Q. Our Maine SCM has appointed W1KX as Net Manager for the Mount Desert Repeater Net. Traffic destined outside of the repeater's range is brought to the Seagull Net, which is an NTS section net. Since we cover only a small part of the state of Maine, I don't suppose you could stretch the rules a bit and designate us as an NTS net?

A. No stretching necessary. You are an NTS *local* net. The basic criterion of conducting proper *liaison* has been met. By properly interfacing your net into a higher level NTS net, you are an NTS net. Since your SCM has appointed a Net Manager, everything is official. You are at the entry level and destination for the flow of traffic by the System to all parts of the U.S. and Canada. To repeat, conducting proper *liaison* is a most important criterion of NTS status.

Q. Our net covers the whole state, but we do not want to send our outgoing traffic to the region net. We have found we can get our traffic through much faster through KQ5XX, who conducts schedules with every place in the civilized world. We are mad at our SCM because he will not recognize us as an NTS net and refuses to appoint an official ARRL Net Manager. What should we do?

A. Don't vote for your present SCM in the next election. This won't change one basic fact, however. He is correct in withholding the NTS label from your net, and therefore is perfectly within his right to withhold the Net Manager appointment. Conduct proper liaison, and conduct the net according to the System, and the SCM will probably change his mind. The bottom line is that the elected SCM is indeed the boss.

Q. Our net covers only our section, but I don't think we would qualify for NTS since very few of the net members can get on the air more than once a week. Shall we forget about NTS affiliation?

A. Heck no! NTS is not based on the iron-man concept, but rather on the premise of many hands sharing the load. Having a different net control and different liaison stations to the region net every day is FB. In fact, that's the whole idea behind NTS!

Q. I'm the SCM of New Atlantica. The New Atlantica Phone Net conducts informals ahead of handling traffic, has lengthy time-wasting roll calls, invites out-of-section check-ins, and chooses its own net manager. What are the chances of this net joining NTS and how can I accomplish it?

A. Right now chances are not good. But your situation is not unusual. This net no doubt has many check-ins and good state coverage. In your eyes this net "ought" to be a section net. But the net doesn't meet the standards of disciplined traffic handling, and thus far apparently prefers to stay that way. You can either work from within to "convert" the net to your persuasion. Or, initiate competition — start another net that does embrace NTS principles. Should the New Atlantica Phone Net adhere to the System concept, they could continue to elect their own net manager whom you, as the elected SCM, could then recognize as NM. Those that see disciplined systematic traffic handling as fun, see such nets as a great potential resource. It's up to you and others of the System-persuasion to promote necessary evolutionary change from within. But don't become frustrated quickly; the task is formidable but potentially rewarding to the overall System. — *John F. Lindholm, W1XX*

ANOTHER ARTS

The Amateur Radio Television Service (ARTS) is a group of SSTV operators dedicated to using visual communications for third-party traffic. Founded in 1979, ARTS makes possible visual communication between friends and relatives throughout the world.

Mike Stone, WBØQCD, is the founder and current director of ARTS. He recently related a personal experience made possible by ARTS.

"A long-time project is becoming a reality in ARTS! There was no SSTV activity known in Chile, South America. After lengthy correspondence and searching, CE3AUL is now on the air on SSTV on all bands with a new Robot 400 digital converter. My wife is from Chile, and she hasn't seen her mother and other relatives for 10 years. On July 12, she conversed with her mother for nearly half an hour via the ARTS relay system. It works!"

The group meets on Wednesdays and weekends on 28.680 MHz and 14.230 MHz. Any SSTVers interested in joining as a registered ARTS member should contact Mike Stone, WBØQCD, P. O. Box H, Lowden, IA 52255.

PUBLIC SERVICE DIARY

☐ Glen Cove, New York — June 28. Nassau County hams used WR2ACN to provide communications for the Red Cross following an apartment fire. Forty victims were evacuated to the local middle school. (Harold E. Russell, Director of Disaster Services, Nassau County Red Cross)

☐ Carbondale, Illinois — June 28-29. Field Day turned from a test into the real thing for the Southern Illinois ARS. Thunderstorms and a twister interrupted normal communications channels, and hams stepped in to help the police department and other city agencies maintain contact. (WD9EBQ)

☐ Manhattan, New York City — July 4. WB2JAS made an emergency call via W2SNM/R when a youth fell 35 feet through a railroad grating during a fireworks display at Riverside Park. He contacted WB2SGA who then telephoned for an ambulance. (KA2CNN, Asst. SCM NLI)

☐ Pilot Butte Reservoir, Wyoming — July 6. W7BKH, WB7AHL and W7NKR relayed a call for help to the sheriff's office when a sailboat hit a low-hanging 69,000-volt power line, burning the occupants. (W7SDA, SCM Wyoming)

☐ Monterey, California — July 12. Monterey hams

*Assistant Communications Manager, ARRL

used 20 meters to try to verify rumors that 11 boats from the local fishing fleet has been disabled by a storm in Alaska. KL7C contacted the Coast Guard in the area and discovered that the rumors were untrue. (WD6EKQ, EC Salinas and WD6COR, EC Monterey Peninsula)

☐ Liverpool, Ohio — July 16. A severe storm hit the area with high winds and lightning, knocking out the local police base radio. K8JD1 and K8HGY set up emergency communications via WR8AJL for the police department and other agencies until power was restored. (K8HGY)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Louisville, Kentucky — January 27. The Sixth District ARES handled communications during the transfer of 165 patients from St. Joseph Infirmary to the new Audobon Hospital. The hams used 2 meters to allow hospital staff members to stay in contact with the patients in 17 ambulances. (WA4PFB, EC 6th District)

☐ Owensboro, Kentucky — February 20. Hams coordinated with the State Fire Marshal, Area DES Coordinator, Local DES Coordinator, State Police, railroad officials and local officials when a train carrying flammable resin derailed. The railroad cars landed within 33 feet of the main oxygen tank at Kentucky's second largest hospital. Hams handled communications involving area security and passed information to and from the railroad company's wrecking crew. (W4OYI, Asst. Dir. Great Lakes Div.)

☐ Central Mississippi — April 11-15. Hams were ready to assist relief agencies when heavy rains caused severe flooding. Using 2 and 75 meters, Jackson ARC and Capitol Area Emergency Net members provided communications for the Red Cross, surveyed damage and assisted in evacuating people from flooded areas. (WB5FXA, SEC Mississippi)

☐ Southern Mississippi — April 13. When severe rains caused flooding in the area, hams provided communications for the Salvation Army, the Red Cross, Mobile County CD, Jackson County Disaster Services and other agencies. Using WR5ANJ and WR5AFE, the hams handled messages to and from affected areas and assisted in the evacuation of low-lying areas when a dam collapse appeared imminent. (WB5FXA, SEC Mississippi)

☐ Owensboro, Kentucky — April 24. Local hams used K4HY/R to help coordinate DES rescue squads searching wooded, isolated areas for a possible suicide victim. (W4OYI, Asst. Dir. Great Lakes Div.)

☐ Van Buren County, Michigan — May 13-19. Local ARES members provided communications among three Red Cross operations when a tornado hit the area. Hams also assisted with damage surveys, provided communications for police and fire officials, and handled reports of downed wires and gas leaks for the utility companies. (K8OQB, EC Kalamazoo Co., and WB8BNN, EC Van Buren Co.)

☐ Jackson County, Mississippi — May 19. Gulf States Emergency Net members handled health-and-welfare traffic via N5AAY/R when a tornado struck the area. (WB5FXA, SEC Mississippi)

☐ Oklahoma City, Oklahoma — May 27-30. ARES members provided communications for the Wilshire Nursing Center via WR5ANG when telephone service was interrupted. The hams arranged for delivery of medication and helped save the life of a heart-attack victim by arranging for his transportation to a local hospital. (KB5BS, EC Oklahoma City).

☐ King City, California — June 2-3. A Navy T-34 trainer aircraft and its two occupants disappeared in mountainous terrain between King City and Monterey. The Civil Air Patrol (CAP) asked amateurs for help in conducting a ground search. Using WR6AZO, W6LIO/R and N6EY/R, the hams provided communications for search vehicles in the remote canyon bottoms not visible from the air. The search officially ended June 8 with the plane and men still missing. (WD6EKQ, AEC Salinas)

☐ Prospect, Ohio — June 4-5. When flooding forced 42 families to flee their homes, ARES members were called in to maintain communciations between the Red Cross Chapter House and an emergency shelter. Hams handled more than 125 messages via WB8SEC/R during the two day period. (WD8NEE, EC Marion and Wyandot Cos.)

☐ Owensboro, Kentucky — June 4-10. ARES members used K4HY/R to provide communications among the DES Rescue Squad, the Sheriff's Department and the Coast Guard during a search for a drowning victim. (W4OYI, Asst. Dir. Great Lakes Div.)

☐ McLean County, Illinois — June 7. A tornado caused heavy damage, and hams provided communications for the power company when high-tension lines were downed. (K9ORP, EC McLean Co.)

☐ Hyde Park, Ontario — June 9. Hams were placed on alert when a train carrying light oil derailed and ignited, forcing the evacuation of 200 people. (VE3GV, SEC Ontario)

☐ Owensboro, Kentucky — June 16-July 4. Local Amateurs provided administrative and safety communications via 2 meters during the 11th annual Hydrofair Festival. During the boat races, rough water caused 11 accidents. In each case, hams in the rescue boats relayed information to the doctor at the helipad. Several of these victims were seriously injured and hospitalized; one was in critical condition, and WB4ZSA and W4WYO were credited with saving his life. (W4OYI, Asst. Dir. Great Lakes Div.)

☐ San Jacinto Mountains, California — June 19-20. Hams provided communications support for the Riverside Mountain Rescue Unit and the Riverside Sheriff's office during a search for four overdue day-hikers. All were found in good condition the next morning. (WA6QMW, EC District 1 Riverside Co.)

☐ San Jacinto Mountains, California — June 22. Amateurs provided 2-meter communications during the rescue of a climber who had fallen about 40 feet onto a rocky ledge. (WA6QMW, EC District 1 Riverside Co.)

☐ San Jacinto Mountains, California — June 28. ARES/RACES members maintained communications for the Riverside Mountain Rescue Unit when a Boy Scout with heat exhaustion and a man suffering from loss of equilibrium had to be airlifted to medical facilities. (WA6QMW, EC District 1 Riverside Co.)

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For August, 29 SEC reports were received, denoting a total ARES membership of 15,252. Sections reporting were Ala, Alta, Ariz, Ark, Colo, EBay, Ill, Ind, La, Me, Mar/NFld, Mich, Minn, Mont, NFla, Ohio, Ont, SV, SJV, SCV, SD, SFla, SNJ, STex, Va, Wash, WVa, WMass, Wis.

COMMUNICATIONS SERVICE OF THE MONTH

It was a typical Nebraska June day, humid but not extremely hot, with the weather forecast calling for a 20% chance of rain and thundershowers. But this all soon took a change for the worse. At 7:30 P.M. June 3, 1980, Aaron, WDØFAA had just started calling the 2-meter ARES net on the KØGCJ repeater when Mac, WØAP, checked in from Dannebrog, about 10 miles north of Grand Island. He reported unusual cloud activity in the area and asked us to watch for any developments in our area.

It wasn't long after Mac's report that the National Weather Service reported a tornado sighting about five miles north of Grand Island. The twister was heading in the usual northeasterly direction, away from Grand Island. Then WØAP reported to the net that the storm had taken a complete about-face and was headed south, toward the city!

Before we knew it, the warning sirens were sounding, and the Grand Island area was under attack by a series of tornados. For the next four hours, Grand Island and its residents, guests and passersby sat through the storm and waited to see what, if anything, was left of their homes and businesses. The tornado knocked out all power to the city, as well as water, sewer and some telephone service.

At midnight, Fritz, WBØMSU, and Carol, WBØMST, managed to get their home station on the air using a portable generator. They established communications with WØMAO, the state Civil Defense station in Lincoln. Bill, WØFHJ and Ken, AJØA, got the local Civil Defense station on the air and in contact with WØMAO. The vital communications net was in full swing and remained active until June 9. The Red Cross, civil defense, Civil Air Patrol, Salvation Army and other organizations all used Amateur Radio communications.

During the early morning hours of June 4, the task of digging out and searching for the injured and homeless began. Steve, WBØSIN, and Jim, WBØTLJ, helped the Red Cross set up and organize communications for their three primary shelters. Communications among the shelters were conducted mainly on 146.52 simplex, while requests for food, blankets and other aid were handled on local repeaters. The hams also helped to verify the numbers and names of the people at the shelters to aid in locating missing persons and to help in the distribution of food, sanitary materials and first-aid supplies.

Our main traffic station was set up and coordinated by WBØMSU and WBØMST. KØGZD also set up an additional station on 40 meters to help handle even more traffic. Hoards of inquiries made it necessary for WØWKP, NØAJQ, WAØJBL and WØPXD to set up another station at Red Cross headquarters to handle some of the outgoing traffic. Most of this traffic was passed on RTTY through the 16/76 repeater in Lincoln to KØKKV and WØMAO.

Amateurs also set up a communications center in a shopping center in South Grand Island. From this location, hams provided communications for the Civil Air Patrol as they took damage surveys from the air. Hams, citizens band operators and other volunteers also assisted in ground searches for missing persons. Because of the large area involved, many people were needed for search parties. Cooperation was generally quite good among all of the organizations participating.

Another service the hams provided was acting as additional eyes in the stricken areas. The Amateurs assisted the National Guard and the local police by watching for and reporting any suspicious activity. WBØHRG and AJØA coordinated between these volunteers and the law-enforcement agencies.

By June 9, the hectic pace slowed down. For the most part, communications were restored to normal, and the H&W traffic dropped to a mere trickle.

The work was hard and the hours were long, and once again the ham operator came through when emergency communications were sorely needed. Each amateur involved deserves a hearty congratulations! (AJØA, EC Grand Island, and WBØMSU, WBØMST and WBØSIN)

REPEATER LOG

According to reports received between August 21 and September 21, 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	Public Safety Events	Drills/Alerts	Power Failures	Total
K1HF							1			1
WR1ADS				1						1
W2SNM				2						2
W3UER	22		1		3				2	28
WA3AOP							1			1
K4SCL	1									1
W4APV	1									1
WR4AKV	1									1
WR4ASY	2						1			3
W5GIX				1						1
WA5FYI				1						1
WR5ABA		1		6						7
WR5ABI				5						5
WR5ABY		2		10	1					13
WR5AJG				1						1
WR5AOQ							1			1
WR5APK				6						6
WR5APN				1						1
W6IYY				6				4		10
WR6AEN			2	25						27
WR6AOX					1					1
K7CC				9			3			12
K7OSM				1						1
W7WGW			3		1				1	5
WA8ULB								1		1
WB8SEC	3						3			6
WR8AES							1			1
K9ORP	3			1				1		5
K9UXP	1									1
K9XA								1		1
WR9AMU				1						1
KØOJ				1						1
WØINK										2
WBØSBH	2									1
WBØYIB	1		1				1			2
WRØACS							1			1
WRØADD			1			2				3
WRØAEV								1		1
WRØAEZ							1			1
WRØAFT	3									3
Simplex	3			1		2	14			19
TOTAL	43	3	8	78	6	4	28	8	3	181

NATIONAL TRAFFIC SYSTEM

Per a recommendation from the NTS area staffs, statistics will revert to the separate format from now on. Sessions will be listed under the appropriate Cycle designation. Note: Only combined reports were available from the ninth and eleventh regions at press time.

WB5YDD has been named assistant manager, CAN/c2. KL7L now coordinating the RN7-KL7 liaison. EAN/c2 certificates to: KB3LF KB3DT WB3GZU K8OZ W3BBN W1QYY N3SJ WB2IQJ WB2TDN. 2RN/c4 certificates to: W2AET W2PA W2ZOJ N2SU N2BKK AA2H AG2R KF2T WB2EAG WB2HDU WB2IQJ WA2AFE WA2MLY WA4JRP/2 KA2CEF KA2CLT KA2CNN KA2CTU (all first annual); W2GWS (second annual), W2MLC (seventh annual).

August Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	1075	34.7	.715	93.0	
CAN	31	650	20.9	.330	100.0	
PAN	31	468	15.1	.343	98.9	
Region Nets						
1RN	56	192	3.4	.263	62.7	90.3
2RN	48	154	3.2	.232	51.9	90.3
3RN	54	212	3.9	.240	81.9	90.3
4RN	57	601	10.9	.406	74.4	100.0
RN5	31	437	14.1	.352	94.0	100.0
RN6	62	357	5.8	.220	82.0	100.0
RN7	62	561	9.0	.784	100.0	100.0
8RN	55	265	4.8	.308	66.7	87.1
9RN*						
TEN	31	132	4.3	.143	55.6	100.0
ECN*						
TWN	31	108	3.5	.247	80.0	96.8
TCC						
TCC Eastern	111[1]	809				
TCC Central	88[1]	266				
TCC Pacific						

*combined report listed under Cycle Four

Cycle Four						
Area Nets						
EAN	31	1748	56.4	1.338	95.7	
CAN	31	932	30.1	.711	98.9	
PAN	31	1091	35.2	.961	96.2	
Region Nets						
1RN	60	537	9.0	.465	96.7	100.0
2RN	91	804	8.8	.576	93.3	96.8
3RN	62	300	4.8	.400	95.7	93.5
4RN	42	408	9.7	.343	63.8	93.5
RN5	62	546	8.8	.362	87.7	100.0
RN6	62	511	8.2	.394	88.0	96.8
RN7	62	611	9.9	.886	100.0	98.4
8RN	60	648	10.8	.490	88.7	90.3
9RN	124	840	6.7	.338	96.0	96.9
TEN	62	341	5.5	.288	74.1	100.0
ECN	95	262	2.7	.309	68.1	100.0
TWN	62	446	7.2	.284	94.5	93.5
TCC						
TCC Eastern	84[1]	324				
TCC Central	55[1]	324				
TCC Pacific	115[1]	754				
Sections[2]	5861	24,066	4.1			
Summary	7378	41,780	5.7			
Record	7300	46,455	16.4			

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (190): AEND AENI AENJ AENM AENG (AL), ATEN HARC (AZ), BCEN (BC), NCN NCTN SBARESN SCN SCNV (CA), CWN HNN (CO), CN (CT), DEPN DTN (DE), BEN FAST FMTN FPON FPTN GN MAN NFPN PBTN PEN QFN QFNS SBEN SPARC SWFTN TPTN (FL), ARES CGVHFN GVEN GCN GSN GSSBN GTFCN (GA), TLCN (IA), IMN (ID/MT), ILN (IL), ICN ITN QIN (IN), KPN KSBN (KS), KDARES BARES KTN KYN PAWN (KY), LAN LEN LRN LSN LTN (LA), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN WMPN WMN (MA/RI), MEPN MMN MTN WRIN (MB), MEPN (MDC), CMEN MPSN MSN PTN SGN (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN (MN), ACE NEMOE (MO), APN (MR/NF), CAEN MN MSBN MTN (MS), CMN CNCTN JFK M2MEN NCSSBN PCTN RARS THEN (NC), CN CNN (NC/SC), DATA (ND), NCHN NMPN NSN PVTN WNN (NE), GSFM (NH), JSARS NJN NJPN NJSN NJVN OBBTN UCETN (NJ), NMRRN (NM), NSN (NV), CDN CNYTN HVN NYPON NYS OCETN SDN STAR WDN (NY), BNR O6MN ONN OSN OSSBN (OH), ATWN OAN OFON OLZ OPEN OTWN STN (OK), JCARES MCCOARES OSN PDXAARES PTTN (OR), EPA EPAEPTN NCARESN NWPATMTN PTTN WPA WPAPTN WPATMTN (PA), WQV/VHF (PQ), SCSSBN (SC), NJQ SDEN SDMN SDN (SD), PWXN SATN SPN (SK), TN TNVHFN TPN TSN (TN), DFW TEX TSN (TX), BUN UCN (UT), VLN VN VNTN VSBN VSN (VA), WARTS WSN (WA), WINS (WE/IN), BEN BWN NWTN WIN WNN WSBN (WI), WVN WVNN WVPN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

WA2SPL received his first TCC-E certificate.

1	2	3	4	5
Cycle Two				
TCC Eastern	124	89.0	1625	809
TCC Central	93	94.6	532	266
TCC Pacific				
Summary	217	91.8	2157	1075
Cycle Four				
TCC Eastern	93	90.3	1214	324
TCC Central	62	88.7	616	324
TCC Pacific	124	92.7	1508	754
Summary	372	90.6	3338	1402

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (August) *Cycle Two* — Eastern Area (N2YL, Director) — W1s QYY XX, K1XA, K2PL, N2YL, W2s CQB RQ ZDJ, WA2MFV, AJ3R, N3SJ, WB3GZU, W4JK, WA4CCK, WB4PNY, AF8V, K8OZ, W8PMJ, WB8YDZ, VE3s ATU CWA GOL. Central Area (W9JUJ, Director) — W4OGG, WD4HIF, W5KLV, WA5INJ, WB5s NKC NKD YDD, WD5HHK, K5s KJN PE, KA5s AZK BSN, W9s JUJ NXG, WB9WGD, WD9FDB. *Cycle Four* — Eastern Area (W4SQQ, Director) — W1s KX NJM, WA1ZAZ, K1s BA EIR GN SSH, W2s CS FR GKZ MTA RQ, K2NY, WA2s ICB MFV SPL, W3s FAF PQ, WB3GZU, K3s KW NGN, W4s MEE SQQ UQ, K4s BKX KNP, N4s KB NK, KB4N, WB4PNY, W8PMJ, WB8WTS, K8s AAZ KMQ, KC8C, VE3s GOL SB. Central Area (W5GHP, Director) — N4MD, W4ZJY, W5s RB SBE, K5GM, N5s RB TC, W9s CXY DND NXG, WØs AM HI, KØCW. Pacific Area (W5KH, Director) — N5NG, W5s JOV KH, N6s GW PZ, W6s EOT OA SZ VZT, WB6s AMP PVH, K7s HLR KSA MC, W7s DZX EP GHT LYA VSE, WA7GYQ, KØs BN DJ, WØLQ, WBØFFV, VE7ZK.

Independent Nets (July 1980)

1	2	3	4
Amateur Radio Telegraph Society	31	912	352
Central Gulf Coast Hurricane	50	366	3026
Early Bird	31	719	370
Empire Slow Speed	31	90	389
Hit and Bounce	31	377	489
Hit and Bounce Slow	31	128	316
IMRA	26	509	1087
Mission Trail	31	290	1320
New England Teleprinter	14	51	83
North American SSB Traffic	24	181	136
Piconet All Day Watch	120	282	2198
20-Meter ISSB	27	348	470
7290 Traffic	53	615	3095
40-Meter National Novice		61	105

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll August 1980

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.

680
KA9CPA
207
WA4CCK
159
W1GUX
150
VE3GOL
145
WD8LRT
141
WB3GZU
140
W2ZOJ
138
W7VSE
135
WA4CNY
131
KY4K
130
WB5YDD
128
WA4JDH
126
KA1BJY
125
WD4HIF
124
W4MEE
WB4FVV
123
KZ4K
WD5JYI
122
WA2SPL
WB8YRY
121
KA8CPS
WD4AWN
120
WB2PJU
117
W5JOV
WA3NAZ
WA4PFK
116
K4SCL
WA3PXA
115
K9PNG
114
WB5NKD
110
KB5TC
KF2T
N6AWH
N9AUG
W7LNE
W9JUJ
WA4STO
109
WA2UWA
108
AF2L
K9BVE
KA4LNA
KB5EK
N2APB
W4JK
WA2MFV
107
N3AIU
VE3ATU
W7BS
106
VE3RCO
WD8NYN
105
W4OGG
104
KA1FE
WA1TBY
103
AJ3R
K3JSZ
K4DZM
WA4SRD
102
W9DM
W9NXG
WA7LGN
101
KA2CTU
KB3DT
KB5NX
WA2ZJP
100
VE1WF
WB2EAG
99
AFØO
98
K8OZ
W2UEZ
W4NWM
W5DTR
97
AA5J
W6JXK
96
KA4GFU
KB4OZ
VE3KK
W4CKS
WB8MTD
WD5EUE
WD9IUX
N7AKX
95
K2VX
WB1GWS
94
N5TC
W5HMR
WA2KOJ
WB8YDZ
WD8KZX
93
VE3DPO
W1TN
WA5RVT
92
AF8V
K1BSO
K3JL
N5BT
N7BMY
W2TCA
W2XD
91
VE5WM
WA7MEL
90
K7JV
KB7JW
WB5NKC
89
KA1EO
B2GT
W2MTA
WAØTNM
WA3WQP
WB4NCH
WB5TAY
WDØBQP
WD5DQR
88
W5KLV
WB1HIH
W6NTN
87
W1RWG
86
W2YJR
WA2MVQ
WB1ANT
85
KA4ASZ
KG5L
WB2IDS
84
AK5N
KØPIZ
K4EV
W7GHT
W8VPW
WA3WIY
WB5ZJP
KA6A
83
WA1UAX
82
AE5I
KB3LF
WB8SYA
WD4CNQ
81
N4PL
W2AET
W8GGX
WB4WYG
WD9DVA
80
AG2R
N8ABA
W4ANK
79
KA8DJZ
N5RB
N6GW
WA6LVO
78
AK1E
WA4EIC
WB1CPF
77
VE3HTL
WB6PVH
76
KCØZ
N3EE
75
K4ZN
KA2CNN
KA8EPK
WA4LJI
WB3FEH
WB3GUR
WD4CNR
74
N4AXN
N7ANT
W4GPL
73
WB3JYZ
W5BGE
WB1DXR
WB1HEQ
WA1MJE
W1EOF
72
WA8GMT
W5CTZ
W3EGJ
AE2T
KØSI
71
WA8PIM
70
WB8UBR
KB2HM
N4BZH
WA2EQW
WD5GKH
69
K6INK
KA7AOB
N5AWG
N5CEK
WØHXB
WD8DYW
68
AG9G
KB2KW
W5VMP
67
K2HD
KB9IT
N2BXB
N4WA
WA4EYU
66
N2CR
W8UE
WA1IOG
WA2MFU
WB5MMI
65
AF1L
K4VHT
KA5AVQ
VE3BVG
VE5HG
W9IEM
WBØHOX
WB8YTD
64
KB4OW
KF8J
W1TM
WB4TZR
WD8RNQ
KA6LSC
63
K5DY
KA3T
KB6FC
KE8X
N4AZI
W9XD
WA5QFD
WB3CAI
62
KØJCF
VE3DUK
VE3GT
VE3JLL
W3DKX
W9JIJ
W9YT
WD5IVD
WD9GXW
62
WB6QBZ
61
W5VMY
WB3GZV
WDØBMR
WD8ILX/T
60
KA1KP
KB5UL
KCØT
W3DP
W4NQL
W6RNL
WA2SEL
WA7IHS
WB4VVL
WB5CIT
WD5IDB
WD8KBW
WD8PEI
WD9JAA
N6ANL
51
KA4BBA/T
47
WD4CFZ/T
46
KA1CGP/T
WB2RMJ/T
44
KA6HNY/T
42
N2BDW/T
WD8EMS/N
41
KA4AUR/N
KA4MZY/N
N2BGR/T

Brass Pounders League August 1980

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	745	897	1301	33	2976
WØWYX	31	950	296	654	1931
KA9CPA	44	857	148	627	1676
NØBQP	0	915	359	310	1584
WA4JDH	7	630	604	7	1248
W9JUJ	3	593	585	9	1190
WB7WOW	58	426	392	116	992
WAØHJZ	30	498	1	361	890
W4MEE	10	376	348	32	766
WB3GZU	59	323	340	40	762
WA3WQP	1	370	362	0	733
W7VSE	20	363	298	37	718
W7DZX	31	332	320	3	686
W3VR	198	181	249	9	637
K8OZ	1	317	279	12	609
K9BVE	10	290	275	34	609
W4JK	0	289	311	4	604
WD4AWN	3	302	288	26	599
WB7TQF	56	186	292	37	571
VE3ATU	7	266	274	18	565
WD4HIF	2	251	275	29	557
AJ3R	6	283	242	2	533
WA4STO	3	222	290	4	519
Multioperator station:					
K8DDG	1166	21	1166	0	2353

BPL for 100 or more originations plus deliveries:

WØFOB	182	W4LX	132
WD4COL	146	N4PL	112

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1K

NOVEMBER

1-2

ARRL Sweepstakes, cw, Oct. *QST*, page 75.

Delaware Valley RA QSO Party, sponsored by DVRA, 48-hour period UTC. Celebrates 50th anniversary of DVRA. Suggested frequencies: Phone — 1980 7235 14,280 21,360 28,610; cw — 35 kHz from low end; Novice — 7135 21,105 28,105. Minimum five QSOs for a certificate. Log and s.a.s.e. by November 30 to DVRA, Box 7024, Trenton, NJ 08628.

5

West Coast Qualifying Run (W6OWP prime, W6ZRJ, alternate), 10-35 wpm at 0500Z Nov. 6 (9 P.M. PST Nov. 5). Frequencies are approximately 3590/7090. 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/endorsement. The complete W1AW schedule appears on page 90 of Oct. *QST*, or is available for an s.a.s.e. to ARRL.

5-6

YLAP, phone, Sept. *QST*, page 84.

8-9

OK-DX Contest, Oct. *QST*, page 96.

European DX Contest (WAE), RTTY, Oct. *QST*, page 95.

Foreign Service Net QSO Party, Oct. *QST*, page 95.

International Police Assn.Contest, Oct. *QST*, page 96.

Delaware QSO Party, Oct. *QST*, page 96.

12

W1AW Qualifying Run, 10-35 wpm at 0300Z Nov. 13 (10 P.M. EST Nov. 12). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. See Nov. 5 listing for more details.

14

ARRL Frequency Measuring Test, begins with a call-up at 0300 and 0600Z Nov. 15 (10 P.M. EST Nov. 14 and 1 A.M. EST Nov. 15). W1AW transmitters will be on the air simultaneously on 20, 40 and 80 meters for the duration of the test but, to correlate your readings with those of the umpire, measurements should be made during the specified periods. Approximate frequencies and measuring periods for the early run are 14,100 kHz between 0307 and 0312Z, 7055 kHz between 0315 and 0320Z and 3510 kHz between 0323 and 0328Z. For the late run, 14,010 kHz between 0607 and 0612Z, 7085 kHz between 0615 and 0620Z and 3570 kHz between 0623 and 0628Z. Submit your averages for each period to be compared with the umpire, a professional frequency-measuring laboratory. Indicate how many readings you took to form your average. Your report must be received at ARRL hq. by Nov. 26. W1AW will transmit official results in an ARRL bulletin beginning Nov. 28.

15-16

ARRL Sweepstakes, phone, Oct. *QST*, page 75.

22

W1AW Qualifying Run, 10-35 wpm at 2100Z (4 P.M. EST). See Nov. 12 listing for more details.

23

ARRL Midnight Special, from 0900 to 1100Z Nov. 23 (4 A.M. EST). Cw only, 80 meters. Suggested frequencies: 3550-3600 and 3725 kHz. Exchange age and state/province (WA1ZUY would send 32 CT). YLs may substitute "YL" for age. Count one point per QSO. *Add* five points per state/province worked to your QSO total for final score. Send within one week to ARRL. S.a.s.e. for results; top scorers will be listed in *QST*.

29-30

CQ World Wide DX Contest, cw, Oct. *QST*, page 95.

10 Meter Ground Wave Contest, sponsored by the Breeze Shooters of Pennsylvania, from 0200Z to 0600Z Nov. 30. Exchange signal report and contest zone (zone 1 — less than 25 miles from Pittsburgh; zone 2 — 25 to 50 miles; zone 3 — 50 to 75 miles; zone 4 — 75 or more miles from Pittsburgh). Count one point per QSO in your own zone, except two points for Novice/Technician QSOs. For QSOs in a different zone, score as above and add one point per zone difference. Count ground-wave QSOs only; skip QSOs do not count. Work stations once only. Low-power category if transmitter will run no more than 20 watts. Postmark log by Dec. 5, 1980 to Breeze Shooter Ground Wave Contest, c/o Donald Myslewski, K3CHD, 359 McMahon Rd., North Huntingdon, PA 15642.

DECEMBER

2

West Coast Qualifying Run, 0500Z (9 P.M. PST Dec. 3). See Nov. 5 listing for more details.

6-7

ARRL 160-Meter Contest, this issue, page 92.

EA-DX Contest, phone, this year's rules not received.

Connecticut QSO Party, sponsored by the Candlewood ARA, from 2000Z Dec. 6 until 0200Z Dec. 8, with a rest period from 0500 to 1200Z. Send signal report, serial number and ARRL section (county for CT stations). CT stations work DX stations for QSO points but only one multiplier. Club station W1QI counts five points per band/mode. Novice QSOs count two points, OSCAR QSOs three points. CT stations multiply QSOs by ARRL sections worked. Others multiply CT QSOs by CT counties worked. Suggested frequencies: Phone — 3927 7250 14,295 21,370 28,540; cw — 40 kHz from low end; Novice — 3725 7125 21,125 28,125. Mail by Jan. 2, 1981 (s.a.s.e. for results) to CARA, c/o Steve Grouse, KA1ECL, 3 Queens Ct., Danbury, CT 06810.

11

W1AW Qualifying Run, 10-40 wpm, at 0300Z Dec. 12 (10 P.M. EST Dec. 12). See Nov. 12 listing for more details.

13-14

ARRL 10 Meter Contest, this issue, page 92.

EA-DX Contest, cw

HA-DX Contest.

28

Canada Contest

30

W1AW Qualifying Run

JANUARY

1

ARRL Straight Key Night

3

ARRL CD Party, phone

10

ARRL CD Party, cw

17-18

ARRL VHF Sweepstakes

73 160-Meter Phone Contest

QRP ARC SSB QSO Party

FRACAP (Central America) QSO Party

25-26

REF (France) Contest, cw

CQ 160-Meter Contest

Classic Radio Exchange

FEBRUARY

Jan. 31-Feb. 8

ARRL Novice Roundup

21-22

ARRL DX Contest, cw

MARCH

7-8

ARRL DX Contest, phone

*Assistant Communications Manager, ARRL

Moved and Seconded...

LIFE MEMBER APPLICANTS
September 13, 1980

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Section 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, E. Roy Ellis, VE6XC — SCM/SEC: E. Roy Ellis, VE6XC. Asst SCM: VE6AMM. STM: VE6ABC. NMs: (ATN) VE6ABC, (APSN) VE6AFO. VE6HE recovering in Calgary hospital. Edmonton Marathon 40 km foot race 31 Aug. saw 23 hams on duty for radio communications — no running. Complete radio coverage for the North American Motor Rally was achieved by locating a 2-M rptr on Moose Mtn 35 miles west of Calgary at 10K ft by local hams. ATN QNI 153, QTC 12. Traffic: VE6HO 97, VE6CHK/6 53, VE6ABC 16, VE6AAT/6 14, VE6AMM 8, VE6CE 8, VE6ARL 4, VE6ARN 3, VE6XC 3.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — VE7SH and her OM were on Vancouver Island in their trailer during July and August. We have been told that Haney's Hamfest was a great success. Burnaby ARC again looked after the PNE display. From the fair they have obtained a large code and theory class for this winter. They have also taken on the CRRL/ARRL QSL Bureau. Do you have your s.a.s.e. there? Traffic: (Aug.) VE7ZK 79, VE7DFY 19, VE7BLO 12. (July) VE7ZK 113, VE7CGJ 33, VE7DFY 27, VE7BLO 17, VE7CDF 17.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst SCM: VE4JP. SEC: VE4TR. STM: VE4RO. NMs: VE4s VJ TE AEJ NM. Summer has about had it, and with it a marked return of amateurs to the bands and nets. VE4VL of Dauphin is having some surgery and we wish him well. The VE4NM family is on a trip south, as far as Mexico I understand. MEPN QNI 765, QTC 9, 31 sess; MTN QNI 58, QTC 20, sess 14; MMN QNI 402, QTC 31, sess 31; WHIN QNI 131, QTC 3, sess 5. Traffic: VE4PG 38, VE4TE 32, VE4AEJ 17, VE4JA 12, VE4LB 10, VE4AAD 8, VE4ADS 6, VE4FK 5, VE4CR 4, VE4ACX 3, VE4GB 3, VE4NE 3, VE4JP 2.

MARITIME — NFLD: SCM, D. R. Welling, VE1WF — A/SCM: VO1FG. NM: VO1JN VE1WF. SEC: VE1ASW. STM: open. Expect to appoint new SEC this month. Congrats to VO1AW on appointment as A/Dir. VO1JN won 1st place in SMIRK Test. VO1DI won Bob Lewis Award. VE3OT & VE3GRO attended Ham Geiidh '80. Many other visitors also. League booth proved popular. Approx 335 in attendance at banquet. CW Test — YL VE1BWP, OM VE1ABU. TX Hunt — VE1AZE VE7AAZ/1 VE1ABU. Grand Prize won by VE1NG — congrats. Hfx area ARES Group participated in Search/Rescue & Test Exercise. I would like to thank everyone for their cooperation during the past 8 months. APN: 31 sess, QNI 189, QTC 53, QNI 390. Traffic: VE1WF 243, VE1LGR/RO 43, VE1BMN 13, VE1XF 13, VE1AUL 12, VE1BXA 10, VO1AW 5.

ONTARIO: SCM, Larry Thiviergе, VE3GT — A/SCM, VE3BMG. SEC: VE3GV. STM: VE3GOL. Last month I informed you of an agreement between the Ont. Section ARRL and the Ont. Division of the Canadian Red Cross Society. In view of this, the DOC issued the call VE3RCO (Red Cross Ont). Hurricane Allen's landfall on the island of St. Lucia, saw the inauguration of VE3RCO. The call was active on the International Assistance Net, (IAN) on 14.303 MHz for a total of 1091 minutes and handled 28 welfare messages. Amateurs should feel a sense of pride knowing that in an emergency, Amateur Radio and the Red Cross work hand in hand as people helping people. Stations from 14 different countries assisted as well. VE3BGX, with his antenna at 80 feet, is up to a countries total of 258/222. New members of the Nippising FM Assn. are VE3s GMZ and HKW. VE3TEM is a new repeater at Lake Temagami on 146.31 in and 146.91 out, sponsored by the LTARG. London's Amateur of the Year award went to VE3IBV. VE3ASH again handling beginners classes for the Bruce ARC. VE3DAP has won the Tennessee QSO Party plaque. During the Ont. Summer Games held in Peterborough, the Peterborough ARC provided communications with scores to score keepers and medical liaison. In addition, they also operated a message handling center with access to the NTS via extra net sessions of OSND and EGND. Running 10 watts from the Big Rideau, VE3GFN scared up 10 states and 4 countries while on holidays at the cottage. VE3JED is the daughter of SEC VE3GV. Between skeds, VE3KK managed to work the submarine USS God operating as a special events station. Traffic: (Aug.) VE3ATU 565, VE3GOL 419, VE3CWA 346, VE3KK 331, VE3OPO 146, KB6FR/VE3 129, VE3GNW 126, VE3ISW 111, VE3GT 92, VE3HTL 89, VE3JLL 89, VE3BB 60, VE3FGU 44, VE3GFN 43, VE3DVE 40, VE3BVG 39, VE3DUK 34, VE3IXB 31, VE3RCO 28, VE3JRT 27, VE3FPI 19, VE3ANJ 18, VE3AYZ 12, VE3IFP 9, VE3EWD 6, VE3MKJ 2. (July) VE3AWE 15.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2FFE. VE2FWE now at college received 15 wpm endorsement. VE2s FSA FMK FFS GAD BBT and YF handled communications on August 24, at the Shawbridge Youth Center. Congrats to VE2AGP with over 230 countries. With regret, I have to announce that VE2AFM is now a Silent Key. De Drummondville, VE2CRD a fait un succes de son Field Day annuel. VE2FEP est le president du club VE2CAM. VE2ESV is the new president of the West Island ARC, VE2CWI. Traffic: VE2BP 23, VE2EC 19, VE2FEX 19, VE2EKC 11, VE2FSA 10, VE2FWE 6.

SASKATCHEWAN: SCM, Norm Waltho, VE5AE — STM: VE5XC, SEC: VE5WM. NMs: VE5DC, VE5HG, VE5SF, VE5WM. SATN: 31 sess, 328 QNI; SPN: 31 sess, 858 QNI, 40 QTC; RARA 2-M: 30 sess, 374 QNI; PWXN: 31 sess, 394 QNI. Regretfully I announce the following have become Silent Keys: VE5ADR VE5BE VE5RZ. The Sask. ARL held a successful flea market and picnic at Watrous on August 2nd. VE5ACS was the lucky winner of the 2-meter transceiver. The Regina ARA provided 2-meter communication at the North Western International Rowing Assn. regatta on Pasqua Lake during the August 16th weekend. SCM, VE5AE, will have writers cramp after he answers all the QSL cards received while operating XJ5AE/VE8 the past two months. Traffic: VE5HG 18, VE5WM 13, VE5XS 1.

ATLANTIC DIVISION

DELAWARE: SCM, Roger F. Cole, W3DKX — SEC: W3PQ. STM: WA3WIY. PSHR: K3JL 92, WA3WIY 84, W3DKX 62. Thanks to K3HBP and helpers for a fine Delmarva Hamfest. Field Day Trophy winners single xmtr with 2016 pts, Sussex ARA. Multiple xmtr and vhf with 3944 & 78 pts, respectively, DARC. Kent Co ARC was multiple runner-up with 2062 pts. Congrats to all participants. Congrats also to WB3DWW and KB3LB (ex-WB3LBM) for upgrading, and to new hams KA3FNB and KA3FNC with KA3GDJ, from the last DARC class. DEPN: QNI 57, QTC 8; DTN: QNI 286, QTC 55. Traffic: W3PO 159, K3JL 53, WA3WIY 52, W3QQ 48, W3DKX 40, WB3DUG 27, WA3YTB 17, WB3FOC 14, AC3T 10, WA3ZBI 7, W3FEG 6, W3WD 3, WB3ILX 3, WA3RTX 2.

EASTERN PENNSYLVANIA: SCM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: WB3JYZ. NMs: AG3R, AJ3R, AA3B, WA3WQP. Net reports: EPA QNI 547, QTC 263, 61 sess; EPAEPTN QNI 431, QTC 164, 31 sess; PFN QNI 311, QTC 380, 26 sess; PTTN QNI 183, QTC 62, 29 sess; ATN QNI 82, QTC 12(2), 8 sess; LVN(2) QNI 9, QTC 1, 3 sess; LVN QNI 8, QTC 1, 3 sess. OBS reports: W3ID WB3JYZ W3AVJ AJ3R WB3FVJ K3EBZ and W3TI. OO reports: W3KCM W3FAF and K3RDT. OVS reports: KA3DZD W3GOA WB3JYZ and WB3AZE. BPL: WA3WQP and AJ3R. PSHR reports: WB3GUR WA3WQP WB3JYZ AJ3R N3BFL N3AIU KB3LF W3BI K3JSZ WB3FEH W3DP WB3CAI WB3GZV KA3DZD and WB3GOA. New appointments: KA3CAT to OES, N3AKQ to OTS, N3BFL to OES & OTS, WA3VIL to OES and W3GVR to OO, congrats. KA3FAD new Novice in Summitt Hill. EPAEPTN welcomes N3AZT WA3EHD and WB3CAT. PTTN welcomes N3BFL N3BHF WA3VIL and WB3CUF. EPA welcomes KBBG. W3IPX will be spending a month in Europe. W3EU spending some time visiting antenna farms. W3ID sez hot, humid and QRN. PFN welcomes N3AIU, N3AZT and WB3FVJ report for the first time. EPA Section picnic was very successful with SCM, SEC, STM and all NMs attending. Entertainment was provided by WB3JYZ and his "Ham Band." W3FAF worked up a new OSK system using reed relays. N3BHF loved those NCS spots. N3AIU attending Lehigh U. and looking for hams with 6-mtr am gear. WA3VIL reports EPA picnic FB and looking forward to next year. WB3KLK and XYL welcomes a new harmonic. New Gear Dept: WN3CDW & WA3NVK new LC-55IDs; WB3JMH new TRS 180s; WA3CKA new tower; AJ3Z new TRS-80 computer; K3KNJ new TR2400 and N3BHF KB3LF new SB230s. AJ3R looking for new 2-m rig. WB3KUA joins ATV ops in W-B area. WB3GUR reports new vhf net operating 147.06 at 9:30 P.M. Wed Fri & Mon evenings for handling traffic in the Phila. area. WB3GZV had a great time out west. Warminster ARC planning a message booth at local mall for Xmas shoppers. WB3IVX upgraded to Gen. W3BUR reports R F Hill ARC 2-m Net will move to club repeater, W3AI, 144.71/145.31 on Wed at 9 P.M. All amateurs are invited to check in. Carbon ARC did FB job operating message booth at Gnaden Hutten Hospital Festival in Lehighton. WB3AZE recently returned from Ft Bragg, NC as 2nd Lt in Signal Corps. K3YD spent part of summer at Ft. Sill, OK. I wish to thank all the clubs, repeater groups etc for sending me their wonderful news letters and bulletins, they sure are appreciated. A committee is now making plans for a section dinner meeting to be held in early spring. Traffic: (Aug.) WA3WOP 733, AJ3R 533, WB3GUR 216, W3AVJ 155, K3JSZ 150, W3IPX 143, AA3B 122, KB3LF 121, W3DP 113, W3FAF 108, W3BI 104, N3CD 104, WB3FEH 103, WB3CAI 87, N3AIU 70, WB3GZV 67, WB3JYZ 65, W3VA 54, WB3CUF 53, K3EIP 50, N3BFL 39, AD3X 38, WA3VIL 35, W3ID 22, WA3EHD 17, AF3Z 13, W3ADE 11, WA3CKA 11, K3KW 9, N3ZAT 8, K3NGN 8, W3TB 8, N3BHF 7, WB3FVJ 6, N3CP 5, W3HK 4, K3NB 4, WA3OFD 4, WB3AZE 3, K3YD 3, K3EBZ 2. (July) N3BFL 40.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — WA3TAI is our SEC. Is he getting all the reports you owe him? For you young squirts, W3ADQ 91, W3AKO 81, WA3CBC 80 and W3MSN 73 can give you a run for your money! WB3JRW, the MEPN Senior Director, vacationed fishing the outer banks. WA3HEM claims he is back in business. W3CDQ was visited by ZS6DH and ZS6J and some of her 'I' friends. K3RXK can hear all T-Mark repeaters, and likes those 2-meter openings. KB3AP says at BARC, W3RUN teaches Novices and KA3G (ex-WB3KZX) handles the Generals. W3NZW opines he is in a summer slump. KA3T has become a real multi-mode man. KA3DXZ provided the communications for the Camp Olympic Horse Trials helped by WB3HAD WB3LHT KA3EWV and WB3LTA along with the REACT team. W3CVE sends 'em out on his own and gets 'em back on the NTS. 6 meters won't let N3AFM slow down. W3MR has been noting a few discrepencies. PVRC has W3LPL, pres.; WA3ZAS, vice pres.; N3GB, secy., W3MR, treas.; W3FA W3GRF K4FJ, dirs. The PVRC Rpt Board is: WA3UXU W4BVV W3GNQ, K3IU K3WX W3MR and W3LPL. AK3X is nearing the DXCC mark. W3MEO WB3JVI WB3ULR W80FQC W3WTU KB3GX and AK3X provided commo for the Severna Park 10 mile Marathon. W3FZV is home from 4 weeks in crowded G-Land. N3SJ does a lot of cooking with maple logs. WB3CES lives! K3CRW is getting back into gear. WB3GZU finds the daytime tfc system to his liking. W3DQI has a new computer, but the family has him outnumbered. N4DR activates the Washington Hospital Center station WB3JYT as well as his own. N3QA sounds good with the new rig, it's back to sea for him, look for him on 80. With the August nets, Netmanager sessions/TFC/QNI average. MEPN/WB3GZU 31/103/22 6. Topper K3ONU. Others N3AGM WB3BFK and WA3IHW. W3ADQ had 91 consecutive skins. WR-PON/W3DFW 22/30/15 9. MDC-PON/W3OYY 4/12/20. Wash County/W3FZT 4/018.2 This is the 2-mtr Hagarstown Net on Tuesdays. In July MDD/W3PO 62/228/7 9. Top Brass W3FA K3JL and W3QQ. Traffic: (Aug.) WB3GZU 762, W3FA 137, N3SJ 118, AK3X 74, W3DQI 36, N3QA 34, KA3T 31, KB3AP 20, N4DR 17, K3RXK 9, KA3DXZ 8, W3FZV 8, WB3JRW 2. (July) W3FZV 10.

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — STM: W2MTA. SEC: W2BCH. No BPL this month. PSHR to W2ZOJ KA2CTU N2APB WA2MFV W2MTA WB2IDS N2BXB WA2KOJ AE2T WA2ZJP W2AET KB2GT WA2MFU. Net reports:

Net	Freq.	Time	Sess	QNI	QTC	Mgr.
NYS (e)	3677	7 P.M.	31	521	273	W2ZOJ
NYS (L)	3677	10 P.M.	31	370	247	W2ZOJ
NYPON	3913	5 P.M.	31	514	197	K2KQC
OGTEN	34/94	6:30 P.M.	—	—	—	WA2MFV
GNYTN	90/30	9:15 P.M.	—	—	—	WA2PUU
STAR	99/39	6:30 P.M.	31	169	54	WA2ZJP
WDN	04/64	9:30 P.M.	31	961	133	N2APB

Ex Oneida Co. EC WB2BEJ now #1 in Vermont. WDN Asst NM, WB2EOX, now sporting KG2D with the new Extra. Boonville ARC provided communications for NYS Woodsmen's Field Days Canoe Races. Griffiss AFB ARC Club stn WA2ZXS and MARS set up at AFB open house in Aug. 1980-81 ARATS officers are WB2JOK, pres., WB2WUB, vice pres./treas.; K2QB, secy. Traffic: (Aug.) W2ZOJ 408, WA2ELD 284, WA2MFV 218, WA2MFU 207, N2APB 190, W2MTA 185, WA2HSB 169, KA2CTU 136, N2BXB 133, KA2CLT 132, WA2KOJ 112, W2FR 104, K3GWN 101, WB2RWW 98, WB2IDS 88, AE2T 75, WA2ZJP 72, W2PPS 71, W2AET 67, KB2GT 51, KA2HAC 44, WB2QIX 35, KG2D 27, AF2K 22, W2TZ 21, W2GJ 17, WB2OWO 16, WB2MVC 9, K2VR 5, K2ZWI 3, WB2NAO 3, WA2VUC 1. (July) WB2MVC 30, K2ZWI 21.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM: N3FM. SEC: WA3JBQ. STM: N3FE. NMs: W3NEM W3KUN W3MML WA3PXA & WB3JDI.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	31	316	133	3585	8:00 Dy
WPAPTN	31	461	111	3983	6:15 P/Dy
WP2MTN	29	622	92	146.28/88	8:00 P/Dy
NWPA2MTN	26	276	10	146.04/64	9:30 P/Dy

First I must apologize for an error in my column in the Sept. *QST*. I listed K3MAN as a Silent Key, it should have been W3MAN. New Extras are N3AZZ WA3BVY & WB3GTR. New Novices are KA3FIW KA3FIP KA3FME & KA3FMG. New Generals are KA3DQH & KA3CNP. One more Novice is KA3GGR. The ARES members in Butler and Armstrong Counties assisted in emergency work after a flash flood. The Irwin ARA should have its repeater on the air (146.925/.325) after extensive damage by lightning. In order to prevent hamfests from conflicting between groups in the section, please send me your dates. It will save some hard feelings. Clubs are urged to send their annual reports to ARRL or risk being put on the inactive list. The weather bureau in Pittsburgh has asked the Allegheny County Public Service Group (ARES & RACES) to try to contact other groups along the rivers to set up a possible net for reporting river conditions during heavy rains. Traffic: WA3PXA 254, W3EGJ 245, KB3DT 167, N3EE 162, N3FM 109, W3AS 98, W3SMV 79, AC3N 49, K3SMB 48, W3MML 38, WB3GUK 33, W3RUL 33, N3WA 33, WB3GJD 30, W3KMZ 28, W3EXC 23, N3KB 23, W3UHL 17, K3VQV 16, K3HCT 15, W3KUN 13, WA3JBQ 13, W3SN 11, W3TDW 11, WB3BOB 9, KA3BGC 8, WB3JDI 8, AF3B 4, K3CR 4, N3AZH 3, W3HDH 3, W3TTN 2, W3FSB 1, W3LOD 1, K3UA 1.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst SCM: W9RYU SEC: W9QBH. NMs: WA9KFK and WB9JSR. Cook County EC: W9HPG.

Net	Freq	Times/Days	QTC	Sess.
ILN	3690	0030/0400		
ILL Phones	3915	2130 Dy	95	26
NCPN	3915	1200/1700 Dy		
IEN	3940	1400 Su	6	4
W9VEY				
Mem Stn	2-meter			

K9CGS reports that the 9R Daytime Net had a traffic count of 277 messages and Illinois participation was 100% with W9HOT W9NXG K9BVE WD9FDB W9JIJ WB9WGD W9PBZ K9GH chicking in. Our sympathy to the family and many friends of W9NFO who recently passed away. The Hamfesters annual hamfest was well attended despite the inclement weather. KA9IVK is a new Novice in the Springfield area. The Sangamon Valley Radio Club of Springfield volunteered radio monitoring for the Red Cross during the Illinois State Fair. The CAND had 650 messages during 31 sessions and that Illinois stations WD9FDB W9NXG W9JIJ WB9WGD K9BVE WB9FDN and K9CIW participated. New ECs appointed are: KB9BB for Champaign County, W9KSU for Franklin County and K9BNI for Clinton County. New officers of CENOIS (Decatur) are: KA9BYB KA9HTF and KB9QO. Now is the time to plan your code and theory classes. Please notify the League of your classes' time and place. WD9FQD and KA9AMF are now Amateur Extra Class licensees. Both are members of the Lamoine Emergency Amateur Radio Club. Chuck Dorwick is the new editor of the Wheaton Community Radio Amateurs publication HAMLETTER. Two new Novices in Sterling are: KA9HIU and KA9HKE. K9BVE is the only BPL recipient this month. Traffic: (Aug.) K9BVE 609, W9NXG 335, K9PNG 212, W9QK 135, K9BX 110, K9EEA 106, WD9FDB 106, W9JIJ 76, KA9ALR 74, KN9BAM 72, WB9WGD 55, N9TN 22, W9TLU 21, W9PRN 20, W9KR 17, WA9AON 10, W9RJW 8, WD9HZF 6. (July) WB9PUK 91, K9EEA 90, KA9EGW 27, W9KR 21, K9UN 10.

INDIANA: SCM, Bruce Woodward, W9UMH — SEC: W9UMH. STM: W9JUJ. NMs: ITN W9QYY, QIN WD9GXW, ICN N9AEI. VHF W9PMT. August net reports:

Net	Freq.	Time/UTC	QNI	QTC	Sess.
ITN	3910	1330/2300 Dy	2771	441	62
QIN	3656	1430/0100/1400 Dy	871	408	92
ICN	3708	0014 Dy	100	48	29
IPN	3910	2130 Dy	1263	216	31
IPON	3910	1300 Su	122	18	5

VHF Nets report: ONI 3433, QTC 209, Bulletins 11. Time 5033 for 20 nets. Indiana 100% 9RND stations: W9JUJ K9CGS W9DLF WD9CIS N5AAA/9 KA9BIO W9KRV WB9MIK W9URQ. 100% CAND stations: W9JUJ K9CGS W9UMH WD9GNP. No reports from 9RN or CAN. CAND station activity is down due to their change in procedure. Thanks to K9CGS for acting as NM for 9RND this month. W9QYY reports activity on ITN double last year. Congrats to all who have contributed to this success, particularly W9QYY. Lightning Bolt Certificates

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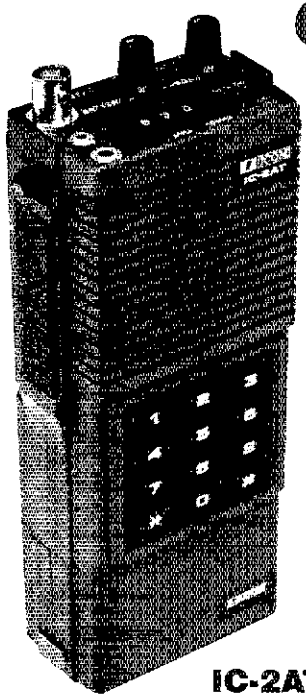

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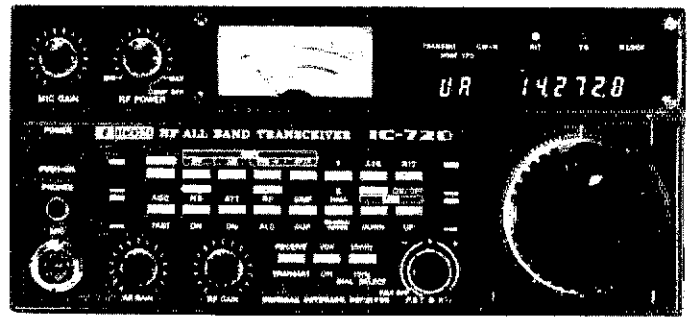

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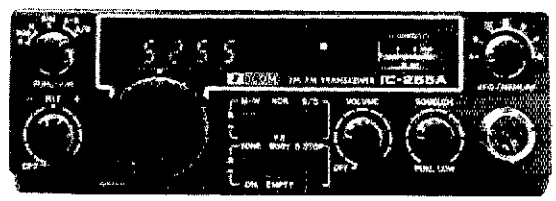
- Receiver sensitivity: Less than 0.25μV.
- Operating voltage: 13.5VDC @ 20 amps.



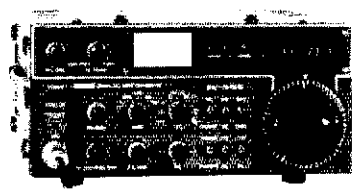
IC-255A 2 METER FM TRANSCEIVER

- 25 watts power output. Current drain only 5.5A.
- 5 channel memory w/memory scan.
- Full coverage plus overlaps, 143.8 to 148.2MHz.
- Dual, built-in VFO's. Tuning in 5 or 15kHz steps.
- An outstanding receiver.
- Standard ±600kHz splits but can be programmed for any split between 143.8 and 148.2MHz.

IC-551 6 METER TRANSCEIVER.

Only set w/capability for scanning on SSB! Invaluable for checking on 6M band openings.

- Cont. tunable, 50-53.999MHz. Dual VFO's.
- SSB w/USB,LSB, CW, AM, FM*
- 3 chan. memory w/scan stop all modes.
- Band scan (any portion) all modes.
- CW monitor. Speech comp.
- Digital, freq./mode readout.
- AC/DC supply. Options: *FM, pass band tuning, VOX.
- Rec: SSB, CW,AM: 0.5μV for 10db S+N/N. FM: 0.6db for 20db quieting.



FREE SHIPMENT, ALL OF THE ABOVE ITEMS, UPS (Brown)

STORE PHONE/ADDRESS GIVEN ON OPPOSITE PAGE (bottom)
CIRCLE NUMBER TO RIGHT OF ITEMS THIS PAGE
CIRCLE TOLL FREE GIVEN ON READING SERVICE CARD

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NEW!

VHF/FM DEVIATION METER

Sets FM deviation precisely w/direct meter readout (marked for nom. tone pad/voice deviation). Covers 144-148 MHz w/freq. selected by xtl. 146.52 MHz xtl supplied. Operating voltage from 11.9 to 16VDC. **$99.95**

FREE SHIPMENT UPS (Brown)

MIRAGE B-1016

160 WATTS OUTPUT

2 METER AMPLIFIER SSB, FM, CW.

Freq. range: 144-148MHz.
RF power out: 160W nom. (10W in).
RF power in: 5-15 watts.
DC operating pwr: 13.6VDC @20-25A.
Duty Cycle" Intermittent.
Built-in receive pre-amplifier.
Automatic int. or ext. relay keying.

REG. $279.95 **$249.95**

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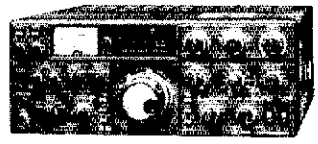
KENWOOD

Call for your special prices* on these outstanding products.

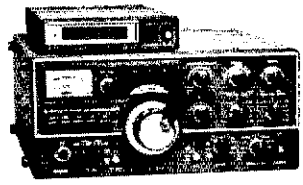
(and all other Kenwood ham products)

**Plus free shipment UPS (Brown)*

TS-830-S



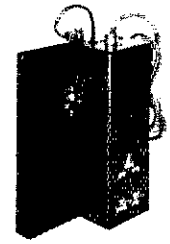
TS-520SE



TR-2400
2 METER HAND-HELD

TS-130-S

25W OUTPUT FROM TR-2400! w/American Radio "324"

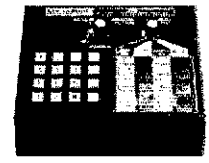


TR-2400 plugs directly into compact assembly. Linear amp features V-Mos pwr transistor, gives 25W RF across band w/1.5W drive.

Built-in amp/spkr boosts audio more than 2W. Also, current-limited charger for TR-2400. Socket for ext PTT mic. 12VDC @ 4A

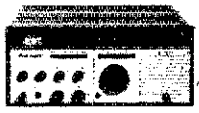
$199.95 **FREE SHIPMENT UPS (Brown).**

AEA MORSEMATIC™ Dual microcomputer memory keyer.



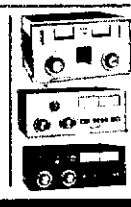
- Programmable, 2 to 99 WPM.
- Any combo, dot and/or dash-to-space ratios (full weighted control).
- Automatic serial number generator (500 char. memory expandable to 2000 char's).
- Also excellent Morse trainer, 2-98WPM.
- Also, precisely timed Beacon Mode.
- Keys any modern transceiver.
- Requires 9 to 16VDC @ 300 MA.

COLLINS KWM-380



DRAKE TR7/DR7

YAESU FT707



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CALL FOR SPECIAL PRICES THESE ITEMS. FREE SHIPMENT, UPS (Brown).

OVER THE COUNTER (Mon. thru Sat. 10 AM to 5:30 PM) MAIL ORDER. Phone. Write

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(714) 761-3033 (213) 860-2040
1 mile east Knotts Berry Farm

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Highway 163 & Clairemont Mesa Blvd

OAKLAND, CA 94609
2811 Telegraph Ave. (415) 451-5757
Hwy 24 Downtown, Left 27th off-ramp.

BURLINGAME, CA 94010
999 Howard Avenue (415) 342-5757
5 miles south on 101 from S.F. Airport

VAN NUYS, CA 91401
6265 Sepulveda Blvd. (213) 988-2212
San Diego Fwy at Victory Blvd.

HAM RADIO OUTLET

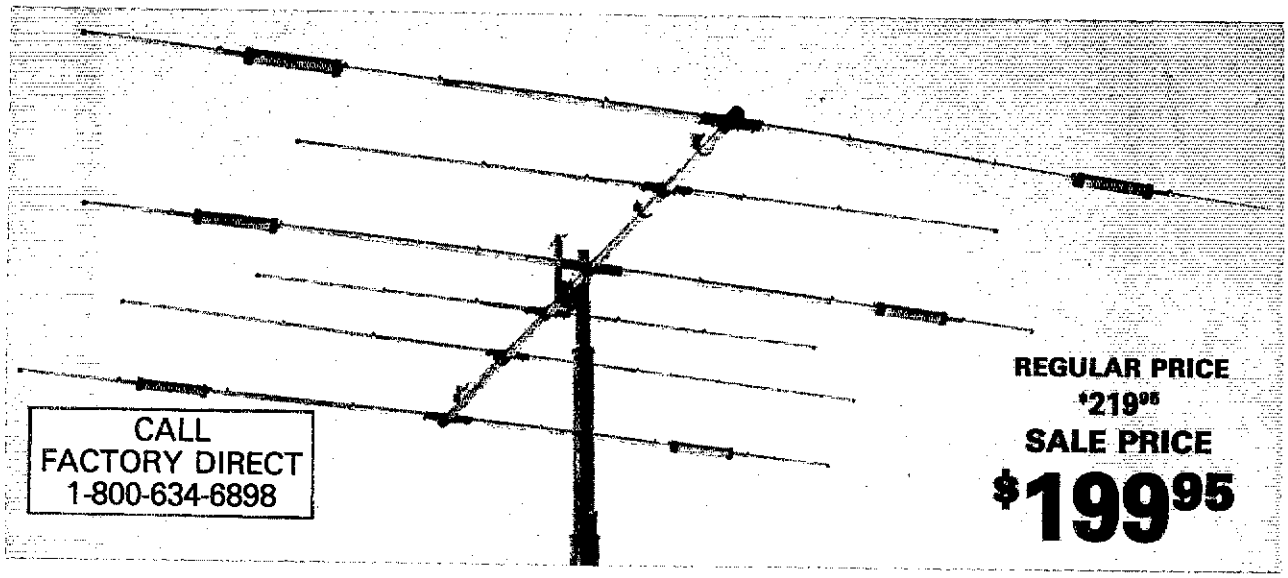
VISA master charge

Prices specs subject to change without notice.
Calif residents add sales tax

AEA • ALLIANCE • ALPHA • AMECO • AMPHENOL • ARRL • ASTRON • AVANTI • BENCHER • BERK-TEK • BIRD • B&W • CALLBOOK • CDE • COLLINS • CURTIS • CUSHCRAFT • DAIWA • DATONG • DENTRON • DRAKE • DX ENGINEERING • EIMAC • HUSTLER • HY-GAIN • ICOM • J.W.MILLER • KENWOOD • KLM • LARSEN • LUNAR • METZ • MFJ • MICRO-LOG • MINI-PRODUCTS • MIRAGE • MOSLEY • NYE • PALOMAR • ROBOT • ROHN • SHURE • SWAN TEMPO • TELEX • TELREX • TEN-TEC • TRISTAO • YAESU and many more!

WILSON SYSTEMS, INC.

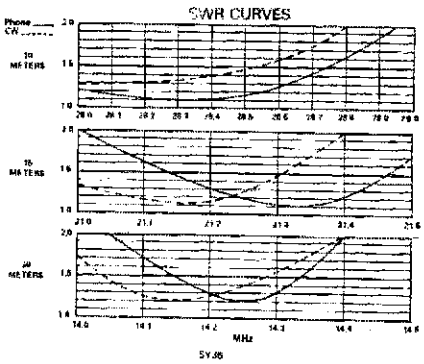
CHRISTMAS SPECIAL SALE SYSTEM 36



CALL
FACTORY DIRECT
1-800-634-6898

REGULAR PRICE
~~$219.95~~
SALE PRICE
$199.95

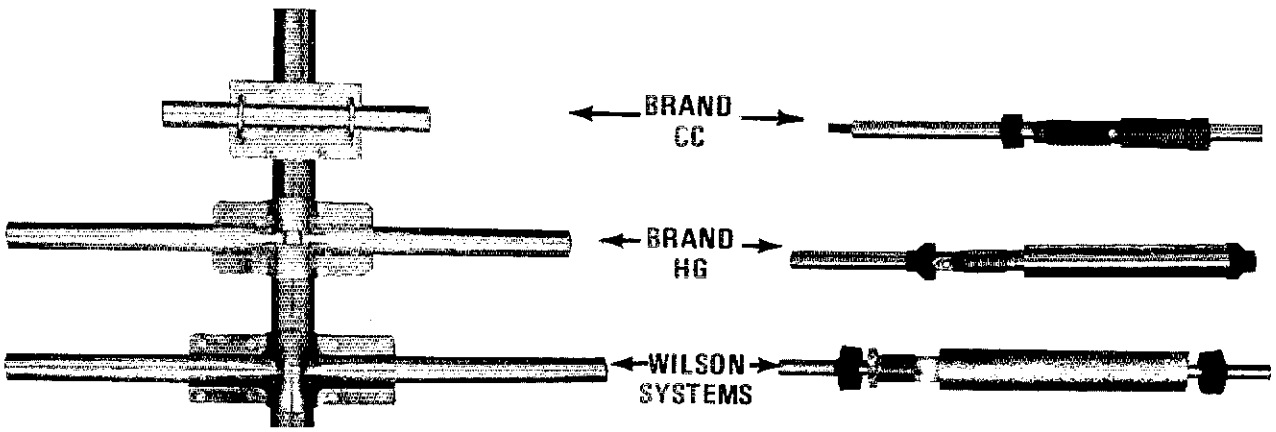
A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. 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
Maximum power input	Legal Limit
Gain (dbd)	Call Factory
VSWR @ resonance	1.3:1
Impedance	50 ohm
F/B Ratio	Call Factory
Boom (O.D. x Length)	2" x 24'2¼"
No. of Elements	6
Longest Element	28'2½"
Turning Radius	18'6"
Maximum Mast Diameter	2"
Surface Area	8.6 sq. ft.
Matching Method	Beta
Wind Loading @ 80 mph	215 lbs.
Mfaximum Wind Survival	100 mph
Feed Method	Balun (Supplied)
Assembled Weight (approx.)	53 lbs.
Shipping Weight (approx.)	62 lbs.

Compare the SY-36 & SY-33 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.

For Christmas Special

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FACTORY DIRECT
1-800-634-6898

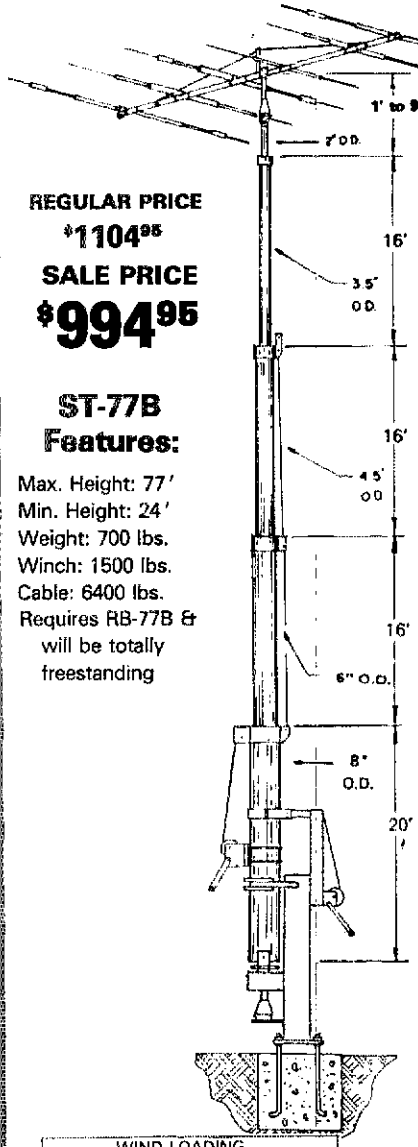
WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice.

WILSON SYSTEMS TOWERS

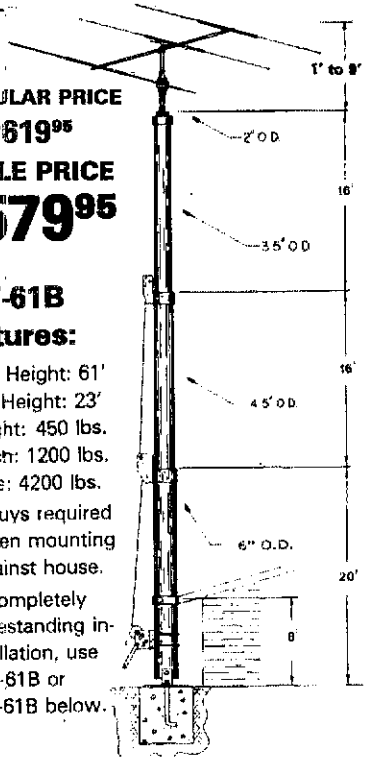
— FACTORY CHRISTMAS SALE —



REGULAR PRICE
$1104.95
SALE PRICE
$994.95

ST-77B Features:

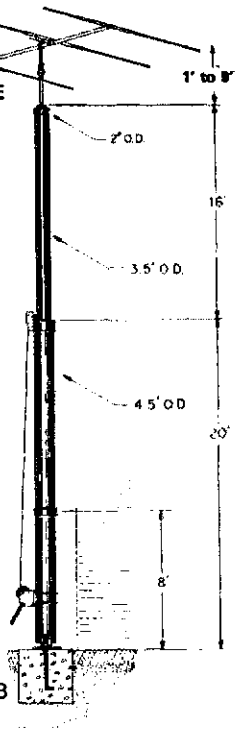
Max. Height: 77'
Min. Height: 24'
Weight: 700 lbs.
Winch: 1500 lbs.
Cable: 6400 lbs.
Requires RB-77B & will be totally freestanding



REGULAR PRICE
$619.95
SALE PRICE
$579.95

MT-61B Features:

Max. Height: 61'
Min. Height: 23'
Weight: 450 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against house.
For completely freestanding installation, use RB-61B or FB-61B below.



REGULAR PRICE
$395.95
SALE PRICE
$349.95

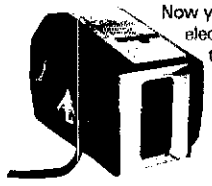
TT-45B Features:

Max Height: 45'
Min. Height: 22'
Weight: 250 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against eve of house.
For completely freestanding installation, use RB-45B or FB-45B below.

WIND LOADING			
Tower	Height	Sq. Ft	
ST-77B	69	16	Square Footage Based on 50 MPH Wind
	77	10	
MT-61B	53	18	
	61	12	
TT-45B	37	18	
	45	17	

BASE CHART		
TOWER	WIDTH	DEPTH
TT-45B	12" x 12"	30"
FB-45B	30" x 30"	4½'
RB-45B	30" x 30"	4½'
MT-61B	18" x 18"	4'
FB-61B	3' x 3'	5½'
RB-61B	3' x 3'	5½'
ST-77B	See Below	
RB-77B	3½' x 3½'	6'

NEW! Wilson Electric Winch



Now you can raise and lower your Wilson Tower electrically. The electric winch will replace the hand operated winch. Available for use on the TT-45, MT-61 and ST-77 towers.

EW-45 (TT-45)
EW-61 (MT-61)
EW-77 (ST-77)

$249.95

Remote Switch . . . $24.95

Wilson Systems uses a high strength carbon steel tube manufactured especially for Wilson Systems. It is 25% stronger than conventional pipe or tubing. The tubing size used is: 2" & 3½"-.095; 4½" & 6"-.125; 8" -.134. All tubing is hot dip galvanized. Top section is 2" O.D. for proper rotor and antenna mounting.

The TT-45B and MT-61B come complete with house bracket and hinged base plate for against-house mounting. For totally freestanding installation, use either of the tilt-over bases shown below.

The ST-77B cannot be mounted against the house and must be used with the rotating tilt-over base RB-77B shown below.

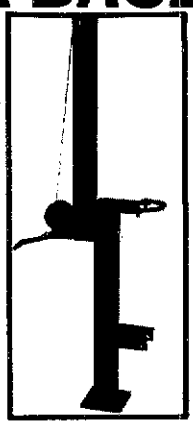
TILT-OVER BASES FOR TOWERS

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.

FB-45B...112 lbs...$169.95

FB-61B...169 lbs...$244.95



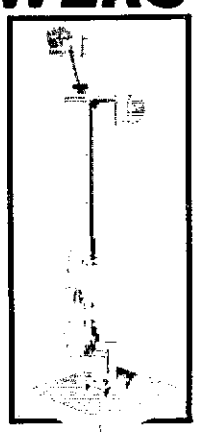
ROTATING BASE

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.

RB-45B...144 lbs...$234.95

RB-61B...229 lbs...$309.95

RB-77B...300 lbs...$463.95



Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

CHRISTMAS SPECIAL SALE
Call Factory Direct
1-800-634-6898

Order the CHRISTMAS SPECIAL!

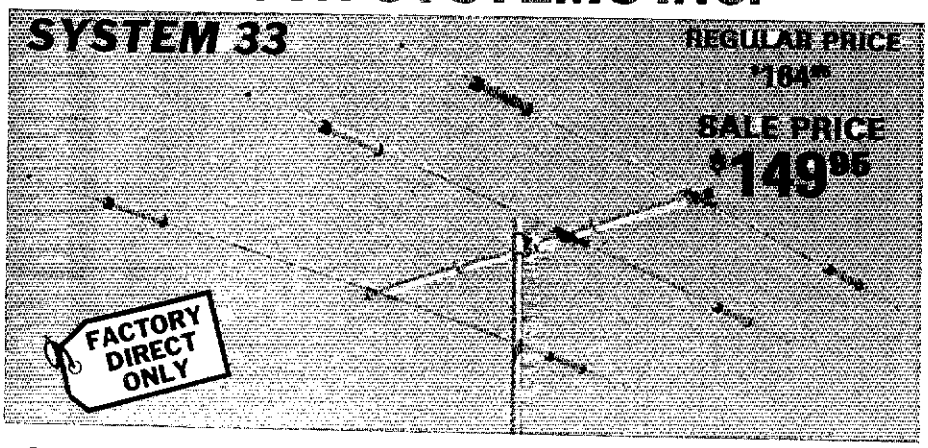
Prices Effective 11-1-80 thru 12-31-80

WILSON SYSTEMS, INC.

4286 S. Polaris Ave. • Las Vegas, Nevada 89103

WILSON SYSTEMS INC.

SYSTEM 33



REGULAR PRICE $164.95

SALE PRICE $149.95

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 excels with the *SYSTEM 33.*

The 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.

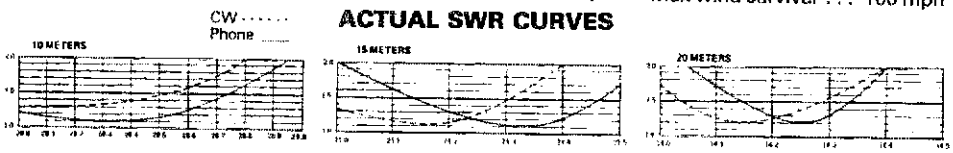
The use of large diameter High-Q Traps in the *SYSTEM 33* makes it a high performing tri-bander and at a very economical price.

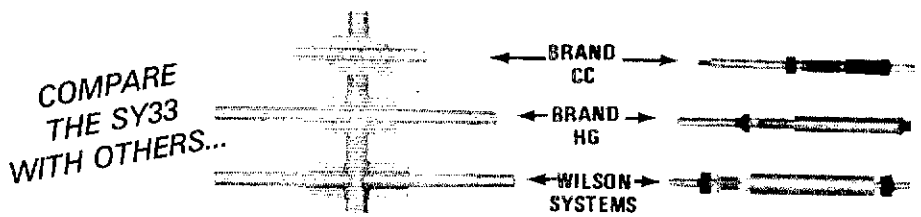
A complete step-by-step illustrated instruction manual guides you to easy assembly and the lightweight antenna makes installation of the *SYSTEM 33* quick and simple.

SPECIFICATIONS

Band MHz..... 14-21-28	Boom (O.D. x length)2" x 14'4"	Wind load @ 80 mph .. 114 lbs
Max power input.... Legal limit	No. elements..... 3	Assembled Wt..... 37 lbs
Gain (dbd)..... Call Factory	Longest element..... 27'4"	Shipping Wt..... 42 lbs
VSWR at resonance..... 1.3:1	Turning radius.....15'9"	Direct 52 ohm feed
Impedence..... 50 ohms	Max. mast diameter...2" O.D.	no balun required
F/B ratio..... Call Factory	Surface area.....5.7 sq. ft.	Max wind survival ... 100 mph

ACTUAL SWR CURVES





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.

ADD 40 METERS TO YOUR TRI-BAND WITH THE 33-6 MK

— IN STOCK —

REGULAR PRICE $65.95

SALE PRICE $59.95

Now you can have the capabilities of 40-meter operation on the *SYSTEM 36* and *SYSTEM 33.* Using the same type high quality traps, the 40-meter addition will offer 150 KHZ of bandwidth. The 33-6 MK will fit your present SY36, SY33, or SY3 and use the same single feed line.

The 33-6 MK adds approximately 15' to the driven element of your tri-bander, increasing the tuning radius by 5 to 6 feet. This addition will offer a rotatable dipole at the same height of your beam.

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave Las Vegas, Nevada 89103

Prices and specifications subject to change without notice.

Prices Effective 11-1-80 thru 12-31-80

For Christmas Special Sale — Call FACTORY DIRECT 1-800-634-6898

REGULAR PRICE $65.95

SALE PRICE $59.95

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 base mount bracket to attach to vent pipe or to a mast driven in the ground.

NOTE:
Radials are required for peak operation or above ground mounting. (See GR-1 below)

SPECIFICATIONS

- 19' total height
- Self supporting — no guys required
- Weight — 14 lbs.
- Input impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q traps with large diameter 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

GROUND RADIAL KIT

REGULAR PRICE $14.95

SALE PRICE $12.95

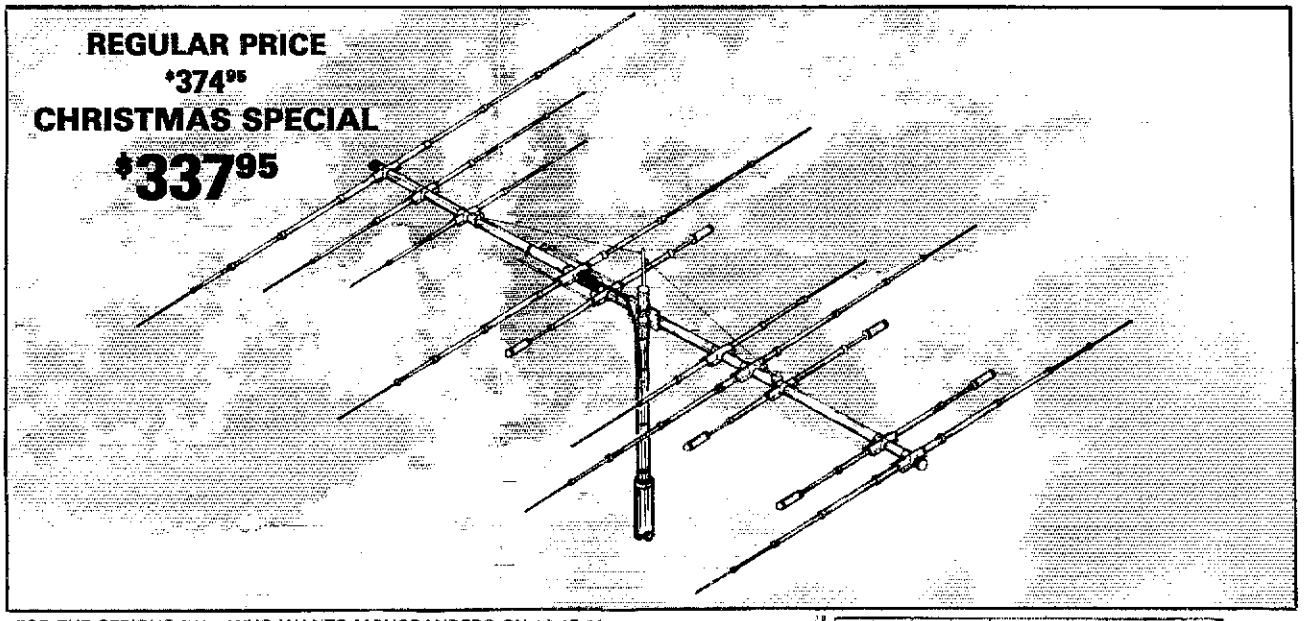
The GR-1 is the complete ground radial kit for the WV 1A. It consists of 150' of 7/14 aluminum wire, heavy duty egg insulators and instructions. The GR-1 will increase the efficiency of the WV-1 by providing the correct counterpoise.

WILSON SYSTEMS, INC. PRESENTS

CHRISTMAS SPECIAL THE SYSTEM 40 TRIBANDER

3 MONOBAND ANTENNAS IN ONE — EACH WITH FULL MONOBAND PERFORMANCE

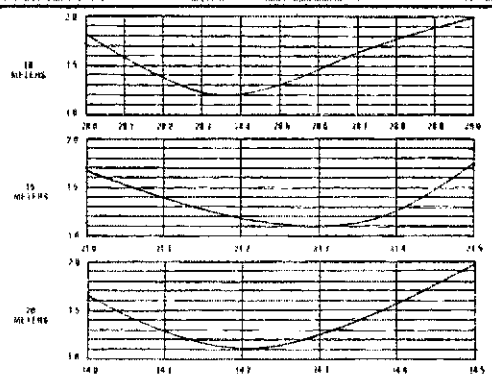
REGULAR PRICE
$374.95
CHRISTMAS SPECIAL
$337.95



- FOR THE SERIOUS DXer WHO WANTS MONOBANDERS ON 10-15-20
- FOUR FULL SIZE 20 MTR ELEMENTS
- FOUR WIDE SPACED 15 MTR ELEMENTS
- FIVE WIDE SPACED 10 MTR ELEMENTS
- ONLY ONE FEED LINE REQUIRED
- HEAVY DUTY BALUN INCLUDED
- DESIGNED WITH NO INTERACTIONS BETWEEN ELEMENTS
- ALL DRIVEN AND DIRECTOR ELEMENTS ARE INSULATED FROM BOOM
- SAME QUALITY HARDWARE AS USED IN ALL *WILSON* ANTENNAS

— SPECIFICATIONS —

Max. Pwr. Input	Legal Limit	Longest Element	36'
VSWR @ Res.	1.2:1	Turning Radius	22'6"
Impedance	50 ohm	Boom	26'
Feed Method	Balun Supplied	Surface Area	12.1 sq. ft.
Matching Method	Modified Beta	Wind Loading @ 80 mph	309 lbs.
F/B Ratio	Call Factory	Assem. Weight	75 lbs.
Gain	Call Factory	Shipping Weight	99 lbs.



WILSON SYSTEMS, INC. · 4286 S. Polaris
Las Vegas, NV 89103 — (702) 739-7401

FACTORY DIRECT ORDER BLANK

CHRISTMAS SPECIAL SALE

Toll-Free Order Number
1-800-634-6898

Qtty.	Model	Description	Shipping	Price
	SY40	10 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	337.95
	SY36	6 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	199.95
	SY33	3 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	149.95
	33-6 MK	40 Mtr. Mod Kit for SY33 & SY36	UPS	59.95
	WV-1A	Trap Vertical for 10, 15, 20, 40 Mtrs.	UPS	59.95
	GR-1	Ground Radials for WV-1A	UPS	12.95
	M-420A	4 Elements on 20 Mtrs.	UPS	174.95
	M-515A	5 Elements on 15 Mtrs.	UPS	139.95
	M-520A	5 Elements on 20 Mtrs.	TRUCK	224.95
	M410A	4 Elements on 10 Mtrs.	UPS	74.95
		ACCESSORIES		
	T²X	Tail Twister Rotor	UPS	274.95
	HD-73	Alliance Heavy Duty Rotor	UPS	109.95
	RC-8C	8/C Rotor Cable	UPS	18¢/ft
	RG-8U	RG-8U Foam Coaxial Cable — Ultra Flex center conductor, 11 guage	UPS	28¢/ft.
	EW-45	Wilson Electric Winch for TT-45B	UPS	249.95
	EW-61	Wilson Electric Winch for MT-61	UPS	249.95
	EW-77	Wilson Electric Winch for ST-77	UPS	249.95

Qty.	Model	Description	Shipping	Price
	RM-1	Remote Switch for EW	UPS	24.95
	TT-45B	Freestanding 45' Tubular Tower	TRUCK	349.95
	RB-45B	Rotating Base for TT-45B w/tilt over feature	TRUCK	234.95
	FB-45B	Fixed Base for TT-45B w/tilt over feature	TRUCK	189.95
	MT-61B	Freestanding 61' Tubular Tower	TRUCK	579.95
	RB-61B	Rotating Base for MT-61B w/tilt over feature	TRUCK	309.95
	FB-61B	Fixed Base for MT-61B w/tilt over feature	TRUCK	244.95
	ST-77B	Freestanding 77' Tubular Tower	TRUCK	994.95
	RB-77B	Rotating Base for ST-77B w/tilt over feature	TRUCK	463.95
	GK-46	Guying Kit for GT-46	UPS-TRK	74.95
	GK-45B	Guying Kit for TT-45B	UPS-TRK	69.95
	GK-61B	Guying Kit for MT-61B	UPS-TRK	79.95
	GK-77B	Guying Kit for ST-77B	UPS-TRK	99.95
	WTB-1	Thrust Bearing for Top of Rotating Towers	UPS-TRK	59.95

NOTE:
On Coaxial and Rotor Cable, minimum order is 100' and 50' multiples.
Prices and specifications subject to change without notice.
Ninety (90) Day Limited Warranty—Shipping Not Included in Above

Christmas Prices Effective Nov. 1 Dec. 31 1980 Nevada Residents add Sales Tax
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City _____ State _____ Zip _____

Prices and specifications subject to change without notice.

were issued to: K9FAP W5GHO K5KTH/R W9OBI WD9IXA W9OGH. It rained in Lafayette but it was a fine indoor hamfest. The East Central Indiana Hamfest and Forums hosted by Connersville was a great success and it should be bigger and better next year. Appts: EC — W9VJX Randolph Cty, N9AST Orange Cty; OTS — WB9EAP K9DIY WA9QVH W9KMY WA9AXF WA9RDF K9OUP WA9JNC WB9AJY W9OZJ W9POF WA9ROU K9FHQ. OOs — WA9LHP KJ50/9. Endorsements: WB9SBI EC Fayette Cty, WA9IPS EC Montgomery Cty. The ARRL Club and Training Department asked me to check on several Indiana clubs that were behind in their reports. In the process I discovered the "807 Club" of Kokomo. They report their meetings are held at midnight on Friday night and the meeting place is a secret. I want to become an Honorary Member or something. WA9TJS was presented a Life Membership in the Clark County ARC. There have been only two others given. It is a great honor and couldn't go to a more deserving ham. Thanks to K9DCX for getting the rainfall reporting project for NWS started. Anyone interested contact him or me. Silent Keys: K9JTQ N9BC W9OIY W9KVM. Traffic: (Aug.) W9JUJ 1190, WD9GXW 166, WD9UYU 151, W9FC 140, N9AEI 102, KB9IT 85, WD9DVA 83, W9QLW 79, K9CGS 65, W9PMT 58, WB9WRC 55, W9EI 50, K9WWJ 50, WD9JAA 42, W9URO 40, WA9QCF 39, W9XD 38, W9IOH 34, W9DLF 32, KA9EJT 31, WB9EAP 29, W9RTH 27, WB9ZHL 27, N9PS 23, K9KTB 22, K9ET 21, K9TKE 20, WA9OHX 19, WB9LCN 17,, WA9OKK 16, K9FZX 15, WA9GJZ 15, WB9KQI 15, K9DCX 14, WD9IAB 13, WD9ART 11, WA9ROU 10, W9UEM 10, W9UPI 9, K9DIY 8, WB9YAY 8, WB9ZOE 7, N9AST 6, WA9AXF 6, K9RPZ 6, WB9AJY 5, W9ZW 5, K9DKP 4, WD9DWD 4, W9DZC 3, K9OUP 3, W9VAY 3, KJ50/9 2, W9BDP 1. (July) N9AEI 85.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTO. NMs: W9AYK BWN, ONI 857, QTC 949; WB9ESM BEN, ONI 770, QTC 154; WSBN WB9IGH, ONI 1078, QTC 208; WNN N9AUG, ONI 164, QTC 30; W9DM WIN-S, ONI 346, QTC 118. WIN-L K9LGU, ONI 271, QTC 79. Wi ExPO WA9NIX, ONI 405, QTC 19. KA9HJN now N9BPN. New Novice Sheboygan area KA9ITQ. KA9GRH now N9BPO. The BWN picnic at Rhinelander was well attended, with people from Phillips to Racine to Peoria, all had a super time. 30 hams provided communications for circus in Baraboo, everything went well. WARAC President presented Wisconsin QSO party plaque to the winning club, YTARC, president WB9BPS at YTARC meeting in July. Due to all the rain the Hartford area, the lumber yards there are advertising their lumber not as board feet but as cubits. New Novice La Crosse area KA9JCX, nephew of W9YCV. La Crosse ARES W9LZQ KAØATU N9BLR W9SFL. W9DOE WD9HLM participated in the bike-a-thon with communications, etc. BPL to KA9CPA. NWTN had 616 ONI, 42 QTC. Green Bay 2-Meter Net had 14 ONI, 2 QTC. AG9G made DXCC Honor Roll on phone. KA9HPQ now Tech. Traffic: (Aug.) KA9CPA 1676, WD9IUX 208, W9CXY 177, WB9YPY 157, W9YCV 152, N9AZI 144, WD9DHF 132, N9AUG 117, WD9ESZ 115, W9IEM 106, K9FHI 101, W9DM 100, K9AKG 81, W9DND 77, W9UCL 62, WB9ESM 61, WB9ICH 48, WA9WYA 48, AG9G 41, W9LDO 42, K9AQ 39, N9CP 36, K9LGU 36, KA9EMF 35, W9UW 33, W9FDY 31, W9GKO 31, W9CJE 29, WB9YPZ 29, K9HDF 27, WB9BRE 26, WD9AJA 24, KB9FM 24, W9IHW 24, WB9WHO 23, W9YT 23, KB9NG 22, N9BCX 21, K9CPM 18, K9UU 18, WB9PAW 11, K9UTQ 7, WA9WYI 5. (July) K9LGU 43, N9CP 29, K9ASC 2.

DAKOTA DIVISION

MINNESOTA: SCM: Helen Haynes, *WBØHOX* — SEC: WAØQIT. STM: AFØO

Net	Freq.	Time	Mgr.	QNI	QTC
MSPN N	3945	12:05 P	WAØAIN	649	77
MSPN E	3929	5:45 P	KCØT	819	188
MSSN	3710	5:15 P	KCØZ		
MSN 1	3685	6:30 P	AFØO	220	56
MSN 2	3685	10:00 P	KØPIZ	134	42
RARES	22/82	7:30 P	KØTS	179	50

By the time this reaches you, KØJTW will have departed Minnesota for Illinois, but at this writing city and address is not available. Good luck. Yours truly, WBØHOX, will be located in a new QTH in Rochester, 3101 NW 18th Avenue. For the first time since I received my license I will have a location for an antenna farm. I would like to say "thanks" to whomever it was that saw fit to nominate me for an A-1 Operator award. I feel very humble, will treasure the certificate and will do my best to live up to its expectation. Congrats to WØGLU on receiving a plaque and silver eagle mic as a token of acknowledgement on being selected the Handi-Ham of the Year. Congrats! It couldn't have happened to a better ham. Congrats to new Novices who have not yet received their call signs! New Novices with signs are: KAØIXF KAØIXG KAØJCH — all from Wilmar, MN. Novice to Tech: KAØCRY; Novice to General: KAØICY KAØCY KA6CUZ; General to Advanced: WDØBAC N6CCU WD9DNQ WDØDZB; Advanced to Extra WBØEXQ. Congrats and happy hamming to each of you. Traffic: WAØTFC 404, WBØHOX 177, WØHZU 132, AFØO 125, KØPIZ 79, KCØT 71, KCØZ 52, KBØMB 48, KØJCF 43, NØBRC 38, WØRIQ 36, WAØAIN 34, WBØWXU 29, WØNZB 26, WAØYVT 23, WAØQIT 22, WBØSCN 19, WØOPX 15, KØTS 13, WBØCGM 9, WBØUKI 8, WØMFR 6, NØJP 5, WØKYG 4, KØCSE 3.

NORTH DAKOTA: SGM, Lois A. Jorgensen, WAØRWM — SEC: WBØTEE. OBS: WØDM. NM: WAØCRH, OO: WDØCLB. On Aug. 6 a devastating storm was at Colfax-Abercrombie area and we want to thank the amateurs that helped activate the 2 meters and also worked 75 meters so we could get the information to the DES in Bismarck, YL WX Net will begin on Nov. 1 on 3996.5 kHz at 1330 UTC. The NWS will appreciate your WX reports. KAØJFG is new ham in Bismarck. KAØJGL is Novice in Minot with a new Ten Tec Argonaut 515. WRØUOR now NØBXT — upgraded to General. Congrats fellows. Three Rivers annual Corn-fed was well attended from 3 surrounding states plus CA and Canada. Wish a speedy recovery to WØVWJ and WØROE. Congrats to WBØWSQ and KAØDCE on their new harmonic. Traffic: WAØRWM 97.

SOUTH DAKOTA: SGM, Lydia S. Johnson, WØKJZ — ASCM: WØDVB. SEC: WAØTNM. NMs: WDØBMR WØWE WAØTNM WAØVRE WØHOJ WØMZI. On October first my SGM term expires, therefore all your news and station activity reports will be directed to our new SGM, Erwin C. Heimbuck, KØOTZ, 3212 Parkview, Rapid City 57701. My most sincere thanks to all of you who have given your support, served the ARRL, contributed to Public Service unselfishly with the true spirit of Amateur Radio "Hams." Thanks, it's been an honor to be SD's first YL

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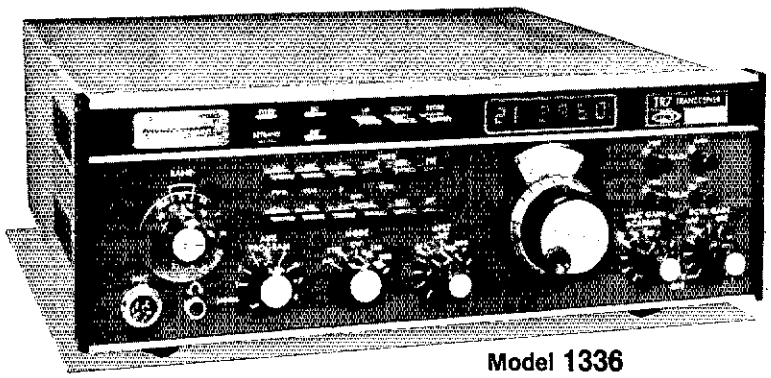
DRAKE 7-Line Family

A pacesetter since 1943, Drake led in 1963 with 9 MHz i-f transceiving, and now with 48 MHz i-f "Up Conversion". Drake brings you tomorrow's state of the art today.



Model 1336

TR7

solid state continuous coverage synthesized hf system

Continuous Frequency Coverage—The TR7 provides continuous coverage in receive from 1.5 to 30 MHz. Transmit coverage is provided for all amateur bands from 160 through 10 meters. The optional AUX7 Range Program Board allows out-of-band transmit coverage for MARS, Embassy, Government and Commercial services as well as future band expansions in the 1.8 through 30 MHz range.* The AUX7 Board also provides 0 through 1.5 MHz receive coverage and crystal-controlled fixed-channel operation for Government, Amateur or Commercial applications anywhere in the 1.8 to 30 MHz range.

Synthesized/PTO Frequency Control—A Drake exclusive: carefully engineered high-performance synthesizer, combined with the famous Drake PTO, provides smooth, linear tuning with 1 kHz dial and 100 Hz digital readout resolution. 500 kHz up/down range switching is pushbutton controlled.

Advanced, High-Performance Receiver Design—The receiver section of the Drake TR7 is an advanced, up-conversion design. The first intermediate frequency of 48.05 MHz places the image frequency well outside the receiver input passband, and provides for true general coverage operation without i-f gaps or crossovers. In addition, the receiver section features a high-level double balanced mixer in the front end for superior spurious and dynamic range performance.

True Passband Tuning—The TR7 employs the famous Drake full passband tuning instead of the limited range "i-f shift" found in some other units. The Drake system allows the receiver passband to be varied from the top edge of one sideband, through center, to the bottom edge of the opposite sideband. In fact, the range is even wider to accommodate RTTY. This system greatly improves receiving performance in heavy QRM by allowing the operator to move interfering signals out of the passband, and it is so flexible that you can even transmit on one sideband and listen on the other.

Unique Independent Receiver Selectivity—Space is provided in the TR7 for up to 3 optional crystal filters. These filters are selected, along with the standard 2.3 kHz filter, by front panel pushbutton control, independent of the mode control. This permits the receive response to be optimized for various operating conditions in any operational situation. Optional filter bandwidths include 6 kHz for a-m, 1.8 kHz for narrow ssb or RTTY, and 500 Hz and 300 Hz for cw.

Broadband, Solid State Design—100% solid state throughout. All circuits are broadbanded, eliminating the need for tuning adjustments of any kind. Merely select the correct band, dial up the desired frequency, and you're ready to operate.

Rugged, Solid State Power Amplifier—The power amplifier is internally mounted, with nothing outboard subject to physical damage. A Drake designed custom heat sink makes this possible. The unique air ducting design of this heat sink allows an optional rear-mounted fan, the FA7, to provide continuous, full power transmit on SSTV/RTTY. The fan is not required for ssb/cw operation, since normal convection cooling allows continuous transmit in these modes.

Effective Noise Blanker—The optional NB7 Noise Blanker plugs into the TR7 to provide true impulse-type noise blanking performance. This unit is carefully designed to maximize both blanking and dynamic range in order to preserve the excellent strong-signal handling characteristics of the TR7.

* NOTE: Transmitter coverage for MARS, Government, and future WARC bands 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 Aux7 Range Program Board. Prices quoted from the factory. See Operator's Manual for details. (Not available for services requiring type acceptance.)

TR7

ACCESSORIES

Model 1336	Drake TR7 General Coverage Digital R/O Transceiver
Model 1338	Drake RV7 Remote VFO
Model 1502	Drake PS7 120/240V Ac Supply for continuous duty operation (25 amps)
Model 1570	Drake PS75 120/240V Ac supply for intermittent duty (15 amps continuous, 25 amps intermittent)
Model 1553	Drake SP75 Speech Processor
Model 1230	Drake LA7 Line Amplifier
Model 1533	Drake CS7 Coax Switch
Model 7077	Drake Desk Microphone
Model 1520	Drake P75 Phone Patch
Model 1536	Drake Aux7 Range Program Board **
Model 1531	Drake MS7 Matching Speaker
Model 1537	Drake NB7 Noise Blanker
Model 1529	Drake FA7 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 TR7 Service Kit/Extender Board Set
Model 385-0004	Drake TR7 Service/Schematic Book

**Aux7 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 Aux7.

TR7 SPECIFICATIONS

GENERAL

Receive
- Without Aux7: 1.5 to 30 MHz, continuous, no gaps.
- With Aux7: Same, plus 0 to 1.5 MHz at reduced performance.

Transmit
- Without Aux7: 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 Aux7*: Above ranges, plus any eight 500 kHz segments from 1.8 to 30 MHz.

Modes of Operation: Usb, Lsb, Cw, RTTY, A-m equiv. (A-3H).

Frequency Stability: Less than 1 kHz first hour. Less than 150 Hz per hour after 1 hour warm up. Less than 100 Hz for ±10% line voltage change.

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 Freq.: 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

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 4.4 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 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 FA7 Fan—33%, 5 min. transmit, max. with 1529 FA7 Fan—100%.

Wattmeter Accuracy: ±5% @ 100 watts (50 ohm load).

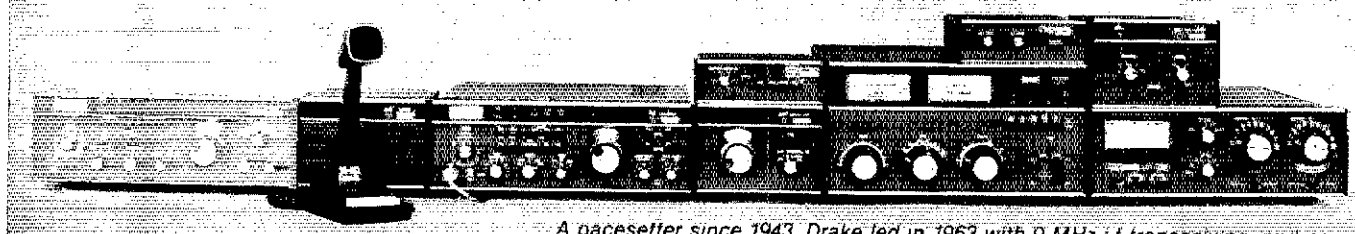
Carrier Suppression: Greater than 50 dB.

Microphone Input: High Impedance.

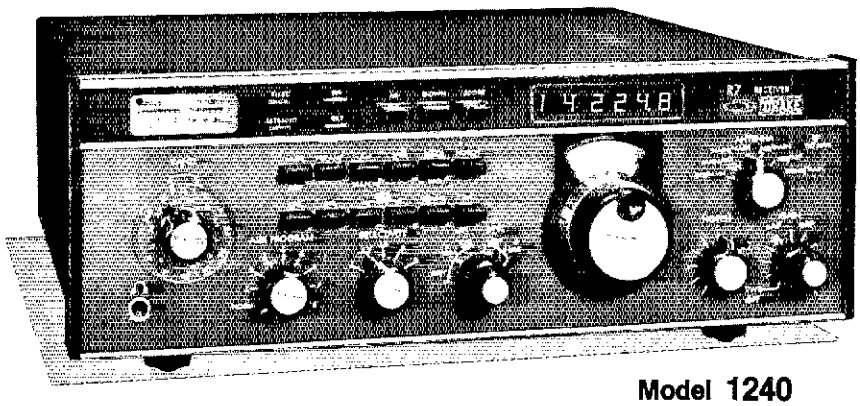
Specifications, availability and prices subject to change without notice or obligation.

R.L. DRAKE COMPANY
DRAKE
540 Richard St. Miamisburg, Ohio 45342 USA
Phone (513) 866-2421 • Telex 288-017

DRAKE 7-Line Family



A paceseffer since 1943, Drake led in 1963 with 9 MHz i-f transceiving, and now with 48 MHz i-f "Up Conversion" . . . Drake brings you tomorrow's state of the art today.



R7

Synthesized General Coverage Receiver

Model 1240

Full general coverage reception, 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 Drake TR7.

- **100% solid state broadband design,** fully synthesized with a permeability tuned oscillator (PTO) for smooth, continous 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 the 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 TR7 transceiver are included, along with separate R7 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 TR7. 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 R7 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 R7 includes a built-in speaker,** or an external Drake MS7 speaker may be used.
- **Built-in 25 kHz calibrator** for calibration of analog dial.
- **Low level audio output** for tape recorder.
- **Up to eight crystal controlled fixed channels** can be selected. (With Drake Aux7 installed.)
- **Optional Drake NB7A Noise Blanker** available. Provides true impulse type noise blanking performance.

R7

Accessories available

Model 1531	Drake MS7 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 NB7A Noise Blanker
Model 1536	Drake Aux7 Range Program/Fixed-Frequency Board
Model 1548	Drake R7/TR7 Interface Cable Kit
Model 385-0005	Drake R7 Service/Schematic Book
Model 3506	Drake RP700 Receiver Protector
Model 1230	Drake LA7 Line Amplifier

R7 SPECIFICATIONS

Frequency Coverage, continuous tuning 0.01 to 30.0 MHz

Plus any eight additional 500 kHz segments between 0 and 30 MHz when programmed into Aux7 Board.

Crystal Controlled Fixed Frequencies: Up to eight crystal-controlled fixed frequencies within the 0-30 MHz range with Aux7 Accessory Board. Proper 500 kHz range for desired fixed frequency is also programmed into Aux7.

Frequency Stability: Less than 1 kHz first hour. Less than 150 Hz per hour after 1 hour warm up. Less than 100 Hz for ± 10% line voltage change.

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 −128dBm). .01-1.5MHz Less than 1.0μV for 10 dB (S+N)/N

Sensitivity (a-m): 1.8-30MHz 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, 4.4 kHz at −60 dB (1.8:1) shape factor. Optional 300 Hz, 500 Hz, 1800 Hz, 4 kHz, and 6 kHz filters are available as follows:

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

Ultimate Selectivity: Greater than 100 dB

Intermodulation:

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)

Specifications, availability and prices subject to change without notice or obligation.

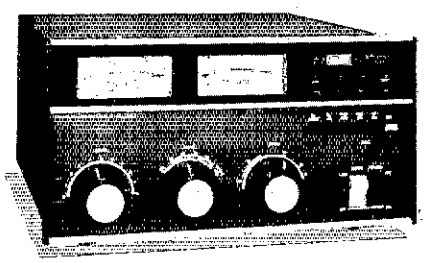
R.L. DRAKE COMPANY

DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA
Phone (513) 866-2421 • Telex 288-017

DRAKE 7-Line Family

A pacesetter since 1943, Drake led in 1963 with 9 MHz i-f transceiving, and now with 48 MHz i-f "Up Conversion"... Drake brings you tomorrow's state of the art today.



Model 1528

Drake L7

Continuous Duty
160-15* Meters

2kW Linear Amplifier

Temperature-controlled design for "key-down" operation over a wide frequency range.

2 kW PEP, 1 kW cw, RTTY, SSTV operation—all modes full rated input, continuous duty cycle.

160-15* 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 L7 utilizes a pair of Eimac 3-500 Z triodes for rugged use, and lower replacement cost compared to equivalent ceramic types.

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.

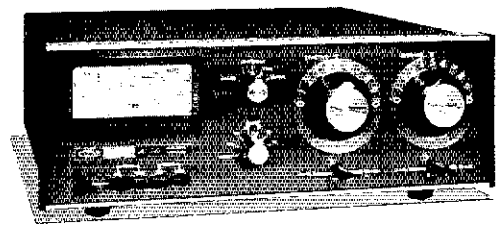
Amplifier is comprised of two units—rf deck for desk top and separate power supply.

Operates from 120/240 V-ac, 50/60 Hz primary line voltage.

DRAKE L7 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 and a-m. 1000 watts dc on cw, RTTY, and SSTV. • **Drive Power Requirements:** 100 watts PEP on ssb and 75 watts on cw, a-m, 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 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.*



Model 1539

Drake Matching Networks MN7 and MN2700

Models 1538 and 1539

- **Frequency Coverage:** 1.8 - 30 MHz
- **Antenna Choice:** Matches antennas fed with coax, balanced line (use optional B-1000 Balun), or random wire.
- **Antenna/By-Pass Switching:** Allows matching unit by-pass regardless of antenna in use, and selects various antennas.
- **Extra Harmonic Reduction:** Employs "pi-network" low pass filter type circuitry for maximum harmonic rejection.
- **Built-in Metering:** Accurate Rf Wattmeter and VSWR Reading, pushbutton controlled from front panel.
- **Input Impedance:** 50 ohms resistive.
- **Power Capability:** MN7—250 watts average continuous duty (0-300 W scale). MN2700—1000 watts average continuous duty (2000 watts PEP). (0-200 or 0-2000 W scale).
- **Dimensions:** MN7—13.1"W x 4.53"H x 8.5"D excluding knobs and connectors (33.26 x 11.5 x 21.6 cm). MN2700—13.1"W x4.53"H x 13"D excluding knobs and connectors (33.26 x 11.5 x 33 cm).
- **Weight:** MN7—10 lbs (4.5 kg). MN2700—11 lbs (5 kg).

Drake MN7 and MN2700 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. • **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 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.

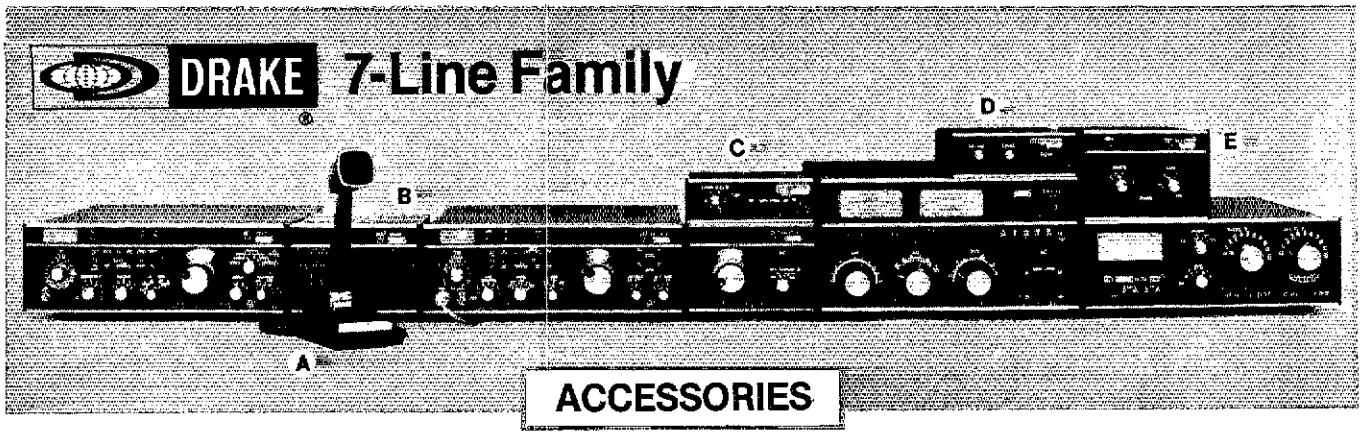
Specifications, availability and prices subject to change without notice or obligation.

R.L. DRAKE COMPANY

DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA
Phone: (513) 866-2421 • Telex: 288-017

DRAKE 7-Line Family



ACCESSORIES

A Model 7077 Dynamic Desk Microphone

• **Audio and level characteristics** custom designed to match the transmit audio requirements of the Drake TR7. • **Features both VOX and PTT** operation without modification. • **High impedance** • **Includes coil cord and plug** wired for direct connection to the Drake TR7. • **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). **Weight** 1 lb 7 oz (650 g).

C Model 1553 SP75 Speech Processor

Provides an increase in average power/readability of a single sideband voice signal during weak signal, high interference conditions. The SP75 is connected between the microphone and microphone input of the ssb transmitter, requiring no modification of existing transmitter or transceiver. A front panel switch allows the processor to be switched in or bypassed. Two additional inputs, such as a tape player or phone patch, may be front panel selected.

Rf envelope clipping adjustable between zero and twenty decibels. LED indicates proper audio input level.

Muting circuitry reduces gain during speech pauses, allowing VOX operation with the processor on.

SPECIFICATIONS • **Processing Type:** Preclipping audio compression followed by rf envelope clipping at the processor intermediate frequency. • **Rf Clipping Range:** Adjustable 0 to 20 dB from front panel control. • **Input Level (Microphone Input):** 3.5 mV minimum for full processing. Gain adjustable to accommodate up to 300 mV maximum. • **Input Level (Tape and Patch Inputs):** 15 mV minimum for full processing. 30 mV maximum. • **Input Impedance (Microphone):** 1 megohm. • **Input Impedance (Tape and Patch):** 50 kilohm. • **Output Level w/Processing:** 0-50 mV adjustable into 50 kilohm load. • **Output Impedance:** 50 kilohm. • **Muting (Microphone Input Only):** 10 to 20 dB attenuation during speech pauses. • **Frequency Response:** 400-6000 Hz@6 dB. • **Distortion:** Less than 5% T.H.D.@1kHz, 20 dB clipping. • **Power:** 11-16 V-dc@95 mA. • **Size:** 7"L x 6¼"W x 2¼"H (17.3 x 15.9 x 5.4 cm). • **Weight:** 1.4 lbs. (.63 kg).

D Model 1520 P75 Phone Patch

Hybrid Phone Patch for use with 7-line or other receiver/transmitter combination. • In/out Switching • Adjustable TX and RX level controls.

E Model 1535 CS7 Coax Switch

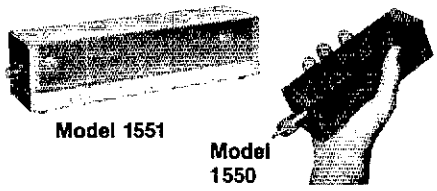
• Switches up to five coax-fed antennas via one main feed line. • Allows selection of up to five radios at other end of main feed line. • Minimizes amount of coax needed for multi-antenna installation. • Grounds unused inputs (both local and remote).

DRAKE CS7 SPECIFICATIONS • **Maximum Input Power:** 2000 watts PEP • **Frequency Range:** Up to 30 MHz, insertion of Switch changes VSWR no more than 1.05:1. From 30 MHz to 150 MHz, insertion changes VSWR no more than 1.5:1 (both switches). • **Operating Temperature Range:** −40°F. to 150°F. • **Supply Voltage:** 120 V-ac or 240 V-ac selectable, 50/60 Hz, 50 watts. • **Dimensions & Weight: Console**—5.25"H x 6.81"W, 7.06" cabinet depth (13.3 x 17.3 x 17.9 cm); 4.33 lbs (1.96 kg); **Remote Antenna Switch**—7.13"H x 5.88"W x 4.39"D (18.1 x 15.0 x 11.1 cm). 8.19" (20.8 cm) center to center mounting; 5 lbs (2.27 kg).

B Model 1531 MS7 Matching Speaker

• **Size:** 7.5"D x 6.9"W x 4.6"H excluding feet (19 x 17.5 x 11.6 cm). • **Weight:** 2.5 lbs (1.13 kg).

"Dry" Dummy Loads
—no oil required



Model 1551

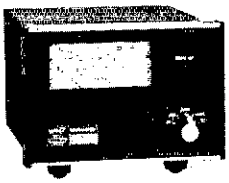
Model 1550

Model 1551 Drake DL-1000

• **1000 watts** for 30 seconds, with derating curve to 5 minutes. Accepts Drake FA7 cooling fan for extended high power operation. • **VSWR of 1.5:1 max.** 0-30 MHz • **SO-239 coax connector** • **Rubber feet** for desk or bench use • **Size** 14" x 3.6" (35.6 x 9.1 cm). **Weight:** 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). **Weight:** 11 oz (310 g).



WH7 Directional Rf Wattmeter

Model 1514

• Directional, in-line wattmeter. • Removable coupler provides remote metering. • Three calibrated scales (0-20, 0-200, and 0-2000 watts. • Fourth scale provides direct reading VSWR.

SPECIFICATIONS: • **Frequency Coverage:** 1.8-30 MHz. • **Line Impedance:** 50 ohm resistive. • **Power Capability:** 2000 W continuous. • **Jacks, Removable Coupler:** Two SO-239 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).

Model 1230 LA7 Line Amplifier

Line output, 1 mW nominal into 600 ohm balanced, adjustable by internal pre-set level control.

TV Interference Filters

High Pass Filters for TV Sets

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

Four pi sections for sharp cut off above the ht 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 above 41 MHz. Helps TV i-f interference, as well as harmonic interference.

Model No. 1605 **Drake TV-42-LP**

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.

Specifications, availability and prices subject to change without notice or obligation.

R.L. DRAKE COMPANY DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA Phone: (513) 866-2421 • Telex: 288-017

SCM, and to have served the past two and one-ha years. Much luck and success to our new SCM, KØOT2 Traffic: WDØBMR 227, WØHOJ 87, WAØVRE 73, KØFR 71, WØMZI 67, WØOVR 64, WBØOMF 39, WAØTNM 3 WØKJZ 30, WØRWE 8, WØIG 6.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC K5TML, NMs: WA5LGN W5MYZ W5POH WA5ZWZ. Nets OZK 3.760 0000/dy 157 25 W5MYZ; APN 3.937 1100/M-S 637 31 W5POH; M-Bird 3.928 2130/M-F 667 19 WA5ZW2 ARN 3.995 2330/dy 1109 65 WA5LGN; SCARC 28.76 0130 M&T 70 12 WA5VSV. MARC participated in annua Field Day exercise. About 200 hams and their familie attended the Jonesboro Hamfest Aug. 17th. Tri-Co. radi group held their monthly meeting Aug. 20 at Ozark Acre Rest. Nominations for SCM of Arkansas will be comin up this fall, so all Ark. ARRL members had better b thinking about who you would like to represent you. No much news from any of the Ark. gang this month. OB K5DW 2, WA5LGN 2, W5UAU 2. Traffic: W5POH 2 W5UAU 22, KA5CFB 9, WB5GQH 9, W5EIJ 5, W5KL 2.

LOUISIANA: SCM, Jim Glammanco, N5IB — WB5TPG leaving the post of SEC. Many thanks to him for hi tireless work with the AHES program. New EC appts ar WD5DBV for St. Martin, WB5MHU for Ouachita WB5LWP for Vermillion and WB5USS as DEC for th Troop G area. During Hurricane Allen the LEN was i session for 29 hours. There were more than a thousan checkins, and over 200 inquiries and bulletins wer handled. It was a smooth and professional operatio that LA Hams can be proud of. Congrats to WD5CQC the new assistant manager of the Central Gulf Coas Hurrican Net, and to WD5GJB for his DXCC 15 WD5EMZ, a new OTS, is taking a NCS spot on LSN Don't forget the Twin City Hams Hamfest in Monroe o Nov. 9 at the West Monroe Convention Center. Informa activities are planned for the evening of Nov. 8. I wi have video tape copies of the film "World of Ham Radio." Contact me if you would like to borrow them U-Matic and VHS formats are available.

Net	Freq.	Time	QNI	QTC	Mgr.
LAN	3615 kHz	7 & 10 P.M. Dy	180	112	N5RB
LTN	3910 kHz	6:30 P.M. Dy	649	115	N5EK
LSN	3703 kHz	7:30 P.M. M-F	107	27	WD5EAE
LRN	3587.5 kHz	6:30 P.M. Sun	10	4	N5RB
LEN	3910 kHz	8:00 P.M. Sun	—	—	WB5TPG

Traffic: N5RB 71, W5VMY 65, WD5EAE 52, N5BEV 47 N5EK 46, K5WOD 44, WD5FLM 35, N5IB 33, WB5JZP 29 WB5QDJ 19, WD5CWK 16, WD5EMZ 16, WB5TPG 10 WB5IKT 5, WD5GJB 3.

MISSISSIPPI: SCM, F. Ed Robinson, W5XT — SEC WB5FXA. Last months notes of hot weather and hu ricanes was certainly on time, as we now know Hu ricane Allen left death and destruction over a 2000 mil plus path ending over Texas. Ham radio did itself proud and gained considerable helpful publicity. Be prepared and those who helped, keep up the good work. New ne manager for the Miss. net (MN-Morning Phone Net K4JSB — an old and capable Miss. ham, is off to a goo start. Congrats to him and Inx to outgoing WA5OPT CGCHN (KC5M) sess 50, QNI 3026, QTC 366. MSB (WD5EYM) sess 31, QNI 2026, QTC 112. MTN (K5OAF sess 31, QNI 113, QTC 42. MSB (KA5GGG) sess 13, QN 80, QTC 3. MN (K4JSB) sess 31, QNI 556, QTC 5. Capita Area EN (KA5AGD) sess 5, QNI 117, QTC 1. Gulf State EN (KB5W) sess 21, QNI 515, QTC 26. Traffic: N5AM 485, W5EDT 118, KB5W 114, K5OAF 112, WB5SNB 47 W5XT 28, KA5AFT 27, W5RIM 14, WD5EYM 10, KA5AGI 3.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joseph E. Miller, K4DZM — STM KZ4G. SEC: WB4ZML. Nets reporting. *Section net

Net	QNI	QTC	Net	QNI	QTC
KRN*	428	23	KPON	63	3
MKPN*	1166	66	PAWN	404	33
KTN*	1400	140	CARN	182	18
KNTN*	403	117	TRI-ST.	319	33
KYN*	305	102	8-ARES	58	10
KSN*	195	45	4-ARES	41	2
9RN-D	71%	277	5-ARES	70	2
CAN-D	100%	650	6-ARES	90	3

BARS starting new Novice classes. New officers RCARA: KZ4G, pres.; KA4EJR, vice pres.; KA4MBE secy.; K4OQQ, treas. PARESC: KS4V, pres.; KS4W, vic pres.; KA4FGU, secy.; AI4I, treas. KB4YH, act. mgr Lincoln Trail ARC, now affiliated. Help!! Need station to QNI 9RN-D. Traffic: K4JLX 146, KC4AV 109, K4DZM 107, KB4OZ 78, WD4LXX 60, KS4V 59, KA4GFU 53 WA4SWF 48, WA4FBN 40, WB4UOI 39, WA4AVV 38 WD4COF 37, WA4JTE 34, KA4IKH 32, KA4AZT 29, KZ4G 29, WD4EKZ 28, WB4AUN 23, WB4APC 22, W4PKX 22 K4HOE 21, N4AOF 16, WD4BSC 16, WA4YPQ 16 WA4RCD 12, N4GD 11, WD4JTO 11, WA4QMH 11 WA4AGH 10, WA4GAL 10, WA4JAV 7, K4AVX 6 WD4CJI 6, K4MHL 6, KA4MBF 6, WA4NOG 5, W4EON 4 KA4MZY 4, KU4A 1.

MICHIGAN: SCM, James R. Seelev, WB8MTD — ASCM WA8DHB. SEC: WA8EFK. STM: WB8YRY. NMs: N8ABA WD8BHE WA8DHB K8LNE K8KMQ WD8LRT WA8PIN WA8RNB AF8V WB8YDZ W8YIQ K8ZJU. DECs: WB8FLI K8RCT W8VWY.

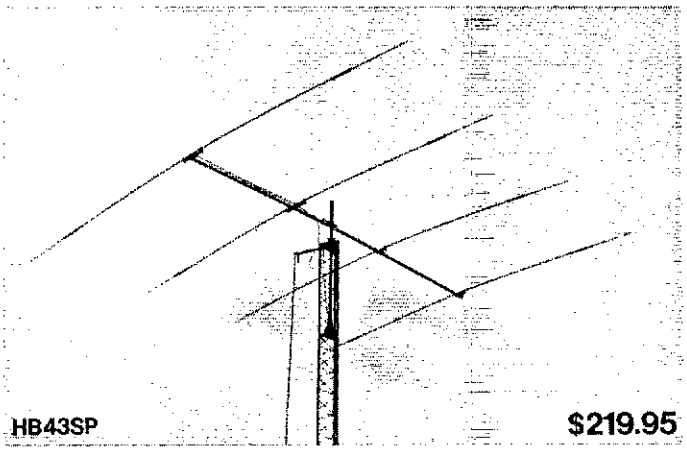
Net	Freq.	Time/Day	QNI	QTC	Sess.
MITN*	3953	1900 Dy	633	406	31
QMN*	3663	1800/2200 Dy	927	399	62
GLETN	3932	2100 Dy	1032	238	31
MACS*	3953	1100 Dy	708	202	31
MNN*	3722	1730/2200 Dy	571	116	62
UPN*	3922	1700 Dy	719	73	36
BR	3930	1730 M-S	437	29	26
WSSBN	3935	1900 Dy	473	24	30
MEN	3930	0900 Su	204	14	5
ARES	3932	1730 Su	88	11	5
MATW**	3953	1600 Su	19	2	3

VHF Activity 10 reports 473 32 38

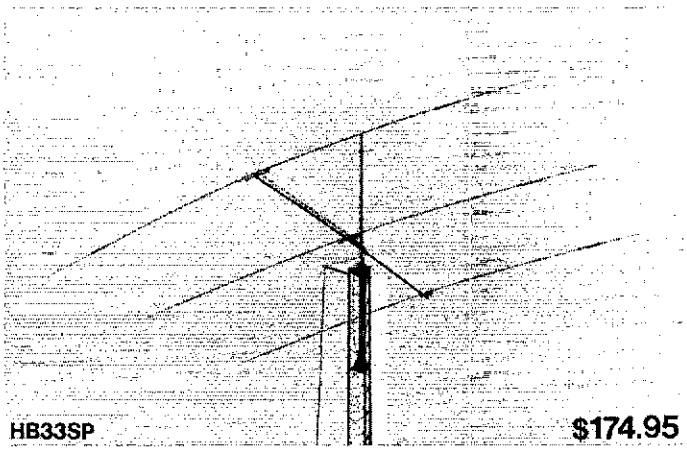
*NTS Section nets **Mich. Amateur Traffic Workshop Times EST. Field appointments: OTS, WD8BHE; NM WA8RNB (for Southeastern Mich. Traffic Net, our firs full-time vhf traffic net). Silent Keys: WA8KGN W8DPU Upgrades: to Tech, KA8BTU; to General, N8BYC (ex KA8AWL) N8BNC N8BYD (ex-KA8EGR); to Advanced N8BLZ N8BFL K8RRD; to Extra, WD8EAR KA8EPK (on month after making Advanced, both of 'em!). New calls WD8ODN now N8BYR; W8IVY (for 26 years) now KG8E OO reports: K8JH W8OG WB8RUQ AG8U KE8X. OBS reports: K8NKB WA8RNB AF8V. New officers for Copper country RAA: KB8W, pres.; WD8AFY, vice pres.; N8BYR secy.; WB8QJZ, treas. New GLETN officers: K8DTG mgr.; WB8RWR, asst. mgr., WD8ROK, secy. WD8NKA

TET®

ANTENNA SYSTEMS
1-800-654-3231



HB43SP $219.95



HB33SP $174.95

TET, THE LEADER IN WIDEBAND ANTENNA DESIGN, introduces another new triband antenna to provide unmatched wideband performance on the 10, 15 and 20 meter amateur bands. This radical departure from conventional triband antenna design employs TWO DRIVEN ELEMENTS with a rigid phasing line to couple power from the radiator element to the reflector. Phase relationships have been carefully engineered to provide extremely high gain figures without neglecting the need for high front to back ratio. The two element drive system is coupled to one parasitic director on the model HB33SP; two parasitic directors on a longer boom with the model HB43SP.

FULL BAND COVERAGE is possible without the need for antenna tuners or separate CW and phone antenna adjustments. The 1.5:1 VSWR bandwidth covers the entire 20 and 15 meter amateur bands, with a little extra for MARS operation. On 10 meters, coverage is in excess of 1 MHz.

QUALITY CONSTRUCTION and repeatable performance permit TET to deliver an antenna package without need for any tuning adjustments. All tubing is cut and pre-drilled to precision tolerances. The phasing harness and feed assembly for the two driven elements are preassembled to insure ease of construction and reliable performance.

MOVE UP with the performance oriented leader in antenna technology. Order your new high performance wideband triband antenna system from TET today.

MODEL	BANDS	ELEMENTS	ELEMENTS PER BAND	MAX PWR	VSWR	IMPEDANCE	MAX ELEMENT LGTH	BOOM LGTH	TURNING RADIUS	WIND SURFACE AREA	WIND LOAD @80 mph	BOOM DIAMETER	MAST SIZE	WT
HB43SP	14/21/28	4	4	2KW	BELOW 1.5	50 Ohm	27'	19' 8"	16' 9"	6.62 sq.ft.	131.3 lb.	2"	1½-2"	38 lb.
HB33SP	14/21/28	3	3	2KW	BELOW 1.5	50 Ohm	27'	13' 2"	15'	4.73 sq.ft.	102 lb.	1 9/16"	1½-2"	27 lb.

Call Factory for ANTENNA GAIN dBd and FRONT TO BACK RATIO.

TET FACTORY DIRECT PRICE **HB43SP $219.95**
HB33SP $174.95

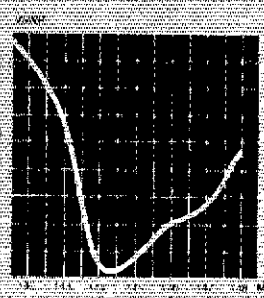
Call Toll Free 1-800-654-3231

VISA

TET U.S.A., INC.

master charge. THE INTERBANK CARD.

425 HIGHLAND PARKWAY, NORMAN, OKLAHOMA 73069 TEL: 405-360-6410



Boomer

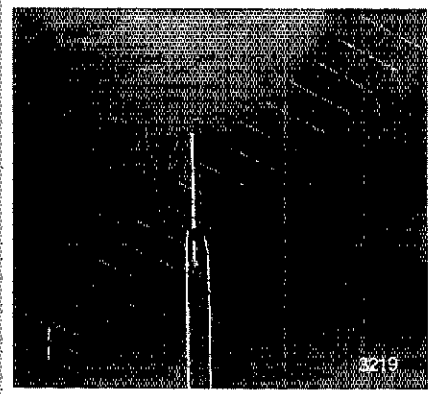
6 and 2 meter High Performance Yagis

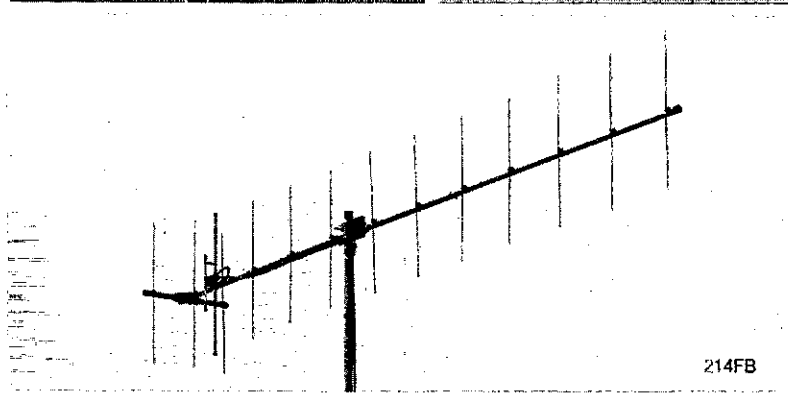
Two Meter Boomers

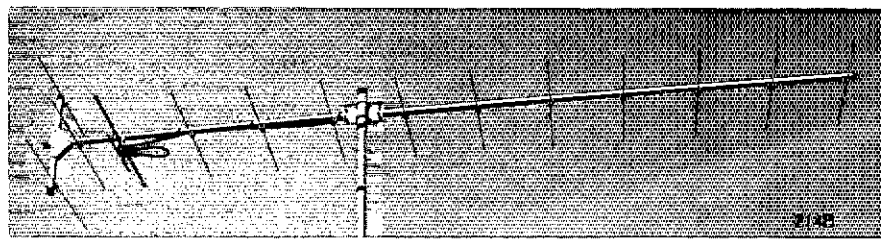
Whether you have the space for the 3.2 λ 32-19 or the compact 2.2 λ models, two meter Boomers are your best choice. They offer the maximum gain available for their boom length (See NBS no. 688). They feature trigon reflectors for additional front-to-back ratio and clearer patterns. All stainless steel hardware and heavy gauge heat treated aluminum are used throughout. Whatever your choice of two meter amateur activity, the Boomer will fill your needs. For FM use the 228FB or 214FB. For CW/SSB on the low end use 32-19 or 214B, in EME, DX or just reliable QSOs Boomer will perform for you.

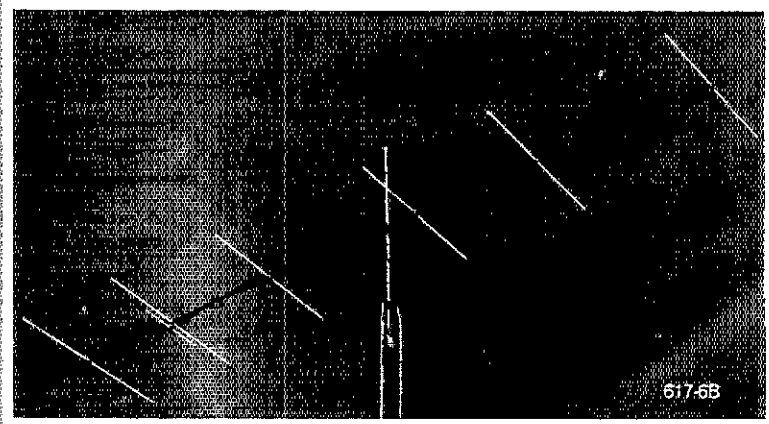
Six Meter Boomer

The new six meter Boomer offers more boom and more gain from its new element spacing. The six meter Boomer has Cushcraft's typical attention to detail, including T match feed with balun, and extra heavy duty mechanical construction. The key to this Boomer's super performance and relatively lightweight is special element spacing and boom length.









Specifications

Model No.	32-19	214B	214FB	228FB	617-6B
Frequency range (MHz)	144-146	144-146	144.5-148	144.5-148	50.0-51
Forward gain (dBd)					
Front to back ratio (dB)					
E-plane Bwidth (deg)	2x14	2x17	2x17	2x17	2x19
H-plane Bwidth (deg)	2x17	2x18	2x18	2x9	NA
Side lobe attenuation (dB)	>60	>60	>60	>60	>60
SWR less than (typ)	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1
Impedance (ohm)	50	50	50	50	50
Recommended stacking distance					
E-plane (ft)	14	10	10	10	NA
E-plane (m)	4.27	3.05	3.05	3.05	NA
H-plane (ft)	12	10	10	10	22.5
H-plane (m)	3.66	3.05	3.05	3.05	6.86
Weight (lbs)	12	8	8	22	38
(kg)	5.44	3.63	3.63	9.98	11.79
Length (ft)	22	15	15	15	34
(m)	6.71	4.57	4.57	4.57	10.36
Longest element (in)	40¾	40¾	39½	39½	113¾
(cm)	102.5	102	100.3	100.3	289
Turning radius (ft)	11	7.5	7.5	9.5	17.7
(m)	3.35	2.28	2.29	2.90	5.39
Windload (sq ft)	3.5	1.7	1.7	4.0	4.8
(sq m)	.33	.16	.16	.37	.45

Stacking Kits

For stacking two Boomers, use the following coax harness and power divider kits.

32-19 = 32-SK 214B = 22-SK 617-6B = 617-SK

When stacking four Boomers, use the following complete stacking kits. They include H frame, harness, hardware and complete instructions.

32-19 = 324-OK 214B = 224-OK

Specifications, Stacked Boomers

Antenna	2x214-B	2x32-19	2x617-6B	4x214-B	4x32-19
Forward gain (dBd)					
Front to back ratio (dB)					
E/H plane beamwidth (deg)					
E-plane	34°	26°	35°	17°	12°
H-plane	19°	17°	20°	19°	15°
Stacking dist. Vert. (ft)	10	12	34	10	12
(m)	3.05	3.66	10.36	3.05	3.66
Horiz. (ft)	—	—	—	10	14
(m)	—	—	—	3.05	4.27
Wt approx (lb)	18*	26*	62*	69	97
(kg)	8.16	11.79	28.12	31.30	44.00
Turn radius (ft)	9	11	18	9	13.4*
(m)	2.74	3.35	5.49	2.74	4.06
Wind Area (Ft2)	3.4*	7.0*	9.6*	8.3	15.2
(sq. m)	.32	.65	.89	.77	1.41

*Support mast not included

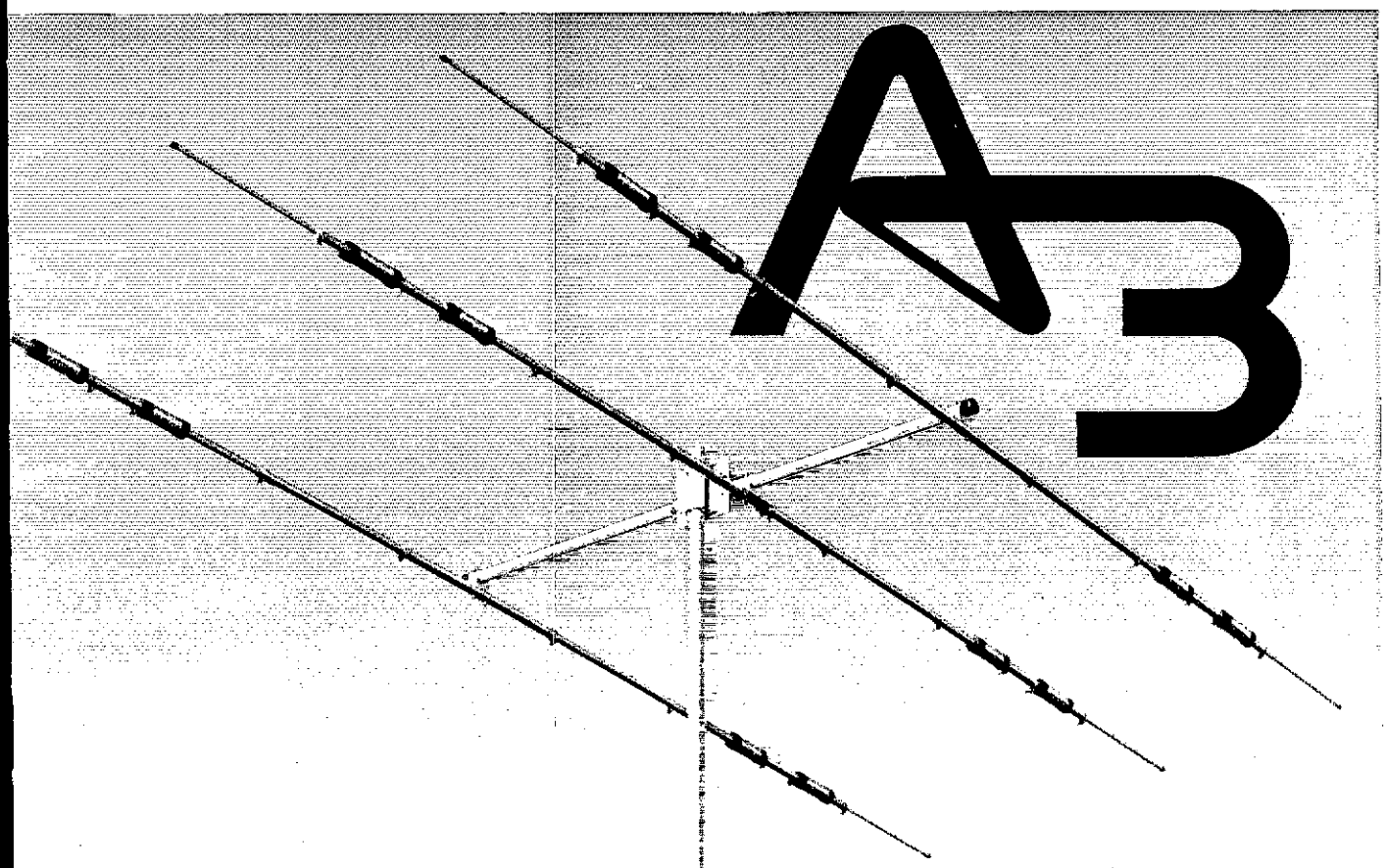
The nominal dimensions and weights listed are for complete arrays. The antennas and stacking kits must be ordered separately.

cushcraft CORPORATION

The Antenna Company

48 Perimeter Road, P.O. Box 4680

Manchester, NH 03108



A3

V.S.W.R.	1.2-1 Typical
Average Bandwidth	500 KHz
Power Rating	2000 w PEP
Feed Point Impedance	50 Ω
Connector	Twin terminal stainless steel takes all coax.
Boom	1⅝"-1½" x 14'
Elements/Longest	1⅛"-½" x 27'9"
Wind Sfc. area	5.6 Feet²
Weight	35 Pounds
Turn Radius	15'6"
Mast Diameter	1¼" min. 2" max.
Material	6063-T832 Seamless aluminum
Fasteners	Zinc Plated Steel
Telescope Method	Taper tubing with full circle clamps

UPS Shippable

No balun required

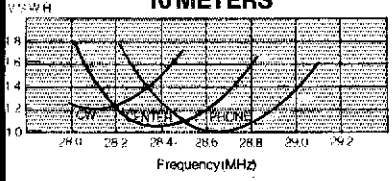
The full power, full performance 20-15-10 meter beam.

Enjoy the thrill of working rare DX with excellent A3 forward gain. Increase the pleasure of your daily contacts with A3 interference reducing front to back ratio. Use your linear amplifier with confidence in our new A3 high power traps.

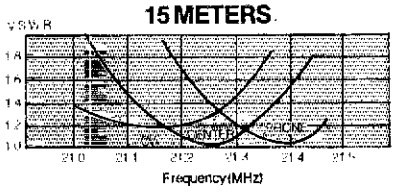
Make friends of your neighbors with A3 compact dimensions, low profile, and small turn radius. Satisfy your budget with A3 economy pricing.

The Cushcraft engineering team has again created that unique combination of quality materials, easy assembly and high performance with A3, the three band beam for the eighties.

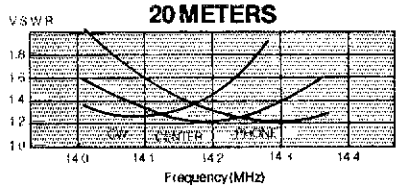
10 METERS



15 METERS



20 METERS



A LEADER FOR OVER 30 YEARS

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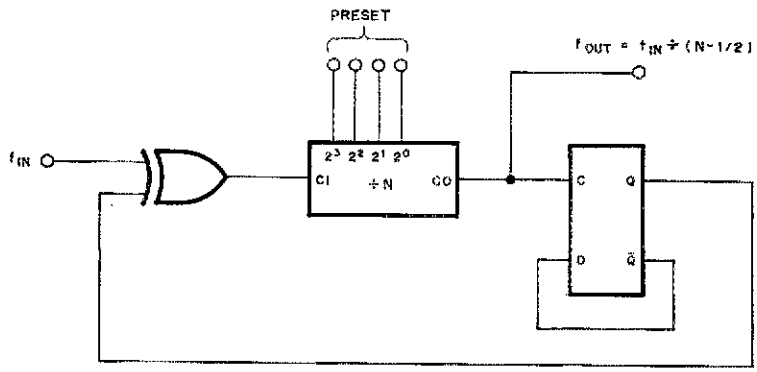
QST DATA FILE NO. 2

DIGITAL CIRCUIT DESIGN



Chances are, at least part of your Amateur Radio station relies on digital electronics. Your keyer and your frequency synthesized fm transceiver are two examples. Some of the more exotic applications include SSTV character generators and scan converters, and RTTY readout terminals. Digital logic systems are designed using switching theory, because the transistors within the ICs have but two states: *On* and *off*. The solid-state fundamentals chapter of the 1981 *Handbook* includes an introduction to the mathematics required to analyze logic circuits such as the one shown above. Basic Boolean algebra and logic symbology are explained in a manner intended to enlighten the old timer familiar with analog circuitry without intimidating the beginner.

But there's much more to digital system design than merely choosing the right logical operations. Real hardware departs from the ideal switch in several ways. A digital circuit is also an *analog* circuit and is a compromise between speed, energy consumption, external conditions and EMC considerations. The new *Handbook* describes the families of digital ICs currently in use, treating such characteristics as input and output voltage and current values, power supply requirements, noise immunity and fanout. A table of these parameters, destined to become a valuable reference resource, supplements the written material. Numerous diagrams show how to interconnect devices from different logic families. The careful balance of theoretical and practical digital information in the 1981 *Handbook* is essential study material for the Extra Class license examination.

Of course, after you've digested the solid state fundamentals chapter, you'll want to apply what you've learned. This edition features several new construction projects based on digital techniques. To get your feet wet, build the crystal calibrator/marker generator in the test equipment chapter. This CMOS design features switched 100-, 50- and 25-kHz outputs, a reliable op-amp oscillator that's exceptionally tolerant of crystal variations, and best of all, inexpensive and easily obtainable parts. The experienced builder will want to upgrade his lab with our new 600-MHz frequency counter having eight digits of resolution. And when you're ready to move up to fast, clean, effortless cw, put together the new buffered Morse keyboard designed by Al Helfrick, K2BLA.

The Radio Amateur's Handbook touches every segment of Amateur Radio and no active amateur should be without one. The 1981 edition is available now. — *George Woodward, W1RN*

For more information and how to order the 1981 *Radio Amateur's Handbook*, see pages 132 and 133.

now heard frequently on 80 cw from Great Lakes NT (Naval Training Station, that is!). Our loss, Navy's gai And we've lost WB8NCD, long-time MNN and OM regular, to Ohio. KC8K reports he is involved with USC Auxiliary and hopes to promote Amateur Radio activit therein. A successful QRP DXpedition was mounted t Isle Royale by K8SB and family. Michigan Chapter o OCWA presented W8CAM with an engraved plaque mak ing him the first member of the new QCWA Hall of Fam at their June 21st dinner meeting in Midland. Yrs truly an family report their first egg, on Sept. 3rd. (The SCM' first egg laid!). Traffic: WD8KZX 300, WB8MTD 29 KA8CPS 288, WD8LRT 269, AF8V 258, WB8YDZ 18 K8RV 183, K8KMO 177, WB8YHY 156, WD8RNQ 14 N8ABA 137, K8DTG 135, N8ACL 130, WA8PIM 127, W8U 123, W8VPW 116, W8PDP 99, W8VIZ 98, W8CUP 9 WA8TAQ 87, WD8OEP 82, WD8BSE 80, K8LNE 7 WA8DHB 71, WD8IBY 66, KB8GT 63, W8LCU 60, W8IH 58, KE8X 57, WD8MJB 54, WA8WZF 52, K8GXV 4 KA8EPK 43, WB8HPZ 41, WD8FIB 40, W8OIO 3 WD8ROK 35, K8ZJU 34, K8DD 32, W8HIN 32, KB8MX 2 N8BIK 25, KA8GMJ 25, WD8OSE 25, WB8VAI 24, K8JE 23, WB8POL 23, WB8ITT 22, WB8ZIY 22, WB8SYA 2 K8UPE 20, KA8ATV 18, W8EOI 18, WD8NKT 18, WA8QA 18, WB8TTA 18, WD8IXZ 17, AF8D 16, WD8JFF 1 W8SCW 14, WD8JRT 13, K8OCP 13, KB8GC 12, WB8HS 12, W8JUP 12, WB8ZNS 12, N8AUL 11, W8CBH 1 WD8RHU 11, W8MOF 10, WB8WYO 10, W8LDS 9, KB8 8, WD8AGC 7, WB8VVF 6, WB8DJS 5, KC8R 4, WB8CV W9NXD 4, W8LOU 3, WA8YBP 3, N8AG 2, N8AOM K8BZ 2, WD8ECT 2, WA8VBF 2.

OHIO: SCM, Harold C. Chapman, WB8JGW — Ass SCMs: W8MOK AF8O. SEC: K8AN. NMs: K8AA WD8KBW WB8KWD K8OZ WD8OMP WB8YGW. Ne reports:

Net	QNI	QTC	Sess.	Time(local)	Freq
BN				6:45/10 P.M.	3.577
BNR	118	19	30	6 P.M.	3.605
ONN	109	38	28	6:30 P.M.	3.706
OSN	236	204	31	6:10 P.M.	3.577
OSSBN	2642	1698	93	10:30 A.M. 4:15 & 6:45 P.M.	3.972
O6mN	285	37	30	9 P.M.	50.18

The Central Ohio ARES group with considerable suppor from COARG and CARA did a yeoman job during the Ohio State Fair. Traffic was down somewhat but al other aspects were reported as encouraging. Interest i Novice classes was particularly satisfying. All of yo should keep in mind that the fair in 1981 will run 17 days There is presently some doubt whether COARES will at tempt to operate the booth in 1981 due to the length o the fair and availability of personnel. A FEW cannot do job intended for MANY! WB8UBR was awarded th OSSBN Merit plaque at the Findlay hamfest — con gratulations, it was well deserved.

Local Nets	QNI	QTC	Sess.
BARF	34	10	16
BRTN	357	225	34
COARES	118	54	4
FABOUT/MIAMISBG	40	[illegible]	4
FRCN	48	10	4
HCARCN	42	0	4
CCNWOARES	248	75	26
MASER (JULY)	77	9	4
RARA	42	0	4
TSRAC	606	75	29
VWCEN	27	2	4

Appointments: EC — N8AAW/Hocking, K8RYW/Morgan Traffic: K8DDG 2225, K8OZ 609, WB8JGW 455, WR8M 357, WA8GMT 349, KB8KWD 315, W8QEM 315, K8D 278, WD8KBW 266, WD8DTG 208, W8RG 190, WB8OMP 176, KA8DJZ 167, W8Q7K 152, WB8MEK 150, WB8WTS 144, W8ENI 141, W8TP 140, WD8KFN 111, WB8GGX 106 WB8UBR 102, W8MOK 101, WD8OMP 101, WB8SIQ 95 N8AKS 90, N8CW 90, WB8MZZ 88, WD8DYW 85, W8JMD 84, K8BYR 83, KF8O 80, WA8HGH 77, N8JR 70, WD8QZN 64, KF8J 60, WB8SRC 60, K8AN 59, WD8IJX 56, N8ALS 55, WB8TKU 52, WB8CJU 48, WA8SSI 47, WD8PUH 45 W8WEG 45, WB8QXN 44, WB8PIY 43, WD8PMW 42 WB8YTD 40, W8MGA 39, WB8TTQ 39, WB8UWD 36 WB8YUS 33, WB8KKI 32, K8CKY 31, WD8QAC 31 WD8NEC 29, WB8YGW 28, W8BMRL 27, WD8PEI 27 WB8TRK 26, W8BVLR 23, W8HVA 22, WB8HL 21 WB8QHU 18, W8LZE 17, WD8OYO 17, WB8OFR 16 KA8CTC 15, WA8MAZ 15, WB8AWM 14, WD8EKI 12 KA8IUK 12, WD8JIK 12, W8OQL 12, W8UOY 12, WD8CHD 10, WD8JIO 10, WD8PRR 10, WB8VZX 10, WD8INK 9 WD8OYK 9, N8AHK 8, WD8EMS 7, WD8LZW 7, WA8BOV 6, WB8NHV 6, W8CAR 4, WD8HDZ 3, W8IM 3, WD8LPP 3 K8BNL 2, WB8NTR 2, K8JA 1.

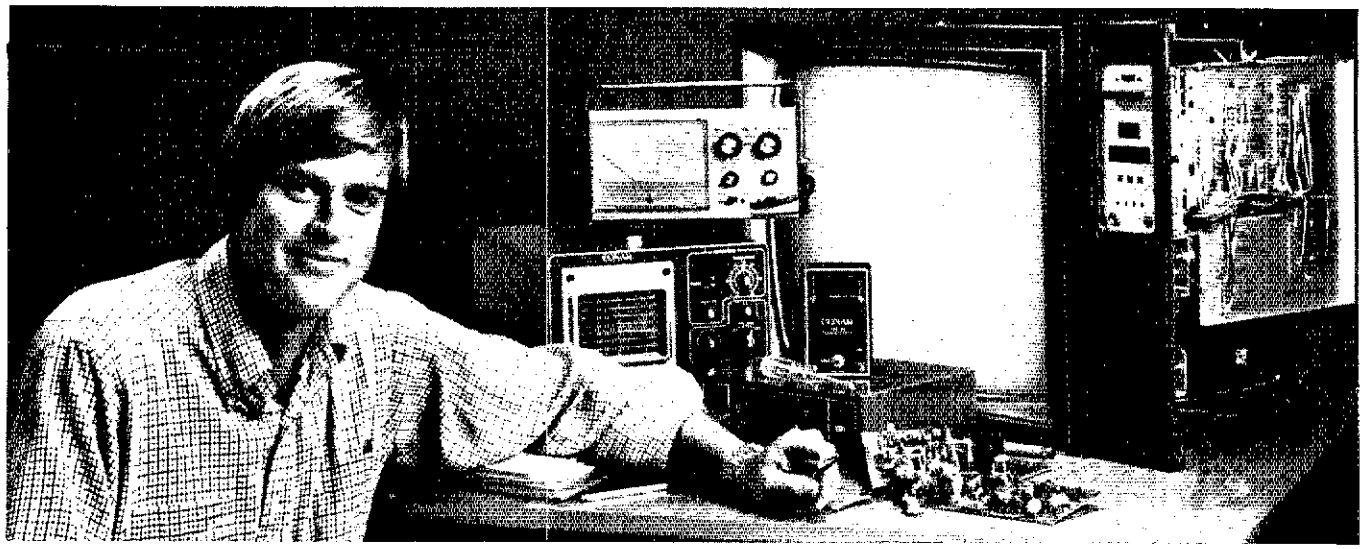
HUDSON DIVISION

EASTERN NEW YORK: SCM, Paul S. Vydareny, WB2VUK — SEC: KB2TM. STM: WA2SPL. ASCM: K2AV W2IT KB2KW. NMs: W2WSS WA2HZM N2BDW WB2ZCM WB2EAG. Nets: NYPON 5 P.M. 3913; ESS (slow) 6 P.M 3590; NYSPTEN 6 P.M. 3925; NYS 7 P.M. 3677; CDN (Troy) 6:30 P.M. 34/94; HVN (Beacon) 7:30 P.M. M-F 3798 SDN (White Plains) 9:30 P.M. S/T/T 66/06 M/W/F 615/015 Congrats to SEC on new call, KB2TM, formerly WB2NKN. In order are congratulations to KA2DVM who recently upgraded to Tech and is active in the Capito District VHF Net. During Hurricane Allen, W2YJR teamed up with VE3GOL to handle traffic from Hait which was without power. He also passed info to th AR regarding the situation in Haiti. Don't forget the ENY Staff Net on Monday evenings at 10:15 P.M. on 3.625. Al staff, ECs, NMs, etc. are welcome to check in. Wha about an ENY SSB Net?? Real fine meeting in Poughkeepsie in September combined ARES/RACES. Really enjoyed meeting many of you. SET has come and gone. The PD, held during the SET, was praised by some criticized by others. We wanted to see how it would work. Would appreciate any comments anyone has on future PDs. Hopefully we will have results in January column. PSHR: N2BDW WB2EAG WA2EGW KB2KW WA2SPL W2YJR. Traffic: WA2SPL 391, WB2EAG 141 W2ACQ 109, W2EFU 101, KB2KW 92, AA2Y 62, W2YJR 56, WA2EQW 45, WB2GOJ 32, WA2CJY 31, W2IQK 30 WB2SON 28, K2MI 24, N2BDW 16.

NEW YORK — LONG ISLAND: SCM, Paul A. Lindgren, WA2UWA — Asst. SCMs: Stephen H. Bloom, WB2IDP Dwight Ernest, KA2CNN. STM: WB2BNY. The following are traffic nets in and around the section. Join one.

Net	Time/Day	Freq	Mgr
NLI*	1900/2200 Dy	3.630	WB2TQC
NSPN*	1815 Dy	3.928	WA2SEL
BAVTN*	2030 M-F	147.315	KA2DBW
ESS	1800 Dy	3.630	W2WSS

Nets denoted with an asterisk are NTS section nets.



Wouldn't you like to have a new skill you could call your own? Then learn TV and audio servicing with at-home training from NRI.

You can learn to service and repair TV, stereos, electronic musical instruments and amplifiers, car and portable radios, record and tape decks, the new video disc and tape players, almost any kind of electronic home entertainment equipment on the market. And as you take NRI's Master Course, you build your own 25" (diagonal) color TV with built-in computer programming that lets you preset a whole evening's viewing. You also build a solid-state stereo receiver with speakers and professional quality test instruments you keep and use.

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The computerized TV, stereo, and test equipment you build are not hobby kits or preassembled commercial units with retrofitted lessons. They are designed by NRI engineers and instructors to give you valuable experience as you build them, reinforce theory with practical demonstrations, and end up as fully operable, high-performance units you'll be proud to have. And only NRI gives you "power-on" training...you introduce and correct problems in live circuits as you learn.

Build Advanced Technology TV

The NRI TV you build features the latest advances in video science. Its computerized tuner lets you change channels at the touch of a button, preset up to eight hours of programming, and key lock it in to control children's viewing. It includes automatic tint and chroma controls, automatic degaussing, and automatic fine tuning...oversized speaker, built-in digital clock, 100% solid-state chassis, modular plug-in circuit boards, and the latest development in picture tubes with 100° tri-potential focus in-line gun. And console cabinet is included at no extra charge.

Other kits you build include the NRI stereo, 5" triggered-sweep oscilloscope, digital frequency counter, 10-display TV pattern generator, transistorized volt-ohm meter, and the NRI Discovery Lab® for performing additional experiments and proving theory.

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MFJ NEW PRODUCTS

exciting new ideas from the world's leading manufacturer of amateur radio accessories

NEW MFJ/BENCHER Keyer-Paddle Combo — "The Pacesetter"

MFJ-422 Combo $99.95 (+$4)

MFJ-422X Keyer only $69.95 (+$4)

The best of all CW worlds — a deluxe MFJ keyer in a compact configuration that fits right on the BENCHER iambic paddle! And you can buy the combination or just the keyer to fit on your BENCHER.

New MFJ keyer — small in size, big in features. Curtis 8044 IC, *adjustable weight and tone*, front panel *volume and speed controls* (8-50 wpm), built-in *dot-dash memories*, speaker, sidetone, and push-button selection of semi-automatic/tune or automatic modes.

Ultra-reliable solid-state keying: grid-block, cathode and solid-state transmitters (−300 V, 10 mA max; +300 V, 100 mA max). *Fully shielded*. Uses 9 V battery or optional AC adapter ($7.95 +$2)

Beautiful functional engineering. The keyer mounts on the paddle base to form a small (4⅛Wx2⅝H x 5½"L) attractive combination that's a pleasure to look at and use.

The BENCHER paddle is a best seller. Fully adjustable; gold-plated silver contacts; lucite paddles; chrome plated brass; heavy steel base with non-skid feet.

NEW MFJ 4 & 8-Band Mobile Shortwave Converters

MFJ-304 $59.95 (+$4)

MFJ-308 $79.95 (+$4)

Another MFJ "first," these low cost mobile SWL converters provide new excitement and variety for your driving/listening pleasure.

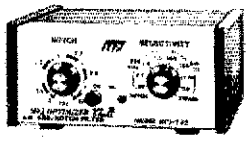
Two models to choose from. The 4-band "World Explorer I" (MFJ-304) offers complete *19, 25, 31 and 49 meter coverage* (the most popular HF bands due to their distance capabilities at various times of the day and year). Hear countries from Europe, Africa, Middle East, Asia, the Islands, North and South America. The 8-band "World Explorer II" (MFJ-308 adds *13, 16, 41, and 60 meter* bands) for even greater listening variety.

Compact and sensitive. The 4-band model measures just 5¼W x 1¼H x 4"D to *fit anywhere* in your vehicle (the 8-band version is just 1" wider and 1" deeper). Two dual-gate MOSFETS give these converters *excellent sensitivity and selectivity* when combined with your automotive receiver.

Easy to use, easy to install. Push a converter button to choose the band, tune in stations with your regular car radio. To install, just plug the car antenna into the converter and insert the converter cable into your car radio antenna jack; connect the power lead to 12 VDC.

Listen to the world on the road. Get the new MFJ mobile SWL converters — "World Explorers I & II."

NEW MFJ Active CW/SSB/Notch Filters



MFJ-722 $69.95 (+$4)

MFJ-723 $49.95 (+$4)

Two new super-selective filters. The new MFJ-722 "Optimizer" offers *razor sharp, no-ring CW filtering* with switch-selectable bandwidths (80, 110, 150, 180 Hz centered on 750 Hz), *steep-skirted SSB filtering*, and a *300-3000 Hz tunable 70 dB notch filter*.

The 8-pole (4-stage) active IC filter gives *CW performance no tunable filter can match*. (80 Hz bandwidth gives −60 dB response one octave from center and up to 15 dB noise reduction). *The 8-pole SSB audio bandwidth is optimized* for reduced sideband splatter and less QRM (375 Hz highpass cutoff plus selectable lowpass cutoffs at 2.5, 2.0, and 1.5 kHz, 36 dB/octave rolloff). Size: 5x2x6".

New model MFJ-723 is similar to the 722 but is for CW only, has a 60 dB notch tunable from 300-1200 Hz, and measures 2x4x6". Other models: **MFJ-721. $59.95,** like 722 but less notch; **MFJ-720, $39.95,** like 723 but less notch.

Versatile, all models plug into the phone jack, provide 2 watts for speaker or can be used with headphones. All require 9-18 VDC, 300 mA max (or 110 VAC with optional AC adapter at $7.95 +$2).

Enjoy pleasant listening and improved readability with one of these new MFJ filters.

NEW MFJ "Dry" 300W & 1KW Dummy Loads

MFJ-262 $49.95 (+$4)

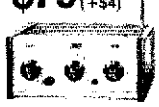
MFJ-260 $26.95 (+$4)

Air Cooled, *non-inductive 50-ohm resistors* in perforated metal housings with SO-239 connectors; both rated to full load for 30 seconds; de-rating curves to 5 minutes included. Just right for tests and fast tune up.

Low VSWR. 300W: 1.1:1 max to 30 MHz, 1.5:1 max. 30-160 MHz. **1 kW:** 1.5:1 max to 30 MHz. **MFJ-260** (300W) is just 2½x2½x7"; **MFJ-262** (1kW) is 3x3x13".

NEW MFJ Shortwave Accessories

MFJ-1020 $79.95 (+$4)



MFJ-1040 $99.95 (+$4)

MFJ-1040 Receiver Preselector

Boosts weak signals, rejects out of band signals, reduces images. *Covers 1.8-54 MHz* with up to 20 dB gain from low noise MOSFET circuitry. *Works with 2 antennas and 2 receivers* (even XCVRS to 350W input).

Built-in 20 dB attenuator prevents receiver overload. Also includes auto-bypass, delay control, PTT jack. Operates on 9 V battery, 9-18 VDC, or 110 VAC with optional AC adapter, $7.95 +$2.

Model MFJ-1045, $69.95, is the same less attenuator, bypass, delay, PTT, 1 antenna & 1 receiver.

MFJ-1020 Indoor Active Antenna

"World grabber," rivaling or exceeding reception of outside long wires.

Unique tuned circuitry with amplification *minimizes intermod distortion, improves selectivity, reduces noise* outside the tuned band, even functions as a *preselector* with an external antenna. *Covers 0.3-30 MHz in 5 bands*. Telescoping ant.; tune, band, gain, on-off-bypass; Uses 9 V battery, 9-18 VDC, or 110 VAC, with optional AC adapter at $7.95 +$2. 5x2x6".

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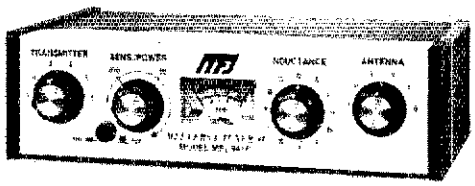
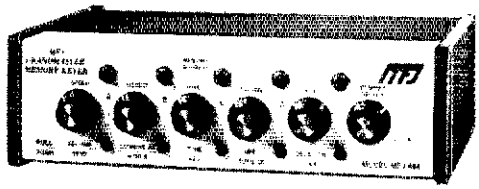
MFJ 941C Versa Tuner II



MFJ-941C
$84.95 (+$4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.
SWR + dual range wattmeter (300 & 30 watts full scale, forward and reflected power). *Sensitive meter* measures SWR down to 5 watts output.
More flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.
12 position efficient airwound inductor for lower losses, more watts out.
Built-in 4:1 balun for balanced lines. 1000v capacitor spacing.
Matches everything from 160-10 meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.
Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.
MFJ-945, $74.95, like model 941C but less ant. switch. Optional mobile bracket for either model is $3.

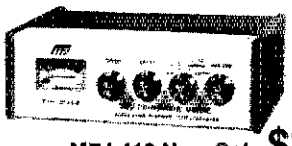
MFJ 484 "Grandmaster" Memory Keyer



MFJ-484
$139.95 (+$4)

Up to twelve 25 character messages plus 100, 75, 50 or 25 ch. messages (4096 bits).
Repeat any message continuously or with pauses of up to 2 min. LEDs show use.
Record, playback, or change messages instantly at touch of a button. Memories are resettable with button or touch of the paddle.
Built-in memory saver — 9 V battery takes over when power is lost.
Iambic operation with squeeze key. Dot-dash insertion. Optional BENCHER paddle $42.95 +$4.
Dot-Dash memories, self-completing, jam-proof spacing, instant start.
Panel controls: Speed (8-50wpm)/Record; Weight/Memories Combined; Tone/Tune; Delay (0-2 min.)/Repeat; rotary Vol/On-Off; Memory Select; Message Buttons select desired 25 ch. messages; Memory Reset button.
Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 mA max; +300 V, 100 mA max). Operates 12-15 VDC or 110 VAC with optional adapter, $7.95 +$2. Size 8x2x6". **MFJ-482, $99.95,** four 25 or 50+two 25 ch. messages: **MFJ-481, $89.95,** two 50 ch. messages. **Get the best seller keyers**-MFJ "Grandmasters."

MFJ 410 "Professor Morse" Code Generator/Keyer



NEW LOW PRICE Save $20
MFJ-410 Now Only **$129.95** (+$4)

Use it to learn, use it to operate. It sends *unlimited random code* in random groups for practice; *never repeats* sequences. And when you're on the air, it's a *full feature keyer.*
Vary speed from 5-50 wpm; meter readout.
Vary spacing; give fast sound to low speed.
Alpha or alphanumeric with punctuation.
Built-in speaker and phone jack; tone and vol. Ideal for classroom or private use.
Full feature keyer includes vol., speed, tone and weight controls, tune switch, dot-dash memories, keys grid block, cathode, solid-state rigs. Optional BENCHER paddle $42.95 + $4. Operates on 9-18 VDC, two 9 V batteries or 110 VAC with optional adapter $7.95 +$2. Size 7x2x6". **Get "Professor Morse"** — you'll never outgrow it.

MFJ Dual Tunable SSB/CW Filter "Signal Enhancer"

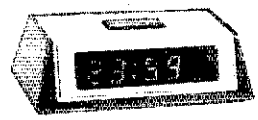
MFJ-752B **$84.95** (+$4)

Dual filters give unmatched performance.
The primary filter lets you *peak, notch, low pass or high pass* with extra steep skirts.
Auxiliary filter: *70 dB notch, 40 Hz peak.*
Both filters tune from 300 to 3000 Hz with variable *bandwidth from 40 Hz to nearly flat.*
Constant output as bandwidth is varied; linear frequency control.
Switchable noise limiter for impulse noise.
Simulated stereo sound for CW lets ears and mind reject QRM.
Inputs for 2 rigs, switch selectable. Plugs into phone jack. Two watts for speaker. OFF bypasses filter. 9-18 VDC, 300 mA or 110 VAC with optional adapter $7.95 +$2. 10x2x6". **MFJ 751, $59.95,** similar, primary filter only, less high pass & noise limiter.

MFJ BEST SELLERS

favorite products from the world's leading manufacturer of amateur radio accessories

GMT Clock/ID Timer



MFJ-101
$29.95 (+$4)

24 hour, solid-state, blue 0.6" digits, ID timer sounds every 9 min (also a snooze alarm), regular alarm for skeds or to awaken, power-out/alarm-on indicators, ready to use on 110VAC, 50-60Hz, 6x2x3".

KW Dummy Load With Oil

MFJ-250
$29.95 (+$4)

Rated at 1 kW CW or 2 kW PEP for 10 min., half that for 20 min., cont. at 200 W CW, 400 W PEP, non-inductive 50 ohm resistor, quality transformer oil (no PCB), VSWR under 1.2:1 to 30 MHz, 1.5:1, 30-300 MHz, 2:1, 300-400 MHz. Coax conn., vent cap., 7½"h x 6⅝" diam.

300 Watt Antenna Tuner

MFJ-949B
$129.95 (+$4)

Does it all! Built-in dummy load, SWR, forward and reflected power meter, antenna switch, balun, matches everything from 1.8-30 MHz (coax, random wires, balanced lines), coax conn., binding post, 10x3x7".

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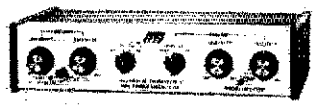
World Leader in SSB/CW Filters

10 Models For Ham Radio & SWL

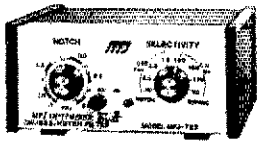
MFJ-752B Dual Tunable SSB/CW Filter



MFJ-752B **$84.95** (+$4)

MFJ's Best! With signal processing performance and flexibility others can't match. For SSB, zero in with the Primary Filter frequency control, adjust bandwidth for best response, then with the Auxiliary Filter notch out an interfering signal, or peak the desired signal. For CW, peak both filters for steep skirt selectivity or use the Aux. filter to notch. **The primary filter** lets you *peak, notch, low pass or high pass* with extra steep skirts. **Auxiliary filter** has *70 dB notch, 40 Hz peak.* **Both filters tune from 300-3000 Hz** with variable bandwidth from 40 Hz to nearly flat. **Constant output** as bandwidth is varied; linear frequency controls. **Switchable noise limiter** for impulse noise. **Simulated stereo sound** for CW lets ears and mind reject QRM. **Inputs for 2 rigs,** switch selectable. Plugs into phone jack. Two watts for speaker. OFF bypasses filter. 9-18 VDC, 300 mA or 110 VAC with AC adapter ($7.95+$2). 10x2x6" **MFJ-751, $59.95+$4,** similar, primary filter only, less high pass & noise limiter. 5x2x6"

NEW MFJ Active CW/SSB/Notch Filters



MFJ-722 **$69.95** (+$4)

MFJ-723 **$49.95** (+$4)

Two new super-selective filters. The new MFJ-722 "Optimizer" offers *razor sharp, no-ring CW filtering* with switch-selectable bandwidths (80, 110, 150, 180 Hz centered on 750 Hz), *steep-skirted SSB filtering, and a 300-3000 Hz tunable 70 dB notch filter.* **The 8-pole (4-stage) active IC filter** gives *CW performance no tunable filter can match.* (80 Hz bandwidth gives −60 dB response one octave from center and up to 15 dB noise reduction). *The 8-pole SSB audio bandwidth is optimized* for reduced sideband splatter and less QRM (375 Hz highpass cutoff plus selectable lowpass cutoffs at 2.5, 2.0, and 1.5 kHz, 36 dB/octave rolloff). Size: 5x2x6". **New model MFJ-723** is similar to the 722 but is for CW only, has a 60 dB notch tunable from 300-1200 Hz, and measures 2x4x6". Other models: **MFJ-721, $59.95 + $4,** like 722 but less notch; **MFJ-720, $39.95 + $4,** like 723 but less notch. **Versatile,** all models plug into the phone jack, provide 2 watts for speaker or can be used with headphones. All require 9-18 VDC, 300 mA max (or 110 VAC with optional AC adapter at $7.95 +$2). **Enjoy pleasant listening and improved readability** with these new MFJ filters.

Low Cost CW/SSB Filters

CWF-2BX **$29.95** (+$4)

SBF-2BX **$29.95** (+$4)

CWF-2BX Super CW Filter; 8 poles; selectable bandwidths (80, 110, 180 Hz) 750 Hz center; steep skirts (80 Hz BW 60 dB down one octave from center); no ringing; up to 15 dB noise reduction; 9 VDC; 2x3x4"; **CWF-2PC, $19.95 +$3,** wired & tested PC board for building into rig.; inc. 4-pos. sw.; less cab.

SBF-2BX Super SSB Filter; improves readability; reduces splatter, low and high pitched QRM, hiss, static, noise, hum; 375 Hz highpass cutoff plus low pass cutoffs at 2.5, 2, 1.5 kHz (36 dB/octave rolloff); 9 VDC; 2x3x4"; **SBF-2PC, $19.95 +$3,** wired & tested PC board for building into rig.; inc. 4-pos. sw.; less cab.

NEW MFJ Shortwave Mobile Tuners & Accessories

MFJ-304 **$59.95** (+$4) MFJ-308 **$79.95** (+$4) MFJ-1040 **$99.95** (+$4) MFJ-959 **$89.95** (+$4)

Two mobile SWL Converters to hear the shortwave world while you drive! **MFJ-304** covers *19, 25, 31 and 49 meter bands.* **MFJ-308** covers *above plus 13, 16, 41 and 60 meters.* Both use *dual gate MOSFETs* for excellent sensitivity and selectivity when combined with your car receiver. *Easy to install.* 12VDC. #304 measures 5¼x1¼x 4"d, #308 is 1" wider and deeper.

MFJ-1040 Receiver Preselector boosts weak signals, rejects out of band signals, reduces images. *Covers 1.8-54 MHz* with up to 20 dB gain. Works with 2 ants., 2 rcvrs., and auto. bypass for xcvrs. up to 350W input. 20 dB attn. 9-18 VDC or 110 VAC with optional AC adapter ($7.95 +$2). 6x2x6" **Model MFJ-1045, $69.95 +$4,** 5x2x6" similar less attn., auto. bypass, 1 ant. & 1 rcvr.

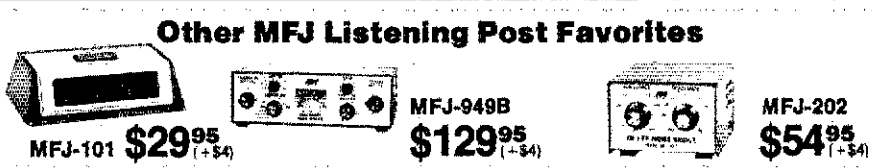
MFJ-959 Antenna Tuner/Preamp boosts signals up to 20 dB. *Covers 1.6-30 MHz.* Use with 2 ants., 2 rcvrs. 20 dB attenuator. 9-18 VDC or 110 VAC with adapter ($7.95 +$2). 9x2x6" **MFJ-950, $59.95 +$4,** similar less preamp, attenuator, bypass; 6x2x6".

Indoor Active Antenna

MFJ-1020 **$79.95** (+$4)

A "world grabber," the MFJ-1020 rivals or exceeds reception from outside long wires. **Unique tuned circuitry with amplification** *minimizes intermod distortion, improves selectivity, reduces out-of-band noise,* even functions as a *preselector* with external antenna. *Covers 300 kHz-30 MHz in 5 bands.* Telescoping antenna, full controls. 9 V battery, 9-18 VDC, or 110 VAC with optional AC adapter ($7.95 + $2). 5x2x6".

Other MFJ Listening Post Favorites



MFJ-101 **$29.95** (+$4)

MFJ-949B **$129.95** (+$4)

MFJ-202 **$54.95** (+$4)

MFJ-101 24 hr Digital Clock/ID Timer GMT time, solid-state, blue 0.6" digits, ID timer sounds every 9 min (also a snooze alarm), regular alarm for skeds or to awaken, power-out/alarm-on indicators, ready to use on 110VAC, 50-60 Hz, 6x2x3".

MFJ-949B 300 Watt Antenna Tuner does it all! Built-in dummy load, SWR, fwd & ref power meter, ant. sw., balun, matches from 1.8-30 MHz (coax, random wires, balanced lines), coax conn., binding post, 10x3x7".

MFJ-202 RF Noise Bridge *maximizes ant. performance;* measures resonant freq., radiation resistance, reactance, series bridge, (±150 pf, 250 ohms, 1-100 MHz). Includes range extender for measurements beyond scale readings; 9 VDC, 2x3x4".

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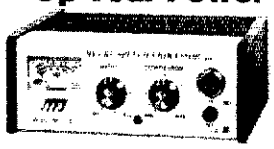
MFJ Operating Aids & Instruments

Handy helpers from the world's leading manufacturer of amateur radio accessories

Up Your Power With MFJ Speech Processors



MFJ-525 **$119.95** (+$4)

MFJ-520BXII **$59.95** (+$4)

MFJ-525 RF Speech Processor gives you up to *4 times more average SSB power* on all bands. *Powerful, natural sounding speech* punches through QRM and DX piles ups. A true RF processor, *the 525 works with any rig, any mic.* No internal connections needed. **Two color VU meter** aids in setting clipping. **Full controls:** clipping level, output level, On-Off/Bypass switch, LED indicator. Shielded cable with PTT line, 4-pin mic. jack & plug, RFI protected. 12-18 VDC or 110VAC with optional AC adapter ($7.95 +$2). 6x2x6"

Super Logarithmic Speech Processors: MFJ LSP-520BX II gives up to 400% more RF power. Plugs between mic. and transmitter. *Three active filters* concentrate power to slice through QRM; **30 dB dynamic range IC amp.,** 9 V battery required. 4x2x6" beige & walnut grain cab. **LSP-520BX, $49.95 +$4,** similar, in metal cab. 2x3x4"

MFJ Dummy Loads — Air or Oil Cooled

MFJ-250 **$29.95** (+$4)

MFJ-262 **$49.95** (+$4)

MFJ-260 **$26.95** (+$4)

MFJ-250 1 kW load with oil only $29.95! *Rated 1 kW CW or 2 kW PEP for 10 min.,* half ratings for 20 min., cont. at 200 W CW, 400 W PEP. VSWR under 1.2:1 to 30 MHz; 1.5:1 to 300 MHz. 7½"h x 6⅝"diam. **New MFJ "Dry" Loads. Air cooled** *50 ohm non-inductive resistors* in perforated metal housings; rated full load for 30 seconds, de-rating curves to 5 min. inc. **Low VSWR:** MFJ-260 (300W) 1.1:1 to 30 MHz, 1.5:1 to 160 MHz; 2½x2½x7"; MFJ-262 (1kW) 1.5:1 to 30 MHz. 3x3x13".

MFJ Deluxe Phone Patches

MFJ-624 **$59.95** (+$4)

MFJ-624 Telepatch II hybrid phone patch with unmatched performance and quality. **Crisp, clear, hum-free audio** with VOX or PTT. **VU meter** to monitor line level and adjust null depth. **Full controls:** separate transmit and receive gain controls, null control, function switch. Jacks for in, out, speaker & mic.; terminals for phone lines. Beige & walnut grain cab. 8x2x6". **MFJ-620, $49.95+$4,** similar, less meter. 6x2x6"

Low Cost MFJ Accessories From Just $17.95!

MFJ-1030BX **$49.95** (+$4)

MFJ-401 **$29.95** (+$4)

MFJ-40V **$29.95** (+$4)

CPO-555 **$17.95** (+$4)

MFJ-200BX **$29.95** (+$4)

MFJ-1030BX Receiver Preselector *boosts 10-30 MHz signals 3-5 "S" units.* Dual-gate MOSFET has 20-25 dB gain, noise figure less than 2.5 dB. Beige/Walnut. 4x2x6"
MFJ-40T QRP CW Transmitter works the world with *5 watts on 40M*; no tuning; 3 crystal sockets, or VFO input; protected transistor output; pi net; 12VDC; 2x3x4".
MFJ-40V QRP VFO; direct dial 7-7.2 MHz; less than 100 Hz drift/hr after warmup; clean 4 V peak-to-peak output flat to 2 dB; 12VDC; metal cab. matches 40T.
CPO-555 Code Oscillator; crisp clear sound from built-in speaker; enough vol. for class use; tone control; 9 V battery, 2x3x4".
TK-555, $1.95, optional key.
MFJ-200BX Frequency Standard; gated for easy ID, markers every 100, 50, and 25 kHz into VHF; 9 V battery, 2x3x4".

More MFJ Shack Bargains

MFJ-101 **$29.95** (+$4)

MFJ-941C **$84.95** (+$4)

MFJ-408 **$79.95** (+$4)

MFJ-101 24 hr Digital Clock/ID Timer GMT time, solid-state, blue 0.6" digits. ID timer sounds every 9 min (also a snooze alarm), regular alarm, power-out/alarm-on indicators, 110VAC, 50-60Hz, 6x2x3".
MFJ-941C "Versa Tuner II" matches dipoles, vees, randoms, verticals, mobile whips, beams; 160-10M; SWR + dual range wattmeter (300 & 30 watts); 6-position antenna sw.; built-in balun; 8x2x6"; mobile mtg. brkt $3.
MFJ-408 "Deluxe Electronic Keyer II"; *Curtis 8044 IC keyer chip; speed meter* to 50 WPM; dot-dash memories; RF proof; sends iambic, automatic, semi-auto, or manual; weight, speed, vol., tone controls; speaker; solid-state keying: grid block, cathode, solid-state transmitters (−300V, 10 mA max, +300V, 100 mA max); 6-9 VDC or 110 VAC with optional AC adapter ($7.95 +$2): 8x2x6".

MFJ RF Noise Bridge

MFJ-202 **$54.95** (+$4)

Maximize your antenna performance. Measure resonant frequency, radiation resistance, reactance, learn how to get minimum SWR. Great for experiments, tests in tuned circuits (measure inductance, RF impedance & more). Series bridge, ±150 pf, 250 ohms, 1-100 MHz. Includes range extender for measurements beyond scale readings. 9 VDC 2x3x4".

Multi-Sensor SWR/Wattmeters

MFJ-825 **$119.95** (+$4)
Sensors $29.95 ea + $3

MFJ-820 **$69.95** (+$4)

MFJ-825 Deluxe Power Sentry accepts any 3 sensors; operates 3 rigs; peak or avg. forward/reflected power in 2 ranges; SWR 1:1 to 6:1, 9 VDC or 110 VAC with optional AC adapter ($7.95 +$2); 6¾x5⅜x5¾"; includes one sensor of your choice.
MFJ-820 Power Sentry accepts one sensor; avg. forward/ref. power in 2 ranges; SWR 1:1 to 6:1; 3⅞"x5⅜x4½"; includes one sensor of your choice.
MFJ-830 HF Sensor, 1.8-30 MHz, 200/2000W fwd, 20/200W ref. **MFJ-831 VHF Sensor,** 50-175 MHz, 20/200W fwd & ref. **MFJ-832 QRP HF Sensor,** 1.8-30 MHz, 2/20W fwd & ref. **MFJ-833 Hi-Pwr VHF Sensor,** like #831 but 200/2000W fwd, 20/200W ref.

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World leader in Electronic Keyers 11 Models to choose from

NEW MFJ/BENCHER Keyer-Paddle Combo — "The Pacesetter"

MFJ-422 Combo **$99.95** (+$4)

MFJ-422X Keyer only **$69.95** (+$4)

The best of all CW worlds — a deluxe MFJ keyer in a compact configuration that fits right on the BENCHER iambic paddle! And you can buy the combination or just the keyer to fit on your BENCHER.

New MFJ keyer — small in size, big in features. Curtis 8044 IC, *adjustable weight and tone*, front panel *volume and speed controls* (8-50 wpm), built-in *dot-dash memories*, speaker, sidetone, and push-button selection of semi-automatic/tune or automatic modes.

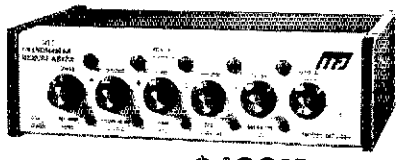
Ultra-reliable solid-state keying: grid-block, cathode and solid-state transmitters (−300 V, 10 mA max; +300 V, 100 mA max). *Fully shielded*. Uses 9 V battery or optional AC adapter ($7.95 +$2)

Beautiful functional engineering. The keyer mounts on the paddle base to form a small (4⅛Wx2⅝H x 5½"L) attractive combination that's a pleasure to look at and use.

The BENCHER paddle is a best seller. Fully adjustable; gold-plated silver contacts; lucite paddles; chrome plated brass; heavy steel base with non-skid feet.

For CW with compactness, convenience and class, order the new MFJ "Pacesetter."

MFJ-484 Memory Keyer



MFJ-484 **$139.95** (+$4)

Ham radio's most popular — up to twelve 25 character messages plus 100, 75, 50 or 25 ch. messages (4096 bits).

Repeats continuously or with pauses that are adjustable up to 2 minutes.

Record, playback or change messages instantly, at the touch of a button.

Built-in memory saver — 9 V battery takes over when power is lost.

Iambic operation with squeeze key. Dot-dash insertion.

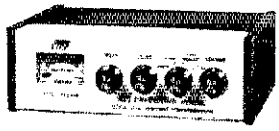
Dot-Dash memories, self-completing ch., jamproof spacing, instant start.

Full controls: Speed (8-50wpm)/Record; Weight/Memories Combined; Tone/Tune; Delay/Repeat; Vol/On-Off; Memory Select; Message buttons; Memory Reset button.

Solid state keying; grid, cathode, solid-state xmtrs (−300 V, 10 mA max; +300 V, 100 mA max). 12-15 VDC or 110VAC w. optional AC adapter $7.95, (+$2). 8x2x6". Optional BENCHER paddle $42.95 (+$4).

MFJ-482, $99.95, (+$4) four 25 or 50 + two 25 ch. messages; **MFJ-481, $89.95,** (+$4) two 50 ch.

Code Generator/Keyer



Save $20

MFJ-410 Now Only $129.95 (+$4)

"Professor Morse," — never outgrow it.

Use it to learn and to operate. Sends *unlimited random code* in random groups for practice; *never repeats sequences*. When you are on the air, it's a *full feature keyer*.

Meter readout of speed (5-50 wpm).

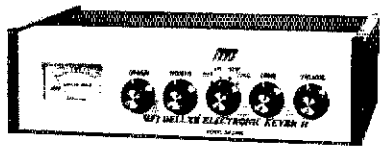
Vary spacing for fast sound at low speed.

Alpha or alphanumeric with punctuation.

Built-in speaker and phone jack, ideal for classroom or private use; tone & volume.

Full feature keyer: vol., speed, tone & weight controls, tune sw., dot-dash memories, keys grid, cathode, solid state rigs, uses two 9 V batteries, 9-18 VDC or 110 VAC with optional adapter $7.95 +$2. Optional BENCHER paddle $42.95 +$4.

Value Leader Deluxe Keyers



MFJ-408 **$79.95** (+$4)

MFJ-408, more for less.

Iambic, automatic, semi-auto or manual.

Speed meter reads to 50 wpm.

Dot-dash memories, self-completing, jam-proof, RF proof, instant start.

Front panel controls: speed (8-50 wpm), weight, tone, vol., function.

Built-in speaker for class or private use.

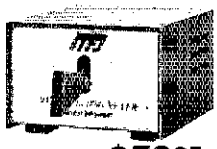
Curtis 8044 IC, proven in use by thousands.

Accessory socket permits using external Curtis memory, random code generator, keyboard (from Curtis Electro Devices).

Solid-state keying; grid, cathode, solid-state (−300 V, 10mA max; +300 V, 100 mA max).

Portable, uses 4 "C" cells, 6-9 VDC, or 110 VAC with optional adapter $7.95 + $2. 8x2x6". **MFJ-406, $69.95,** (+$4) same less meter; Optional BENCHER paddle $42.95.

MFJ 'Econo' Keyers Save $



MFJ-404 **$59.95** (+$4)

MFJ-400 **$49.95** (+$4)

MFJ-400 — all the features plus low price! Uses Curtis 8044 IC.

Built-in sidetone and speaker. Convenient.

Full controls: speed (8-50 wpm), internal weight control for a QRM-penetrating distinctive signal; internal tone control; front panel volume control; tune switch; on-off.

Dot-dash memories, instant start; self-completing characters; jamproof spacing.

Use squeeze key for iambic operation or single lever key.

Reliable solid-state keying: grid block, cathode, solid-state transmitters (−300 V, 10 mA max.; +300 V, 100 mA max.).

Portable: powered by 9 V battery. 2x3x4". Optional BENCHER paddle, $42.94 +$4.

MFJ-404, $59.95, (+$4) with paddle. **MFJ-402, $44.95,** (+$4) like 404 less sidetone.

TO ORDER PRODUCTS, CALL TOLL FREE

master charge **800-647-1800** VISA

For tech. info., order or repair status, or calls outside continental U.S. and inside Miss., call 601-323-5869.

- **All MFJ products unconditionally guaranteed for one year** (except as noted)
- **Products ordered from MFJ are returnable within 30 days for full refund (less shipping)**
- **Add shipping & handling charges in amounts shown in parentheses**

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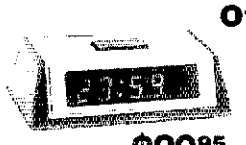
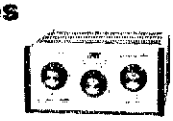
Box 494; Mississippi State, MS 39762

Other MFJ Shack Favorites



MFJ-101 **$29.95** (+$4)

MFJ-941C **$84.95** (+$4)



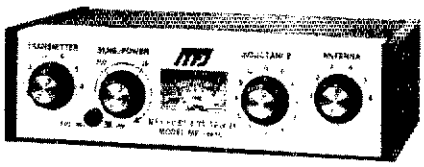
MFJ-900 **$42.95** (+$4)

24 hr Digital Clock/ID Timer GMT time, solid-state, blue 0.6" digits, ID timer sounds every 9 min (also a snooze alarm), regular alarm for skeds or to awaken, power-out/alarm-on indicators, ready to use on 110VAC, 50-60Hz, 6x2x3".

"Versa Tuner II" matches everything from 160-10M; dipoles, vees, randoms, verticals, mobile whips, beams; SWR + dual range wattmeter (300 & 30 watts); 6-position antenna sw. for 2 coax lines direct or thru tuner, random/balanced line or dummy load; built-in balun; 8x2x6"; mobile mtg. brk $3.

"Econo Tuner" matches coax, random wires from 1.8-30 MHz; to 200 watts RF output; efficient airwound inductor for more watts out; 5x2x6".

300 W Versa Tuners—Versatile Bargains



MFJ-941C **$84.95** (+$4)

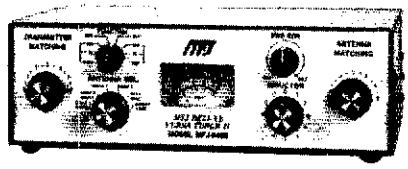
MFJ 941C Versa Tuner II
SWR + dual range wattmeter, 300 & 30 watts full scale, forward & reflected power. *Sensitive meter* measures SWR down to 5 W output.

6-position antenna switch selects 2 coax lines, direct or through tuner, random/balanced line, or bypass for dummy load.

12-position airwound inductor, *built-in balun.*

Matches everything from 160-10M, dipoles, vees, randoms, verticals, mobile whips, beams.

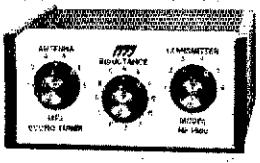
Easy to use anywhere. Coax conn., binding posts, size 8x2x6" in eggshell white, walnut-grained sides. Mobile bracket, $3.



MFJ-949B **$129.95** (+$4)

MFJ 949B Versa Tuner II
Matches everything from 1.8-30MHz, coax, randoms, bala ced lines, up to *300 W output,* solid-state or tubes.
Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.
Built-in 4:1 balun; 200w, 50-ohm dummy load; SWR meter and 2-range wattmeter (300w & 30w).
6-position antenna switch, 12-position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".
4 Other 300W Models: MFJ-940, $74.95, (+$4), like 941C less balun. **MJF-945, $74.95,** (+$4) like 941C less ant. switch. **MFJ-944, $74.95,** (+$4) like 945, less SWR/Wattmeter **MFJ-943, $64.95,** (+$4) like 944, less ant. switch.

200 W Economy Tuners do the job for less



MFJ-900 **$42.95** (+$4)

MFJ-900 — improved but still low cost. **Matches coax, random wires** *1.8-30 MHz.* **Handles up to 200 watts output;** efficient airwound inductor gives more watts out.

Works with any transceiver, solid-state or tube type.
Increases antenna bandwidth to operate all bands. SO-239 + binding post; 5x2x6".
2 OTHER 200W MODELS:
MFJ-901, $52.95, (+$4) like 900 but includes 4:1 balun for use with balanced lines.
MFJ-16010, $32.95, (+$4) *for random wires only.* Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

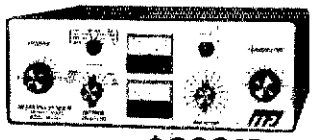
1.5 KW Versa Tuners III — low cost power handlers

MFJ 962 VERSA Tuner III
Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.
Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.
6-position antenna switch handles 2 coax lines, direct or through tuner, plus wire and balanced lines.
Built-in 4:1 ferrite balun; 250 pf 6 kV capacitors; 12 pos. inductor; ceramic switches; black cabinet and panel.

MFJ-962 **$189.95** (+$10)

ANOTHER 1.5 KW MODEL
MFJ 961, $169.95, (+$10) similar but less the SWR/Wattmeter.

3 KW Deluxe Antenna Tuners — MFJ's best



MFJ-984 **$299.95** (+$10)

MFJ 984 Versa Tuner IV
Up to 3 kW PEP and it matches *any feedline,* 1.8-30 MHz, coax, balanced or random.
Exclusive 10 amp RF ammeter assures maximum power at minimum SWR.
Separate SWR/Wattmeter, forward and reflected, with 2000 and 200 watt ranges.
18-position dual inductor, ceramic switch.
7-position antenna switch handles 3 coax lines through tuner and 1 coax through or direct to antenna, random wire, balanced line, and dummy load.
Built-in 200 watt, 50 ohm dummy load.
Built-in 4:1 ferrite balun; 250 pf 6 kV capacitors; 5x14x14" black & aluminum.
Compare this MFJ deluxe 3 kW tuner with any! You'll agree MFJ gives you more.
3 MORE 3 KW MODELS
MFJ 981, $199.95, (+$10) similar to 984 but less the 7-position antenna switch and 10 amp. RF ammeter. **MFJ 982, $199.95,** (+$10) similar to 984 but less 10 amp. RF ammeter and dual range SWR/Wattmeter. **MFJ-980, $169.95,** (+$10) similar to 984 but less antenna switch, RF ammeter and SWR/Wattmeter.

MFJ
World leader in Antenna Tuners 15 Models to choose from

Other MFJ Shack Favorites

MFJ-101 **$29.95** (+$4)

24 Hr Clock/ID Timer has blue 0.6" digits; GMT time; ID timer (also snooze alarm); regular alarm for skeds or to awaken; power-out & alarm-on indicators; ready to use on 110VAC, 50-60 Hz; 6x2x3" bargain.

MFJ-484 **$139.95** (+$4)

MFJ Grandmaster Memory Keyer has up to twelve 25 ch. messages plus 100, 75, 50 or 25 ch. messages (4096 bits) that repeat continuously or in adjustable pauses (to 2 min.); full controls; 8-50wpm; solid state keying; 12-15 VDC or 110VAC with adapter ($7.95 +$2).

MFJ-752B **$84.95** (+$4)

MFJ Dual Tunable SSB/CW Filter; primary filter has peak, notch, lowpass and highpass; aux. filter notches to 70 dB or peaks to 40 Hz; both tune 300-3000 Hz with bandwidth from 40 Hz to flat; constant output; noise limiter; 2 inputs; 9-18 VDC 300 mA; or 110VAC with adapter ($7.95 +$2) 10x2x6".

TO ORDER PRODUCTS, CALL TOLL FREE
master charge **800-647-1800** VISA

For tech. info., order or repair status, or calls outside continental U.S. and inside Miss., call 601-323-5869.

- **All MFJ products unconditionally guaranteed for one year (except as noted)**
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Congratulations to new NLI NM WB2TQC. Please give him your cooperation. WB2BNY continues as STM and NM of the WR2ACN traffic net. Congratulations to N2BCA on upgrading to General. Congratulations to new appointees WB2TQC as NM and WB2VEX as OTS. OO report received from WA2PMW. He also reports very good E skip openings on 2 meters on July 17th. I regret to report W2HXT formerly of the Bronx as a Silent Key. He was a well known operator on the cw traffic nets. Congratulations to W2AJR on new granddaughter. The Suffolk Cty ARC reports having successful clambake and hamfest. They will be giving classes as SUNY Stony Brook. Their 220 repeater doing real well. The Grumman ARC reports that K2MFY will be teaching classes at the Bethpage Adult Ed program. Congratulations to WB2IIH and family on new daughter. By the time you read this the SET will have been history. I hope it was successful for everyone. Traffic: WA2UWA 209, W2MLC 84, K2GCE 81, WB2EUF 78, N2BKK 77, K2HD 75, KA2CNN 66, KA2DBW/T 38, WB2TQC 35, W2GKZ 34, WB2IDP 17, WB2KCT 17, N2BGR/T 16, W2DBO 15, WA2SEL 14, WA2PMW 10.

NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MVQ — SEC: WB2VUF. STM: W2XD. NMs: N2CR KB2HM W2PSU KA2GQO W2TCA W2UEZ & WB2IQJ.

Net	Mgr.	Freq.	Time/Days	Sess.	QNI	QSP
NJN/E	W2UEZ	3695	7 P.M. Dy	31	246	201
NJN/L	W2UEZ	3695	10 P.M. Dy	31	233	132
NJSN	WB2IQJ	3735	6:30 P.M. Dy	30	212	39
NJPN	N2CR	3950	6 P.M. Dy	36	459	220
NJVN	W2TCA	49/49	10:30 P.M. Dy	31	270	136
OBTTN	KB2HM	72/12	8 P.M. Dy	31	514	152
UCETN	KA2GQO	085/685	7:30 P.M. Dy	31	189	48

News from radio clubs: Bell Labs Club — Holmdel: K2VX gave a talk on "Accoustical Noise Cancellation and Military Microphones." Ramapo Mountain Amateur Radio Club held a very successful hamfest. Both the 2-meter and 220 repeaters are at new locations and functioning well. Novice and Tech/General courses are being held at Pequannock Township High School. Classes started Sept. 25th and run for 10 weeks. Tri-County Radio Association reports KA2ARB upgraded to General. TCRA is again holding both Novice and General courses. Contact WB2RNJ for particulars. Both courses start Sept. 18th and run for 10 weeks. They will have election of officers and a buffet on Oct. 6th. They finally got the TVI problem solved in their repeater. BARA news: KA2ETA upgraded to General. The BARA Club dinner will be held Oct. 26th. Cw training net meets at 21.175 on Fridays at 8 P.M. and Sundays at 8:30 P.M. Join us! Old Bridge Radio Club reports: N2BQO and WB2ZSI upgraded to Advanced. 4-colored QSL cards have been mailed from K2 Liberty Island expedition of July 4th weekend. W2XD K2UL WB2VUF and WA2MVQ have been invited to speak on various aspects of traffic handling to be held at the HARC Convention. KA2CYZ and N2SU have new Azden PCS-2000s. CYZ sez he has 16 elements on 2 and "wat a sig!" From NJVN News: W2TCA has awarded a new certificate and the title of "Net Command Station" to the following: WA2OPY AG2R and N2BOP. This is for outstanding service on the net. Now that the "lull" of traffic has past, due to lots of vacationing, traffic counts will being to soar. See you all on the SET. Traffic: (Aug.) KF2T 276, W2UEZ 244, W2COB 232, AF2L 178, W2XD 173, K2VX 154, AG2R 116, W2TCA 106, WA2MVQ 95, W2GWS 86, N2BOP 79, N2CR 68, KB2HM 43, W2UH 43, N2BNB 39, KA2GQO 39, W5DTR 38, W2CC 36, WB2RMJ/T 31, KA2CYZ 20, WA2MIF 19, N2XJ 19, N2BQL 18, WA2UPH 18, K2PH 17, KA2HNQ 10, WB2KLF 9, K2WM 8, N2SU 4, (July) N2BOP 59, N2SU 10.

MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, KØCY — SEC: WØRPK, NM: WAØAVW WØYLS. DEC: WBØAVW WØFO KØMST WBØVYG WBØURB. Thanks to WØLFF and WØIYW for many years of fine service to the section. Welcome to WØRPK as new SEC. 120 hams plus their families attended the 75M picnic at Waterloo. A good time for all. WBØAVW recognized for outstanding service to the net.

New Automatic Antenna Tuner Auto-Track Model AT-2500

Check these state-of-the-art specifications

- Power Capability: 2500 W PEP.
- Frequency Range: Continuous 3.0 to 30 MHz (Including WARC Bands).
- Impedance Matching: 10 ohms to 300 ohms to 50 ohms resistive.
- Direct Reading SWR Meter: 1:1 to infinity.
- Direct Reading Power Meter: Two meter scales from 0 W to 250 W and 0 W to 2500 W; front panel switch selects FWD or Reflected Power *(illuminated panel meters)*.
- Power meter displays RMS with continuous carrier and automatically displays PEAK when driven with SSB signal.
- Average "Automatic" tune-up time: 15 seconds or less.
- Tune-up time not affected by power level; can be as low as 1 W (5-10 W preferred).
- A unique "Linear Disable" circuit automatically switches companion linear amplifier to standby within milliseconds whenever SWR exceeds a threshold preset on front panel, thus protecting the linear from excessive SWR.
- Toroidal bridge coupler provided in separate enclosure, permitting it to be installed directly at the output of the transmitter for meaningful SWR measurements.
- Power requirements are 115/230 VAC 50-60 Hz, 10 W operating/5 W standby; or 13.5 VDC, 1 A operating/.5 A standby.
- Antenna tuner packaged in cabinet 17"W x 5¼"H x 14"D (Front panel handles or rack mount optional).

Specifications subject to change without notice.

Write for literature.

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BELL INDUSTRIES

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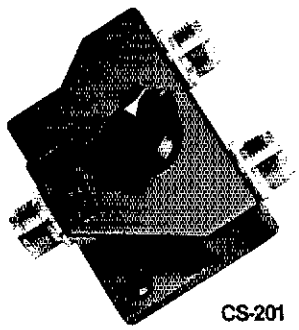
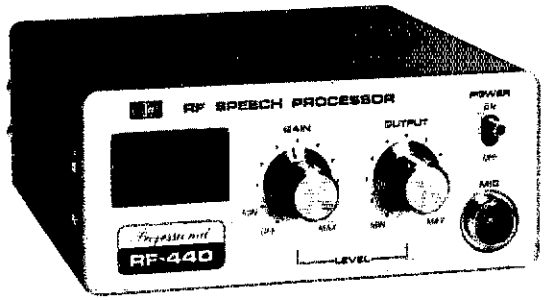
More DAIWA INDUSTRY CO., LTD. Communications Essentials From J. W. Miller

Automatic Antenna Tuner
Model CNA-1001

Frequency Range: 3.5–30 MHz (Including WARC Bands)
Power Rating: 500 Watts PEP
Internal Dummy Load: 50 Watts/1 Minute
Impedance Matching: 15–250 Ohms to 50 Ohms Resistive
Input Power Required for Automatic Tune: 1, 5 or 10 Watts
(Set by rear panel switch)
Tune-up Time: 45 Seconds Max
Power Requirement: 13.8 VDC/2 Amp



CS-201



RF Speech Processor
Model RF-440

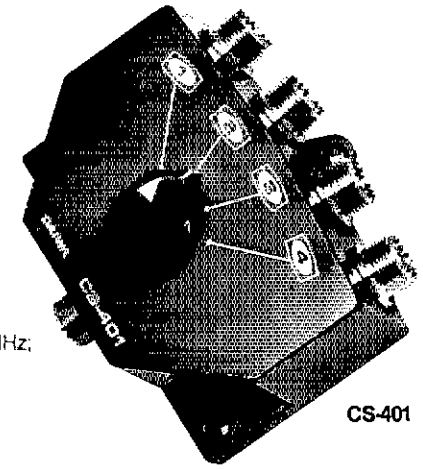
Increases talk power with splatter free operation. RF clipping assures low distortion. Simply install between microphone and transmitter.

Talk Power: Better than 6 dB
Clipping Threshold: Less than 2 mV at 1 kHz
Panel Meter indicates clipping level
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: 115V AC, 60 Hz, 1 W, for self contained AC power supply; or 13.5 V DC, 55 mA for alternate external power
Dimensions: 150 x 70 x 150 mm; 6 x 2.5 x 6 in

Coaxial Switches
2 Position/Model CS-201
4 Position/Model CS-401

Professionally engineered cavity construction.

Power Rating: 2.5 kW PEP, 1 kW CW
Impedance: 50 Ohms
Insertion Loss: Less than .2 dB
VSWR: 1:1.2
Maximum Frequency: 500 MHz
Isolation: Better than 50 dB at 300 MHz; better than 45 dB at 450 MHz; adjacent terminal
Unused terminals grounded
Connectors: SO-239



CS-401

Exclusive USA agent for these units; inquiries invited.

Write for literature.

Specifications subject to change without notice

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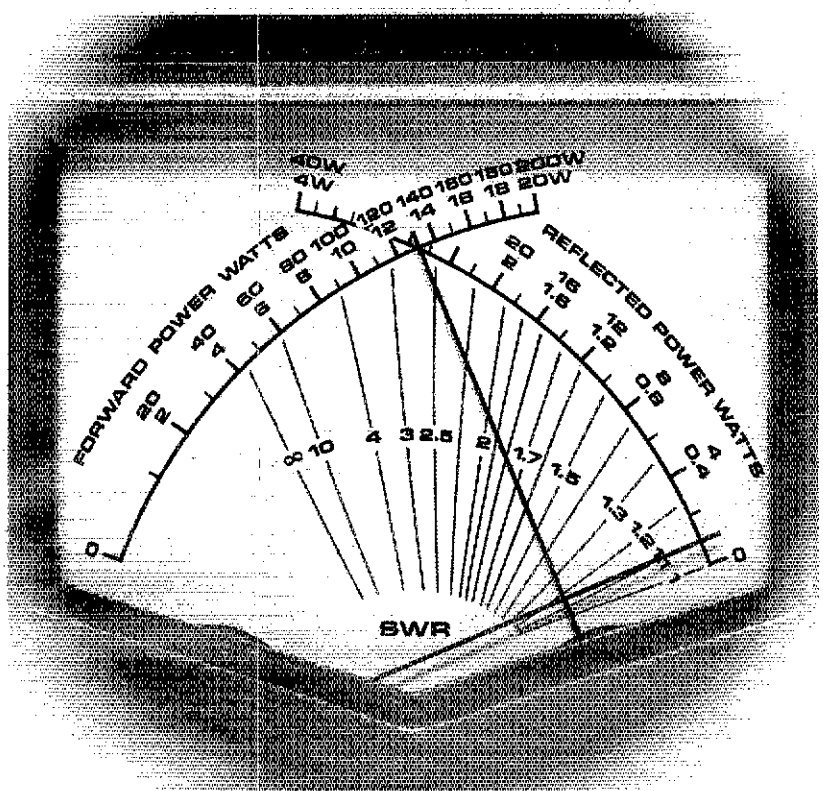
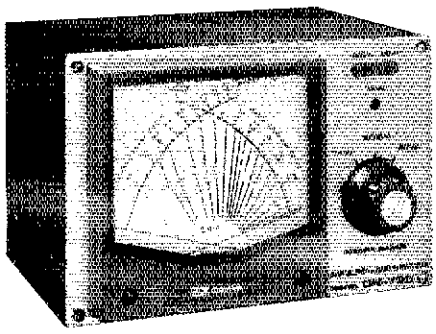
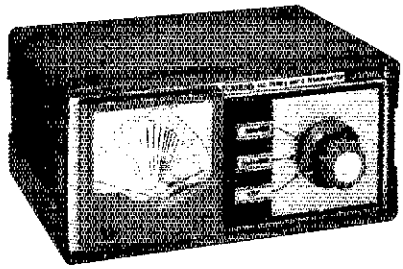
DAIWA INDUSTRY CO., LTD. Cross Needle Meter



Simultaneous SWR/Forward & Reflected Power Readings

CN-720



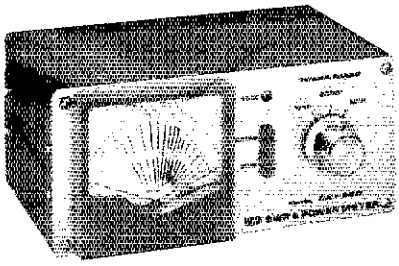


CN-630

SWR & Power Meter Model CN-630

Simultaneous direct reading SWR, Forward Power and Reflected Power.

Frequency Range: 140—450 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 2 Ranges (Forward, 20/200 Watts)
(Reflected, 4/40 Watts)
Tolerance: ± 10% full scale
Input/output Impedance: 50 Ohms
Connectors: SO-239
Dimensions: 180 x 85 x 120 mm;
7.12 x 3.37 x 4.75 in.



CN-620

SWR & Power Meters Models CN-720 and CN-620

Simultaneous direct reading SWR, Forward Power and Reflected Power.

Frequency Range: 1.8—150 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 3 Ranges (Forward, 20/200/1000 Watts)
(Reflected, 4/40/200 Watts)
Tolerance: ± 10% full scale
Input/output Impedance: 50 Ohms
Connectors: SO-239
Dimensions: 180 x 120 x 130 mm;
7 x 4.75 x 5 in.
165 x 75 x 97 mm;
6.5 x 3 x 4 in.

Specifications subject to change without notice.

Exclusive USA agent for these units; inquiries invited.

Write for literature.

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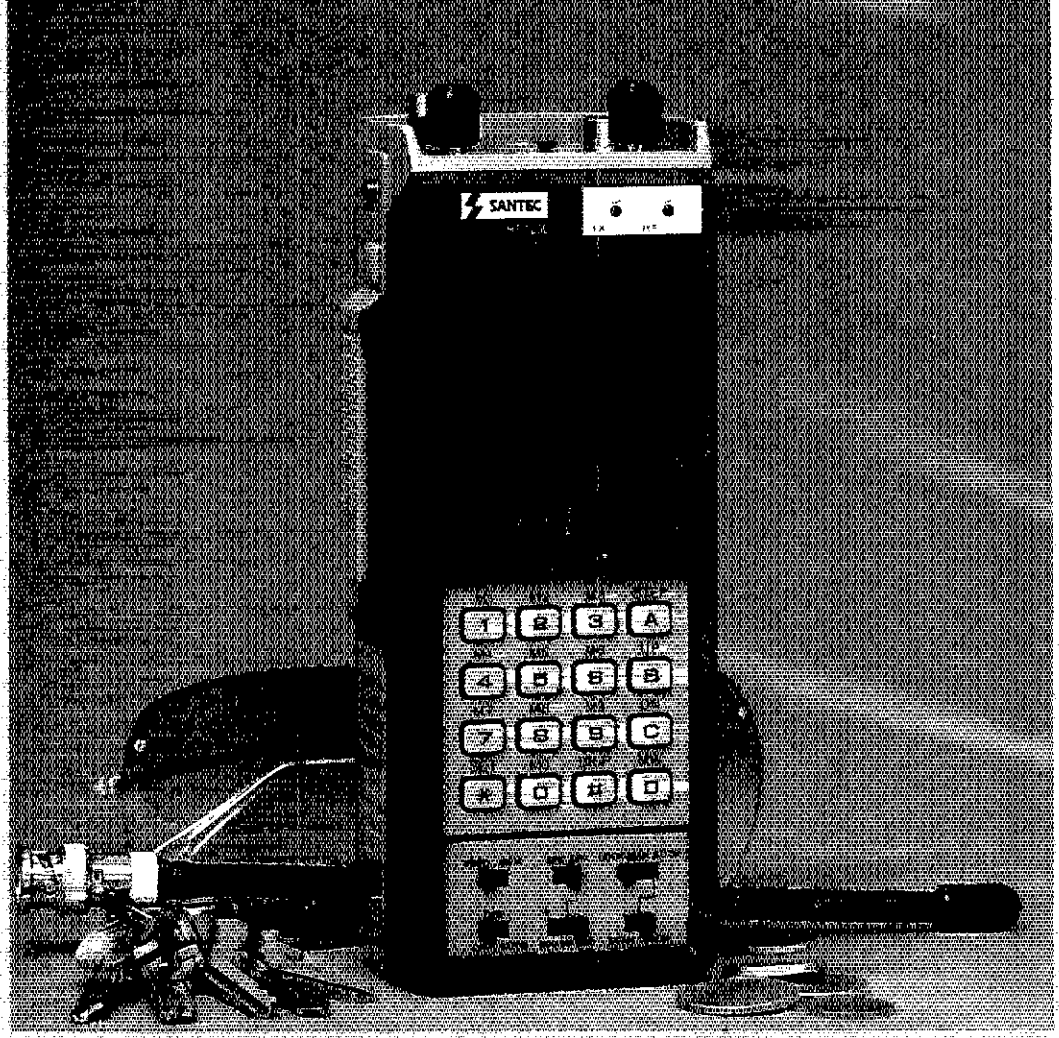

The Majority Leader

In the race of popular demand for quality in fully synthesized, multifeature hand held transceivers, the Santec HT-1200 emerges as the commanding front runner. More than just handy, the Santec stands on a solid platform of big rig features which fully utilize the very latest microprocessor technologies.

When you choose Santec, you opt for 4 modes of automatic scan and search of 10 memories and the whole band. When you choose Santec, you opt for selectable output power of 3.5W or 1.0W, with only a 6ma drain for the optional continuous display of the bright LED readout. When you choose Santec, you opt for variable scan steps in any multiples of 5kHz. And when you choose Santec, you opt for a band range that covers most Army MARS, Navy MARS, and CAP frequencies and the ease of entering all frequencies from the integrated keyboard. Assuredly, when you choose Santec, you opt for the majority leader which hands over features hand over fist.

SUGGESTED RETAIL PRICE: $379.00

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CHECK HOW THEY STAND ON THE ISSUES:

SANTEC HT-1200	YAESU FT-207R	KENWOOD TR-2400
Texas Instruments TMS-1000 microprocessor	NEC-650	NEC-650
Rx on 143 to 149.995 MHz Tx on 143 to 148.995 MHz (1200 channels with MARS coverage)	Rx & Tx on 144 to 147.995 MHz, Ham band only (800 channels)	Rx & Tx on 143.9 to 148.395 (900 channels with some MARS coverage)
Direct keyboard entry of all frequencies. Keyboard entry of 5kHz digit which stays in memory	Keyboard entry of 10kHz steps with a switch for 5kHz steps	Direct keyboard entry of Ham band only. MARS frequencies must be entered into a memory by stepping and recalling
10 programable memories with frequencies preloaded on cold boot	5 programable memories. All memories loaded with 144.00 on cold boot.	10 programable memories. All memories loaded with 145.00 on cold boot.
Up/Down variable scan steps in any multiples of 5kHz over whole band or auto-scan of 10 memories. Scan (restart) or search (lock) modes for both band and memory modes.	Up/Down scan with 10kHz steps only. Misses every other 15kHz by 5kHz. Locks without restart.	Scans 10 memories only. Restart only; lock mode not available. Continuous band scan/search not available.
Full 16 button TTP with LED display of number as it is dialed.	12 button TTP only.	Full 16 button TTP. Readout of the number dialed is not available.
9.6v 500mah battery (included)	10.8v 450mah battery (included)	9.6v 800mah battery (included)
Tx High: 3.5W (4W nominal) Tx Low: 1W	Tx High: 2.5W Tx Low Tx Low: 300mW	Tx at 1.5W only.
Readout: LED	Readout: LED	Readout: LCD
Volume: 548cc 170mm(H) x 68mm(W) x 47mm(D)	Volume: 684cc 181mm(H) x 98mm(W) x 54mm(D)	Volume: 640cc 198mm(H) x 71mm(W) x 47mm(D)

The Santec HT-1200 is approved under FCC Part 15 and exceeds FCC regulations limiting spurious emissions.

Encomm, Inc.
3331 Towerwood Drive
Suite 304
Dallas, Texas 75234

☐ Please send me more information about the Santec HT-1300 and a list of Authorized Santec Dealers.

NAME _____ CALL _____

ADDRESS _____

Announcing the Heathkit VF-7401 2-meter FM Digital Scanning Transceiver

Optional Micoder II Microphone/Auto Patch Encoder lets you phone through repeaters with auto patch input. Draws power from the 7401, so no mike battery is necessary.

The Squelch Control also functions as the receiver's sensitivity control to stop scanning only upon reception of "full-quieting" signals, skipping the weak ones.

The 100 kHz Selector button controls the VF-7401's tuning in 100 kHz increments. **The 7401's 1 MHz Selector** button lets you choose any 1 MHz segment of the 2-meter band.

The 10 kHz Selector advances in 10 kHz steps. In Scan, as it re-cycles from "9" to "0," it also causes the 100 kHz readout to advance by one digit. Depress once to resume scan function.

LED indicates 5 kHz position.

The 0 kHz/5 kHz Switch gives you an effective choice of 800/2-meter channels in 5 kHz steps.

Dim/Bright Switch for bright illumination of frequency read-out and meter for daytime, and lower intensity for safe mobile operation at night.

The Manual/Scan Switch lets you choose your frequency manually, or have the VF-7401 find an active channel for you.

Lock/Latch Switch. In Scan Latch mode, a channel latch-up signal inhibits scan circuits when signal is detected, and the 7401 stays on that frequency. If it detects a 4-8 second break in received signal, scanning resumes. In the Scan-Lock mode, once the receiver scans to a signal, it remains on that channel until reset.

More features that make the VF-7401 the 2-meter rig that belongs in your shack and vehicle

No more searching through repeater guides while mobiling in unfamiliar territory – your new Heathkit VF-7401 will find the active channels for you. It will even alert you to band openings. You're going to enjoy building your VF-7401... and you're going to love using it. The VF-7401, the ultimate 2-meter rig...from the more than 200 Hams at Heath.

- Adjustable, 15-watt (nominal), solid-state, narrow-band FM Transceiver. Fully synthesized digital circuitry provides full-band coverage without need for added crystals.
- All-new, state-of-the-art circuits provide the exciting, exclusive features of 1 MHz bandwidth scanning, and Scan Lock/Latch capability on 2-meters.
- A receiver hotter than Heath's HW-2036A features dual-gate MOSFET front-end to minimize overload and adjacent-channel interference.
- "Power-up" on a pre-programmed frequency of your own choice, such as your favorite repeater.
- Convenient detachable mike using 4-pin connector.
- Power to the Micoder II Microphone (if used) eliminates need for a battery.
- Sturdy SO-239 rear-panel antenna jack.
- Chassis-mounted power and external speaker plugs.
- Improved synthesizer, eliminating need for panel mounted sync lock light.
- Tuning for Power Amplifier and output power level adjustment is accessible without removing case.
- Capability of mobile or base operation (with Model VFA-7401-1 AC Power Supply – 13.8 V at 4A nominal, transmit).

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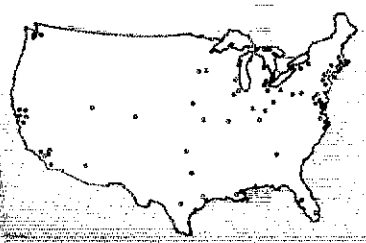

The new VF-7401 is featured in the latest Heathkit Catalog. For a free copy write: Heath Company, Dept. 009-714, Benton Harbor, MI 49022. Or visit the nearest Heathkit Electronic Center in the U.S. or Canada where Heathkit products are displayed, sold and serviced. See the white pages of your phone book for location. In the U.S., Heathkit Electronic Centers are units of Veritechnology Electronics Corporation.

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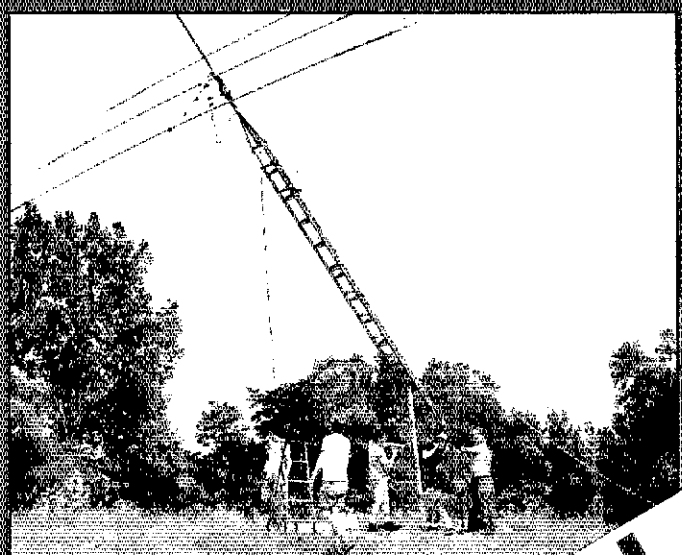
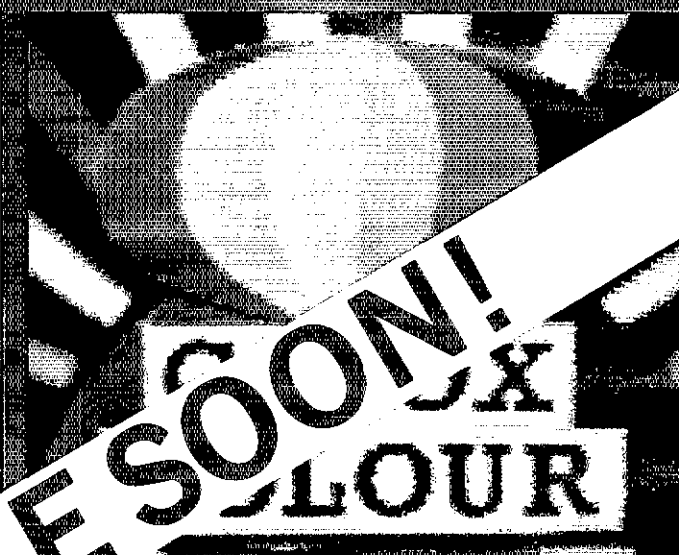
1981 THE RADIO AMATEUR'S HANDBOOK





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- Modulated RX Noise Bridge
- 50-75 ohm broadband transformer
- Foldover tower
- 12-volt, 30 amp regulated supply
- Economy 1.2-15 volt 5 amp Bench Supply
- NBS design charts for 50-432 MHz Yagi Antennas
- Table of optimum guy-wire lengths
- Amateur ASCII and Baudot technical standards and definitions
- Noise figure/temperature definitions and conversions
- New inductance formulas (for strip lines, etc.)
- Transmitting tube cooling specifications and blower information
- Table of phasing line lengths for vhf/uhf arrays
- Updated propagation information
- IC op amp and TV sweep tube charts
- Ferrite toroid electrical and mechanical cross reference
- Digital logic family compatibility chart and interface circuits
- PIN diode QSK system
- Modern Band-Edge Marker
- Buffered Morse Keyboard
- Antenna/Preamp system for EME
- 50 and 432 MHz Yagis
- 50 MHz kw linear amplifier
- Lightweight portable HF Antennas

There are also more template drawings for a variety of circuit boards, plus revised chapters on Solid State Fundamentals; Power Supplies; VHF and UHF Transmitting; Mobile, Portable and Emergency Equipment; Code Transmission; Specialized Communications Techniques; Test Equipment and Measurements; HF Antennas; and Vacuum Tubes and Semiconductors.

The price of the paper edition is $10 in the U.S. and possessions, $11 in Canada, and $12.50 elsewhere. The clothbound edition is $15.75 in the U.S. and Possessions and $18 elsewhere.

Use the handy order form on page 138! Beat inflation by ordering your copy today.

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DELTA RIG

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DELTA—symbol of change—and the first HF transceiver with all nine bands—offers more of the features you need for these changing times.

Tennessee Technology Leads The Way.

Today's operating demands the changes a DELTA station offers. All nine HF bands in all solid-state design with optimized receiver sensitivity and selectivity, 200 watt, 100% duty cycle no-tune transmitter, QSK, VOX, PTT, ALC, Notch, Offset, and more. All in a compact, ready-to-go-anywhere functional design that offers light weight, thorough shielding, and operating ease. And a price that permits affording the full complement of accessories. TEN-TEC put it all together—in DELTA—for you.

For The Change in Bands.

DELTA with all nine bands—another TEN-TEC "first." 160 through 10 meters, including the new 10, 18 and 24.5 MHz bands. (Crystals optional for 18 & 24.5 MHz). DELTA is ready.

For The Change in Band Conditions.

Optimized design for the ideal balance between sensitivity (0.3 μV for 10 dB S+N/N) and dynamic range (85 dB or better) plus switchable 20 dB attenuator that puts you in control of even extreme situations. No matter where you live or what power your neighbor is running, DELTA can handle it.

Super selectivity permits narrowing DELTA bandpass to suit the crowds. The four-position switch selects the standard 2.4 kHz SSB filter, adds a section of the 4-stage active audio filter, cascades an optional CW filter (for 14 poles of filtering), and cascades both filters with 4 stages of audio filters to give you the passband window you need with the virtually ultimate skirt selectivity required to knife through strong adjacent signals.

Built-ins to quiet the world. A *variable notch* filter is standard on DELTA. Vary from 200 to 3500 Hz to notch out interfering carriers or CW signals to a depth of 50 dB or more. *Offset tuning* for moving the receiver frequency ±1 kHz to reach that DX or to fine tune. *"Hang"* AGC to give you smoother receiver operation.

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Variety is the word for today, and DELTA offers it.

For a rag-chew with an old friend, 200 watts of SSB to the proven solid-state amplifier (designed by the leader, TEN-TEC) with built-in VOX and PTT.

For the fun of operating 200 watts CW with QSK—full, fast break-in that makes CW a conversation, saves time, and opens a window on DX.

Power up or down. Adjustable threshold ALC and drive let you choose power levels with full ALC control.

DELTA accepts what you have, what you want . . . from separate antennas to linears, transverters, remote VFO, 12 VDC, keyers and more—just plug in.

For The Change In Lifestyles.

DELTA moves with you. "At home" anywhere—on your operating desk, in the field, on a boat, plane, camper, wherever. Its neat small size (4¾"h x 11⅜"w x 15"d) and light weight (12½ lbs.) make it a good traveling companion. Yet compact as it is, DELTA panel size and knob spacing make it comfortable to use hour after hour in your home station.

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These days, everyone wants more value for his money. And DELTA offers it. More features and performance per dollar. Quality that's American-made. Service you can count on. A solid warranty—one year on the transceiver plus an extra five year pro-rata warranty on the amplifier transistors. And low prices!

The DELTA Rig

Model 580 DELTA Transceiver	**$849.00**
Model 283 DELTA Remote VFO	**179.00**
Model 280 DELTA Power Supply	**149.00**
Model 282, 250 Hz CW Filter	**50.00**
Model 285, 500 Hz CW Filter	**45.00**
Model 234 RF Speech Processor	**124.00**
Model 214 Electret Microphone	**39.00**
Model 645 Dual Paddle Keyer	**85.00**

Other Optional Accessories

Model 670 Single Paddle Keyer	**34.50**
Model 227 Antenna Tuner	**79.00**

Isn't it time for you to change? Check the DELTA rig at your dealer or write for full details.

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A LIFE TIME GUARANTEE AND 12 MORE REASONS TO BUY AN OPTOELECTRONICS FREQUENCY COUNTER

1. SENSITIVITY: Superb amplifier circuitry with performance that can't be matched at twice the price. Average sensitivity of better than 15 mV from 10 Hz to 500 MHz on every model and better than 30 mV from 500 MHz to 1.1 GHz on the Series 8010A and 8013.

2. RESOLUTION: 0.1 Hz to 12 MHz, 1 Hz to 50 MHz, 10 Hz over 50 MHz.

3. ALL METAL CASES: Not only are the heavy gauge aluminum cases rugged and attractive, they provide the RF shielding and minimize RFI so necessary in many user environments.

4. EXTERNAL CLOCK INPUT/OUTPUT: Standard on the 8010/8013 series and optional on the 7010 series is a buffered 10 MHz clock time base input/output port on the rear panel. Numerous uses include phase comparison of counter time base with WWVB (U.S. National Bureau of Standards). Standardize calibration of all counters at a facility with a common 10 MHz external clock signal, calibrate scopes and other test equipment with the output from precision time base in counter, etc., etc.

5. ACCURACY: A choice of precision to ultra precision time base oscillators. Our ± 1 PPM TCXO (temperature compensated xtal oscillator) and ± 0.1 PPM TCXO are sealed units tested over 20-40°C. They contain voltage regulation circuitry for immunity to power variations in main instrument power supply, a 10 turn (50 PPM) calibration adjustment for easy, accurate setability and a heavily buffered output prevents circuit loads from affecting oscillator. Available in the 8010 and 8013 series is our new ultra precision micro power proportional oven oscillator. With ± .05 PPM typical stability over 10-45°C, this new time base incorporates all of the advantages of our TCXO's and virtually none of the disadvantages of the traditional ovenized oscillator: Requires less than 4 minutes warm-up time, small physical size and has a peak current drain of less than 100 ma.

6. RAPID DISPLAY UPDATE: Internal housekeeping functions require only .2 seconds between any gate or sample time period. At a 1 second gate time the counter will display a new count every 1.2 seconds, on a 10 second gate time a new count is displayed every 10.2 seconds. (10.2 seconds is the maximum time required between display updates for any resolution on any model listed).

7. PORTABILITY: All models are delivered with a 115 VAC adapter, a 12 VDC cord with plug and may be equipped with an optional ni-cad rechargeable battery pack installed within its case. The optional Ni-Cad pack may be recharged with 12 VDC or the AC adapter provided.

8. COMPACT SIZES: State-of-the-Art circuitry and external AC adapters allowed design of compact easy to use and transport instruments.
Series 8010/8013: 3" H x 7-1/2" W x 6-1/2" D
Series 7010: 1-3/4" H x 4-1/4" W x 5-1/4" D

9. MADE IN U.S.A.: All models are designed and manufactured at our modern 13,000 square foot facility at Ft. Lauderdale, Florida.

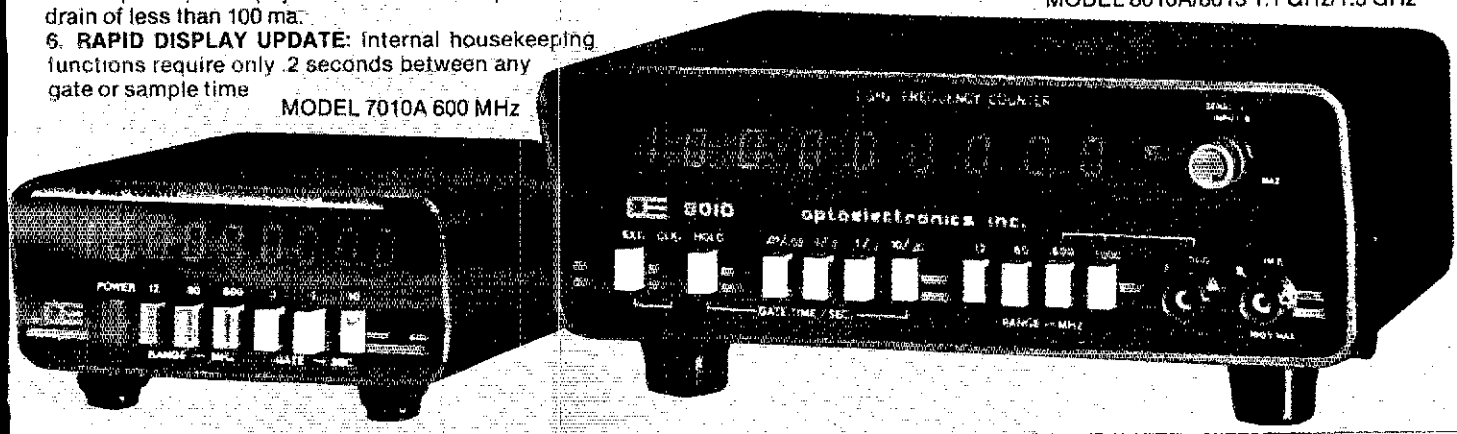
10. CERTIFIED CALIBRATION: All models meet FCC specs for frequency measurement and provided with each model is a certificate of NBS traceable calibration.

11. LIFE TIME GUARANTEE: Using the latest State-of-the-Art LSI circuitry, parts count is kept to a minimum and internal case temperature is only a few degrees above ambient resulting in long component life and reliable operation. (No custom IC's are used.) To demonstrate our confidence in these designs, all parts (excluding batteries) and service labor are 100% guaranteed for life to the original purchaser. (Transportation expense not covered).

12. PRICE: Whether you choose a series 7010 600 MHz counter or a series 8013 1.3 GHz instrument it will compete at twice its price for comparable quality and performance.

MODEL 8010A/8013 1.1 GHz/1.3 GHz

MODEL 7010A 600 MHz



MODEL	RANGE (From 10 Hz)	10 MHz TIME BASE STABILITY	AGING	AVG SENSITIVITY DESIGNED 10 Hz to 500 MHz	500 MHz to 1.1 GHz	GATE TIMES	RESOLUTION 12 MHz	50 MHz	Max. Freq.	EXT. CLOCK INPUT/OUTPUT	SENSITIVITY CONTROL	NI-CAD BATTERY PACK
7010A	600 MHz	± 1 PPM	± 1 PPM/YR	TCXO*	15 mV	N/A	(3) .1, 1, 10 sec	1 Hz	1 Hz	10 Hz (600 MHz)	YES OPTIONAL	NO	YES OPTIONAL
7010A		± 0.1 PPM											
8010A	1.1 GHz	± 1 PPM	± 1 PPM/YR	TCXO*	15 mV	30 mV	(4) .01, .1, 1, 10 secs	1 Hz	1 Hz	10 Hz (1.1 GHz)	YES STANDARD	YES	YES OPTIONAL
8010A-1		± 0.1 PPM											
8010A-05		± .05 PPM		OCXO**									
8013A	1.3 GHz	± 1 PPM	± 1 PPM/YR	TCXO*	15 mV	30 mV	(4) .01, .1, 1, 10 secs	1 Hz	1 Hz	10 Hz (1.3 GHz)	YES STANDARD	YES	YES OPTIONAL
8013A-1		± 0.1 PPM											
8013A-05		± .05 PPM		OCXO**									

*TCXO = Temperature Compensated Xtal Oscillator **OCXO = Proportional Oven Controlled Xtal Oscillator

SERIES 7010A

7010A	600 MHz Counter - 1 PPM TCXO	$199.95
7010-1A	600 MHz Counter - 0.1 PPM TCXO	$249.95
OPTIONS:		
-H	Handle/Tilt Bail (not shown)	$7.95
-Cad-701	Ni-Cad Battery Pack & Charging Circuitry Installed Inside Unit	$19.95
-70	External Clock Input/Output	$35.00
C-70	Carry Case - Padded Black Vinyl	$9.95

SERIES 8010A/8013

#8010A	1.1 GHz Counter - 1 PPM TCXO	$399.00
#8010-1A	1.1 GHz Counter - 0.1 PPM TCXO	$450.00
#8010-05A	1.1 GHz Counter - .05 PPM Oven	$499.00
#8013-1	1.3 GHz Counter - 0.1 PPM TCXO	$550.00
#8013-05	1.3 GHz Counter - .05 PPM Oven	$599.00
OPTIONS		
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#C-C-80	Carry Case - Padded Black Vinyl	$ 9.95

ACCESSORIES

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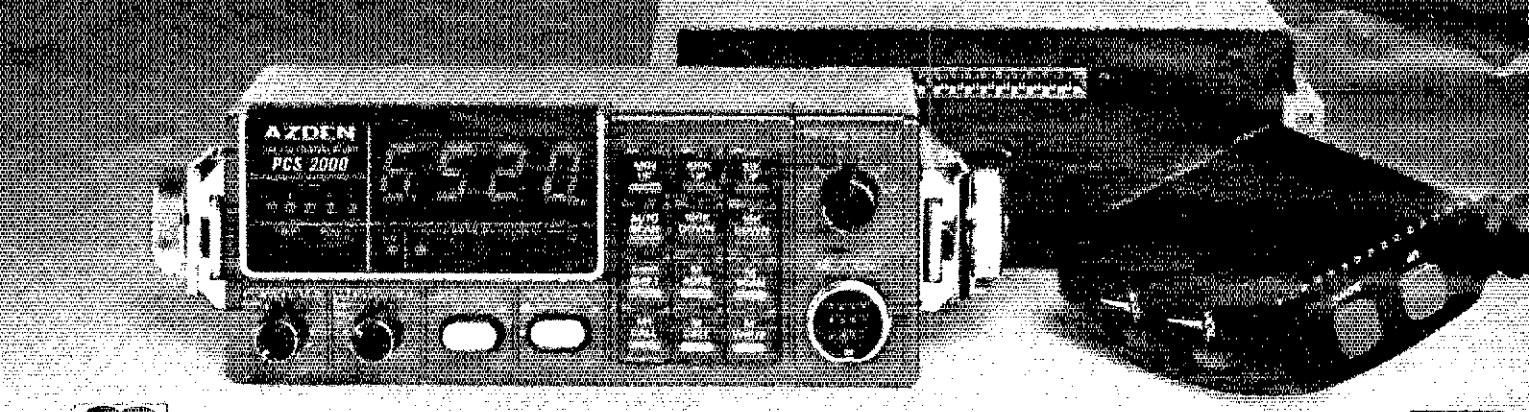

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- **ALL SOLID-STATE-CMOS PL DIGITAL SYNTHESIZED.**
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- **SIX-CHANNEL MEMORY:** Each memory is re-programmable. Memory is retained even when the unit is turned off.
- **MEMORY SCAN:** The six channels may be scanned in either the "busy" or "vacant" modes for quick, easy location of an occupied or unoccupied frequency. AUTO RESUME. **COMPARE!**
- **FULL-BAND SCAN:** All channels may be scanned in either "busy" or "vacant" mode. This is especially useful for locating repeater frequencies in an unfamiliar area. AUTO RESUME. **COMPARE!**
- **INSTANT MEMORY-1 RECALL:** By pressing a button on the microphone or front panel, memory channel 1 may be recalled for immediate use.
- **MIC-CONTROLLED VOLUME AND SQUELCH:** Volume and squelch can be adjusted from the microphone for convenience in mobile operation.
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- **SUPERIOR RECEIVER SENSITIVITY:** 0.28 uV for 20-dB quieting. The squelch sensitivity is superb requiring less than 0.1 uV to open. The receiver radio circuits are designed and built to exacting specifications, resulting in unsurpassed received-signal intelligibility.
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- **OTHER FEATURES:** Dynamic Microphone, built in speaker, mobile mounting bracket, external remote speaker jack (head and radio) and much, much more. All cords, plugs, fuses, microphone hanger, etc. included. Weight: 6 lbs.
- **ACCESSORIES:** 15' REMOTE CABLE.....$29.95. CS-6R A/C POWER SUPPLY.....$49.95. TOUCHTONE MIC. KIT.....$39.95. EXTERNAL SPEAKER.....$18.00.

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BRASKA: SCM, Rex P. Greenwell, KØKP — SEC: ØASM. This will be my last report as SCM of braska. I have enjoyed working with you and have de many friends across the state. My new QTH will be uth, MN and I will look forward to working you on the nds in the months to come. Thank you for your help d support. I'm sure Nebraska Section will continue to w and prosper. Your new SCM is Shirley Rice, ØBCB — welcome. Please forward your reports, news d such to her. The address: Shirley M. Rice, KAØBCB, E. 16th St., Scottsbluff, NE 69361

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stern	WØNIK	1446	35
nday ARES	WØIRZ	203	3
rning Phone	WBØGWR	1105	26
or Storm	WAØLOY	867	166
WA	WØEUT	76	0
tte Valley	KAØBCB	58	2
nhusker	WBØGMQ	880	69
wnee 2M	WBØMKD	126	0

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N-WB2OSY	3965	1800/1000 Su	30	71	281
NN-WB1CPF	3720	1815	31	141	257
tmeg-WA1ELA-	28/88	2130	31	65	411
SON-WA1FSM	13/73	2100 MWF	13	8	89
SCON-WB2PJU	7818	2030	31	69	419

QNI CN: WB2PJU WA1UAX CPN: W1ICF WB2PJU. Hi C Nutmeg: W1DFT W1EFW. WESCON NCS of the nth: KA1KP. Meriden ARC demonstrated RTTY, TV, two meters and traffic handling at Meriden are during Harvest Festival, Sept 26-27. Upgrading... tEGJ and KA1FOV (Technicians), KA1BZS and 1BZW (Generals). KA1KA = WA1VOO, TKB = WA1VON, KA1KS = KA1AXM. RAdioteletype traffic enthusiasts take note... the New England eprint Net meets Mondays, Wednesdays and Fridays 900 EST on 3.625 MHz to handle traffic via the green WA1WQG handled his first cw message... with a ck of 63! New appointees: Asst SCM: WB1AIU; OBS: ADE; STM: KA1KD. K1XA TCCing again after three nth hiatus. New officers of Southington ARA: KA1HJ, s.: WA1YBB, vice pres.; WB1GIR, treas.; W1EFW, v. With 1256 QSOs, the Greater Fairfield ARA (as CQO) topped last year's Field Day effort by 347 con- ts; also logged 335 contacts during the club's self- nsored Dogwood Festival QSO Party on May 17. KD recipient of new PSHR certificate, K1EIC and HAD planting late summer antenna farm in prepara- for fall traffic harvest. W1VS DXCC'd and KA1KP ked number 100. And, as we bid adieu to the E's of mmer, ten meters awakens again to the cry of "CQ test, CQ contest" (and the circle is unbroken). Traf- (Aug.) K1GF 209, WB1CPF 178, WB2PJU 156, EW 135, WA1UAX 119, W1BDN 88, W1DFT 58, 1CRH 55, KA1CMX 42, W1GVT 26, WA1LOU 23, QE 22, KA1KP 20, K1XA 18, WB1AIU 17, K1FUW 15, 1ESJ 14, W1KV 13, KA1KD 12, W1ICF 11, KA1DZV 6, OV 6, WA1WQG 6, W1CUH 5. (July) KA1DZV 11

STERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD STM: WA1TBY. SEC: WA1BLG. ASCM: WA9NEW.

	Mgr.	Freq.	Time(loc)/Dy	QNI	QTC
RI	N1GQ	3,658	19/2200 Dy	474	293
RIPN	KA1BJY	3,898	1730 Dy	334	121
2MN	WA1IFE	90/30	2000 MWF	59	26
2MN	WA1IFE	145.8	2000 TTH	—	—
EPN	K1BZD	3,945	0830 Su	71	15
TN	K1BSO	04/64	2230 Dy	685	161
RISS	WB1DHW	3.715	2030 Dy	100	59

STM, WA1TBY, put together a great clambake for tic handlers. It included lobster and all that goes h it — great job!! A League officials meeting was d in Billerica and many topics were discussed with division director and vice director. Topics of concern uded: malicious interference, allocation of the 10 z band, the proposed changes to the 40-meter band, ergency communications in our and other sections, to get newcomers into traffic handling and much e. Speaking of emergency communications, the a 1 Civil Defense monthly drills have commenced m. WA1QOV will be running them from Area 1 head- rters in Tewksbury on the first Mon of the month. sult your E MA Emergency Plan for the frequency check with your town radio officer to make sure r town is represented. W1HDX gave a very in- esting talk at the Billerica Club meeting on OSCAR se III-A which went in the drink and OSCAR Phase III- hich is on the drawing boards. Our financial support esperately needed. The Massasoit Club Repeater on 8 is back in service thanks to K1UIW and others y also welcome W1SXU AK1EKE WA1ZJG KA1FAP WA1CRN as new members and W1GLF back on the after his heart attack. The Framingham Club had its ual picnic in WA1IGL's back yard and it was a fine cess as usual. They have also awarded the Dr. lton Crosby Memorial Scholarship to KA1CFC who started at the Tufts School of Electrical Engineer- The Sturdy Memorial Club is starting a Novice rse and member WB1HFM is the new radio officer Attleboro. Mitre-Bedford Club officers are W1GMM, .; W1FM, vice pres.; K2OF, secy., WB6KDG, treas. ED, sta. mgr, who also recently operated from his h floor hotel room overlooking Waikiki Beach — e people have all the luck. WB1GWS who is often rd tractor trailer mobile on 2 fm is looking for con- ts on 2 cw and he promises to both send and drive w. Traffic: (Aug.) WA1TBY 417, WA2UGJ 389, KA1BJY WB1GWS 158, K1GN 140, KH6JNQ 102, WB1DHW WB1DXR 60, WB1ANT 57, WA1QOV 50, WB1EZT 39, 1CGP 36, W1CZB 24, K1BZD 19, W1CE 19, W1CE 16, AOG 12, W1PJ 12, W1EGE 10, WA1DXT 9, K9HI 9, XA 5, WA1FNM 4, WB7TPY 4, WA2ORV 3, WA9NEW

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3, (July) WA1QQV 72, WA9NEW 48. (June) WB1AN WA9NEW 18.

MAINE: SCM, Cliff Laverty, W1RWG — STM: W SEC: WA4UJJ. WA4UJJ is resigning Oct. 1. We'll his conscientious work, but the Navy has other plar him. KL7IJG/1 is being appointed SEC; has hac perience in Alaska as EC under emerg condit Yankee RC elected officers at annual mtg at Wir Hamfest: W1CUW, pres.; K1TVT, vice pres.; W1 secy.; WB1FAK, treas. Club secretaries, send me r mation on club activities, include public svc, electi hamfests, spec projects. PSHR, KA1EO W1RWG A Sessions/QNI/QTC: PTN 31/123/261; SGN 26/124 AEN 4/0/53; MSN 13/14/52. Traffic: W1RWG WB1BYR 87, W1JTH 79, W1BJ 73, AF1L 65, W1HD W1KX 44, W1GKJ 36, KA1EO 34, WB1GLH 28, WA 28, W1AHM 22, W1NBO 16, WA1JCN 11, W1BM KA1CNG 7, N5YX/1 7, WA1YNZ 6, WA1ZJL 6, KA1E KA1CFU 4, W1GTR 4, KL7IJG/1 3.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1N SEC: K1RSC. STM: W1TN. NMs. AK1E & N1NH. Th Worked All Counties award sponsored by Cor Brasspounders available from W1JB for s.a.s.e. date, time, frequency, mode, call & county into. W1 attended the QCWA meeting in Hartford. K1DQM new TR7800. K1RSC went open cockpit flying, silk s goggles and all. WB1FKX now KA1KW. Bicyclist A peddled 1500 miles in 3 weeks around Ireland. tendees of the NH Traffic Handlers Picnic were A WB1HGQ K1UQX N1NH W1TN K1OSM W1JY WA1 KA1BBI WA1SRU WA1PEL K1BZD WA1WGR & W OTS KA1BBI's rig struck by lightning. K1CEU spok model planes at the Great Bay Radio Assn. Just re ed another phone call regarding GSPN proceu News flash — AK1E is now on cw. W1HNZ won the Nashua Club Foxhunt. This club meets Tuesday n at 8 on 146.130/730. K1WHS made Worked All tinents by 2-meter EME. The GSPN had 440 check 34 traffic. Happy Thanksgiving to all. Summer is Traffic: W1GUX 309, W1QYY 195, W1TN 166, AK1 K1OSM 53, KA1BJ 51, W1MHX 43, WB1HGQ 22, W 22, W1PYR 15, K1NH 13, N1ALM 12, KA1BBI 8, W1 W1BYS 7, WA1PEL 7.

RHODE ISLAND: SCM, J. Titterington, W1EO K1AUN is back on the job as OO — glad to have back. AE1S is prepping to make his debut or 80-meter cw traffic nets. WA1GCT is new General, grats. RI ARES Net moved to 146.55 MHz on Oct Newport CRC furnished communications for reenactment of the Battle of Rhode Island. RIEM ffic Net had 21 sess. QNI 207 and QTC 40 — report WA1OSL, acting net mgr. very good, nominations w opened for SCM in RI. I am definitely not a candida reelection. Please get your thoughts together and up with your candidate. It is very important that th fice keep functioning without a gap. Any one ne forms for nomination please contact me and I will them to you. Traffic: KA1FE 111, KA1BTU 76, W1EO AE1S 2.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1 W1CBW now working at Mount Ascutney. He is on ssb and looking for contacts. N1ARI has rep WB1DSW at Net Manager of the VT Sideband Thanks for doing a fine job and hope your work pe you time to be on the net often. You set a hard pac new NM to follow. RFD 5/64/13, VPN 5/63/5, 25/442/47, Carrier 25/482/44. Someone gave me new this report while I was mobile — sorry — short mem K1QBE, now living in FL, has been visiting the area in ME. Patience with the LIDs — understand the fixed-up a couple of the oddballs who get their kic malicious interference. Your cooperation will ge others. Traffic: K1BOB 117, N1ARI 41, W1RNA 11.

WESTERN MASSACHUSETTS: SCM, Art Zava W1KK — ASCMs: W1BVR K1BE. STM: W1TM. W1JP. NMs: W1UPH WA1MJE W1UD. Look for DX by fearless foursome W1JP/WB1ABF/K1JUK1L VP2V-Land in March. W1BVR protege, KA1EBA, FB in traffic training nets. Welcome back to WA1I 3935; as well as VHFer WA1ZAM, assisting Berkshire EC WB1HIH. W1ETH back after six joy weeks in Japan. Tnx to W1DWA fixing WA1OPN T charge to help keep Worcester in the NTS. Cycle doing fine with WA1MJE's yoeman duty and W1KUE W1UKR WA1OUZ. W1ZPB now "beaming" signals both Mt. Tom and Greylock 2-m FM. PSHR grats new achiever WB1HIH 88, WA1MJE 73, W1T Traffic: WA1MJE 302, W1UD 157, W1TM 153, K1SSH WB1HIH 89, WA1OPN 56, W1KK 50, K1JHC 37, W 30, K1IJV 30, W1ZPB 29, W1JP 12, W1UPH 10, WA1 10, W1YI 7.

NORTHWESTERN DIVISION

IDAHO: SCM, Lem Allen, W7JMH — Some of the bunch had a "Backyard Test SET." Those particip set up an emergency battery powered rig with temp antenna in their back yard, exchanged sig reports each other and worked a few distant stations quickie "smoke test" of their "set"up — quite a teresting exercise! The new Mt. Harrison repeater stalled and working fine throughout Southeastern 146.40/147.00 fm. The Boise AREC still testing pro tion on 40 meters for c.d. daytime emergency Teststake place at 10 A.M. and 3 P.M. on 7290 ss 7090 cw. W7AZL will go in hospital in Sept. for su — good luck and a speedy recovery. WB7TNA mi from nets lately. Congrats to KA7AJF, now Ge KA7FOV and W7JMH furnished daily news bet parents and boys at scout camp. W7LAM has ne 1800

Net	Freq.	Time	Sess.	QNI
FARM	3935 ssb	8 P.M. Dy	31	1370
CD	3990 ssb	6:10 A.M. M-F	21	474
IMN	3635 cw	9 P.M. M-F	21	225

Send your EC and SCM a message during SET! T W7GHT 172, W7JMH 82, K7JV 56, W7LAM 33

MONTANA: SCM, Robert Leo, W7LR — N7ANT ach PSHR. FB! IMN: QTC 130, QNI 225. WB7UTJ 40 Net: QNI 131. QTC 3. New Richland County A W7BOE N7BMR. WA7OBH sez Sheridan Wyo 22/8 good So Central MT. K7LK WA7LSF ran 220 tes Mtn to Red Lodge Mtn. MT Section Net active Su A.M. local 7240 kHz. Glendive/Sidney LYARC News 1 yr old. 6 new Richland Co. area Novices. KB7Q re 4 six-mtr openings. Silent Key: WA7NDO. 65 ham picnic at Canyon Ferry Lake to celebrate Gallatin winning FD. Thanks to Butte ARC for refreshm Bozeman hams put up antenna system on court roof for c.d. use. Anaconda hams helped search fo child. MT hams discuss MT RTTY Net — time

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e Bearcat 250 performs any scanning function you uld possibly want. With push button ease you can ogram up to 50 channels for automatic monitoring. verseas customers should order the *Bearcat* **250FB** $349.00 each. This model is like a *Bearcat* 250, but signed for international operation with 220 V AC/12 V C power supply and 66-88 MHz low band coverage stead of 32-50 MHz.

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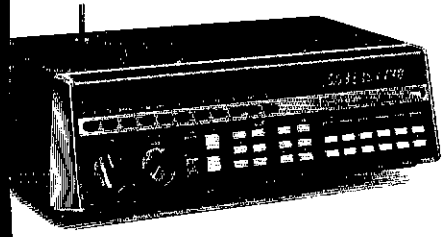

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mode need to be set. Honolulu ARC has Dec 13 hamfest. W7LR had dinner & picnic with visitor JA8 Recent W7LR DX: D68GA D68XX 6Q0DX 3B8AS T FB8XY FB8ZO C5ACG A22GV. See you in Montana Party Oct 11 & 12. WB7EVG N7ANR now Extra C Traffic: W7NEG 9, W7LR 5.

OREGON: SCM, Dale T. Justice, K7WWR — K7OLN. STM: W7VSE. Section nets:

Net	Time/Days	Freq	QNI	QTC	Mgr.
BSN	0145Z Dy	3908			WB7P
OSN	0230Z Dy	3587	383	466	KB7JW
	0600Z Dy				
PDXAARES	0330Z Dy	147.32	394	29	K7WW
PTTN	0300Z Dy	146.76	608	104	W7LR
JCARES	0315Z Th-Sa	147.06	139	50	W7VS
WCN	0300Z Dy	3702			K7ZIG
MPARES	0300Z M-Th	146.85	95	11	WA7Z

New Novice YL in Roseburg is KA7IKV. WA7YZP is N7BVD. New on Six is WB7WLC. N7DB worked lo Es, and shared W7DB, OTVARC and Hoodview C held campouts this month. New on BSN is WA7Z Traffic: W7VSE 718, KB7JW 447, WA7LGN 213, K7 178, KA7AOB 175, W7LNE 107, WB7OEX 100, WA 49, K7WWR 27, K7QPW 10, W7LT 3.

WASHINGTON: SCM, Bob Klepper, W7IEU — W7DZX. SEC: WA7RWK. Nets reporting for this mo NTN, QNI 1789, QTC 80; WARTS, QNI 3030, QTC NWSSBN, QNI 751, QTC 51; WSN, QNI 616, QTC PSTS, QNI 149, QTC 97; EWTN, QNI 102, QTC SCARES, QNI 47, QTC 3. NM WA7CBN rpts Eas Washington Traffic Net (EWTN) on 146.04/64 got off slow start but improving as stns become aware o coverage for written tfc. Anyone thinking of starti net on 2? Let me know and I'll be glad to help you need one in SW Wash, any takers? K7RBT Evergreen Amateur Radio Service (EARS) is ge more involved in community and emergency activi Whidbey Island Repeater, 147.82/22, has new ante up 520-ft above sea level. Congrats to W7JIE on his as Intruder Watch Director for North, Central, and So America. WB7CFH has upgraded to General and e to get more involved in tfc handling. W7ERH has a phone patch for ht. Clallam Cty ARC hosted the Vic Short Wave Club at the International Port Ange Victoria BC Picnic, 165 hams and families atten Chehalis Valley ARS preparing for elections December. New officers of Mt Baker ARC are: WA7C pres.; WB7AUP, vice pres.; WA7ZBX, secy.; WL7 treas.; WB7PMV K8EYU WA7CHR, bd. WB7CZI WA7 upgraded to General. New upgrades from Lower Co bia ARA: KA7CRW to Technician; KA7GRI WB7UUM vanced; W7HGH to Extra. The Rebels Net meets K7OSM/R 147.98/38 Wednesday evenings. West Sea ARC enjoyed super program by their TVI-RFI commu KB7G wrkd 35 stns in 8 states via OSCAR 8. WB7 and others worked horse trails near Stanwood with g results and no injuries. W7CDM installing quads communicating with both sides of the mountains mtrs. The Tacoma Hamfair was a success and facilities could not have been better, good to W7OVW and W7ZMG at the Hamfair, both are recove from recent illness. K7KFP has become a Sk. K7 made Tri-Yagi for 6 and waiting for an opening, m while enjoying first venture on 2 with a TR 2400. WW Club's Totem Tabloid reminds us to identify correctl this time ID'ing the other station is still required. H all of you have a happy and joyful Thanksgiving. Tra (Aug.)WB7WOW 992, W7DZX 686, WB7TOF 571, K7 206, W7FJZ 118, W7IEU 98, WA7BDD 87, K7CTP W7BUN 83, N7AFZ 81, WB7EBP 55, W7GB 45, N7AFV WB7CFH 22, WA7RCR 18, W7APS 9, WB7QWC W7ERH 6, K7RBT 2. (July) N7BJM 32.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SC W6ZF. VE?AQV/W6. SEC: WB6KOU. W6OA trave most of Aug & Sept. N6NE back from visiting F, H OE, DJ, PA0, HB0 and G on his vacation. N6RO activ 20 during Hurricane Allen. MDARC membership no 306; upgrades and new calls: KA6AHO to Tech, KA6 & KA6GTD to General; K6OYE now KN6M. MDARC F Day efforts resulted in 8 articles in the print media, n tions on 3 A.M. broadcast stations, and film footag two TV stations which may not have made air th SBARA Novice classes conducted by KB6TO. Their breakfast, picnic, T-hunt and jogging meeting at L Elizabeth was well attended. The T-hunt was won by DM of pres. WD6GKN, who is presently studying for Novice license. KA6BJB recently upgraded to E W6RSY back on the DXCC Honor Roll. WA6HAE back 20 after a long spell of inactivity. Traffic: (Aug.) W6 484, K6UGS 71, WB6UZX 39, W6OA 18, KA6ERF N6NE 2. (July) W6OA 91.

PACIFIC: SCM, Pat Corrigan, KH6DD — STM: W0K SEC: KH6CKJ. EC: Honolulu, KH6ILR. Thanks to KH6 for good SET effort. Pac. Div. Convention in Santa C saw KH6JWK KH6ZD and family, KH6DZB KH6WG KH6DD and a couple other stray KH6's. Good turn Honolulu DX Club hosted DX group from mainland August. They visited with KH6BZF also. New call le plates this year. See your local Civil Defense of Don't forget HARC Hamfest early Dec. Also, electi coming up. ARRL Pres., W2HD told me in Aug. he ho to visit Pac. Sect. next year. Pac. Tfc Net survives th KH6HKT. Congrats to WH6ADG & WH6AQS, rece upgraded to General on Maui. Cal-Hawaii Net me 14340 at 1700 UTC daily. Wish speedy recovery KH6BFU. Father Tom, KH6DZB, looked great at Pac. Conv. Volunteer to help your local radio club. Tra KH6HIJ 67, KH6JJP 52, KH6DD 18, KH6H 11.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6J SEC: WB6GFJ. ASCM: AI6I. WB6GFJ was awarde much deserved ARRL special citation for his outsta ing work in emergency communications at the divi convention in San Jose. The new rules allowing l plates on motorcycles are in effect. Thanks to KB6 for his efforts. The River City ARCS and the Fulto Camino Park Dist. are starting Novice/General clas at the Howe Community Center. N6DDO and N6D have swelled the ham ranks in Live Oak. W6DEF is b in business in Auburn. N6JV won a 40-foot crank mast at the div. convention. WA6BSS has a transceiver and the tribander at W6GO/K6HHD is u 90-feet. River City ARCS reports the death of KA6F Traffic: W6SX 61, W6RSP 7, W6DEF 5.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — WB6ZRK. STM: K6TP. Sonoma County RA won place in Pacific Division club competition and Humb ARC got honorable mention. K6GWE/R reports WB6 WA6POR W6FCQ active in emergency preparedne

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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

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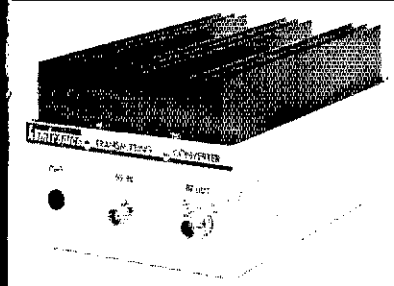

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XV2/LPA2-45/Cabt (6M or 2M)	$199.95	$299.95
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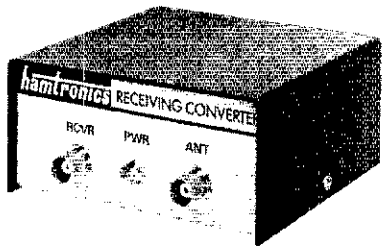

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- Less than 2dB noise figure, 20dB gain

MODEL	RF RANGE	OUTPUT RANGE
CA28	28-32 MHz	144-148 MHz
CA50	50-52	28-30
CA50-2	50-54	144-148
CA144	144-146	28-30
CA145	145-147-or-144-144.4	28-30 27-27.4 (CB)
CA146	146-148	28-30
CA220	220-222	28-30
CA220-2	220-224	144-148
CA110	Any 2MHz of Aircraft Band	26-28 or 28-30
CA432-2	432-434	28-30
CA432-5	435-437	28-30
CA432-4	432-436	144-148

Easily modified for other rf and if ranges.

STYLE	VHF	UHF
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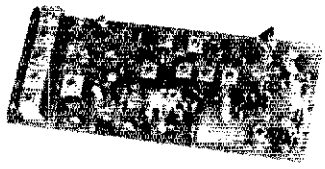

T50-50	6-chan, 6M, 2W Kit	$44.95
T50-150	6-chan, 2M, 2W Kit	$44.95
T50-220	6-chan, 220 MHz, 2W Kit	$44.95
T450	1-chan, 450 MHz, ¾W Kit	$44.95

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LPA2-30	6M, 2m; 25 to 30W	$89.95
LPA2-40	220 MHz; 30 to 40W	$119.95
LPA2-45	6M, 2M; 40 to 45W	$119.95
LPA4-10	430MHz; 10 to 14W	$79.95
LPA4-30	430MHz; 30-40W	$119.95

See catalog for complete specifications

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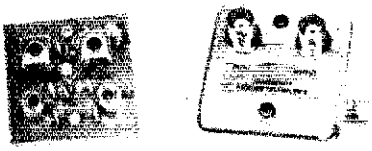

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- Case only 2 inches square
- Specify operating frequency when ordering

MODEL P-30 VHF PREAMP, available in many versions to cover bands 18-300 MHz.

MODEL P432 UHF PREAMP, available in versions to cover bands 300-650 MHz.

STYLE	VHF	UHF
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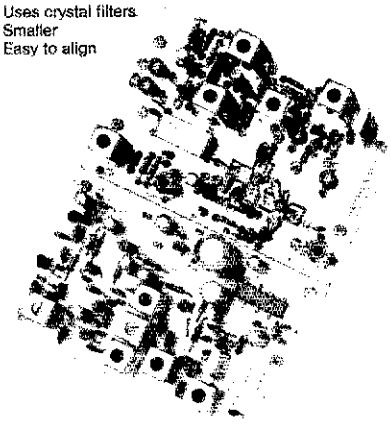

R75A* VHF Kit for monitor or weather sattelite service. Uses wide L-C filter. -60dB at ± 30 kHz. $69.95

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

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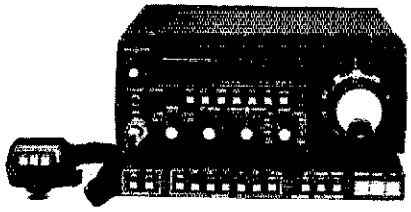
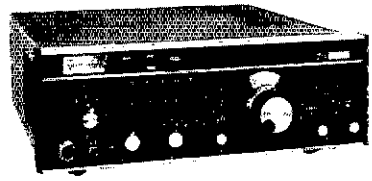


YAESU FT-707

FT-101ZD, FT-901DM, FT-227RB, FT-480R, FT-720R, FT-720RV/RVH, FT-107, FRG-7000



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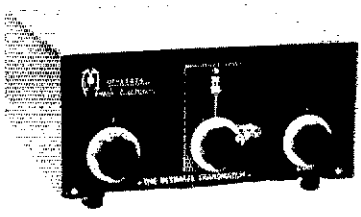

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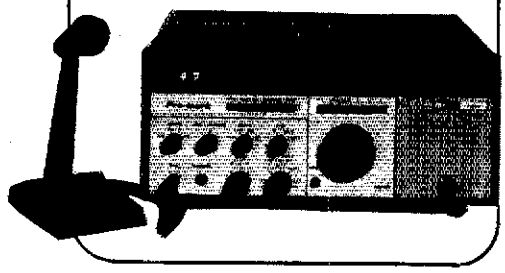

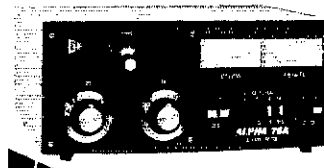

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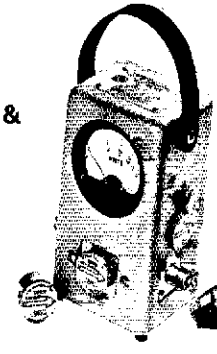

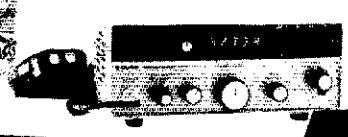

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Swan WM-2000A

EIMAC 3-500Z, 572B, 6JS6C., 12BYZA & 4-400A

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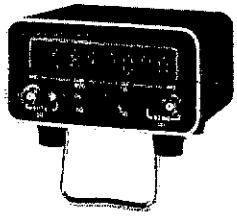
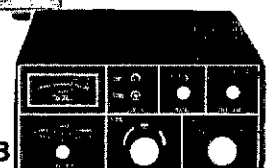
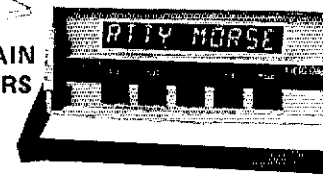




DENTRON GLA-1000B

DTR-3KA Antenna Tuner DTR-1200L Amplifier
DLR-2000/MTA-3000/Clipperton "L"



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DEALER INQUIRIES INVITED, PHONE IN YOUR ORDER & BE REIMBURSED

New members of QCWA are K4DRD W6VV WR6ACI/WB6FDT held fantastic picnic, K6OHG a Silent Key. Redwood Empire RA received ARRL club charter. San Francisco RC furnished communications for bathtub regatta. Upgrades are KA6IYG N6CZJ to General and KA6MEN to Tech. New calls are N6DBZ KD6HQ KO6G KA6MCU. AG6C reports DXCC. Another PSHR for W6RNL! W6BIP worked 245 countries in NCDXC marathon. Traffic: (Aug.) W6IPL 227, W6RNL 118, K6TP 79, W6GGR 10, WA6CXV 4, W6BIP 2. (July) K6JFY 23, W6GGR 11.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. Asst SCMs: W6TRP WA6YAK WA6HIN. Officers of the Tulare County ARC are: WA6FGM, pres.; W6ZZC, vice pres.; WB6MGG, secy.; KA6HAY, treas. The club meets the 4th Thurs in Visalia. Officers of the Turlock ARC are WA6CVL, pres.; KB6DJ, vice pres.; KA6AIM, secy.; W6SM, treas.; WB6MDN, mem. The club meets the 2nd and 4th Tues. in Turlock. For info on the Port of Stockton Award, send s.a.s.e. to WA6SSG. N6BVP is 2nd vp of the Sierra ARC. If you're interested in assisting the NOAA with weather information, contact W6DPD or WA6YAB. N6BNW is Advanced. KA6FYB is General. W6JPU and WA6HIN attended the Sierra Hamfest. KA6ENM is KD6JS. W6XP joined W6YO and W6YK on the DXCC Honor Roll. WA6SZE has DXCC. WA6CPP has Worked All Counties. WB6EUO has a TH6DXX. W6TO has a TH3JR. Happy Thanksgiving to all. There are 5 months until the ARRL Pacific Division Convention and 39th Fresno Hamfest May 15-17, 1981 in Fresno. Come and hear Roy Neal, K6DUE, at the banquet. Traffic: N6AWH 155, WB6TTP 24, K6RAU 14, WA6YAB 10, WD6FRS 8, N6AMA 8, W6DPD 2.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. The Pac Div Convention had a good turn out and was well organized. WA6RXB and his committees are to be commended. Remember next year is at Fresno in May. WB6IZF presented an excellent program on emergency communications and ARES. W6KZJ busy with NCN, RN6 and PAN nets, and has a good ttc total. EC W6ASH reports ARES system in 4 city area. 110 active members and serving 17 agencies — a very active group. W6OII handled ttc for NPS booth at Monterey Cty Fair. New ECs are K6TWF for Cupertino and KD6BD for Santa Cruz County. New members of Gabilan ARC are WD6BTX WB6LND and KB6GV. W6GJZ W6GKY KB6GV K6HWR KB6IT K6JHK and K6THR participated in communications for the Garlic Gallop. PAARA had some very nice Field Day photos in their bulletin. SCCARA members are relaxing after putting on the convention! Anyone interested in a "weather net/skywarn" contact WB6IZF or WB6GFJ. WD6COR has a new 65-ft tower up, thanks to the help from several other NPS ARC members. A talk on performance of current amateur receivers was given to FARS meeting by AA6PZ. FARS also planning a field trip for the Calif QSO Party. KD6BD, EC, is working with Santa Cruz Cty disaster coordinator on emergency comm for the county. SCCARC has the following as new members: KA6KLY KA6MIP KA6MLR W6NOE N6ARV KA6DKJ KA6MLQ W6NXU KA6MLJ KA6ITU and KA6LAF. K6TCN is moving to Alaska. SCCARC had a demo of amateur fast-scan TV given by WB6MLY WB6OHF and WA6SVW. Another joint breakfast was held by the SCCARC and SLV groups. Traffic: W6YBV 181, W6OII 130, W6KZJ 111, W6AUC 36, W6RFF 31, W6PRI 23, W6ASH 8, N6XI 2, WB6IZF 1.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — Asst SCM: N4UE. STM: K4VHT. SEC: WA4BFT. NMs: CMN WD8NYN, THEN WD4CNR, JFK WD4CNQ, CN AB4S, CNN WD4JJK, NCSSBN WB4CES. Congrats to WD4CNQ, newly elected Net Manager for the JFK Net. Also congrats are in order to WD4JJK, NM for the Carolinas Novice Net, who just recently upgraded to General. Good turnout at the combined net meetings of the CMN and CN held at the Shelby Hamfest — WD8NYN and AB4S chaired the event. Three good hamfests held in the section during August — Shelby, Fayetteville, and Concord. Thanks to the three clubs and all their volunteers who put on those fine events. The Mecklenburg ARS (W4BFB) now operates the ARRL WX/N-4 QSL Bureau, see address in QST. Congrats to N4ARZ and KA4BZG who upgraded to Extra. W4FUI continues to provide good technical articles to the WCARS newletter. Sorry to report that WB4VVL lost his rig to lightning — should be back on by now. Recent appointees include AB4V (OTS), WB4MJH (OTS), WB2LEI (EC Mecklenburg Co.), and WA4IVX (EC Moore Co.) Best of luck and a lot of thanks to our retiring Roanoke Division Director Phil Wicker, W4ACY. He has been a terrific leader in our division and his presence at all the various functions in the area will be missed. Thank you for a job well done from all your North Carolina friends. Traffic: WD8NYN 296, K4GCN 282, WD4CNQ 252, WD4OCO 226, WB4WII 190, K4VHT 140, AB4S 136, WA4SRD 116, KU4W 91, N4CJJ 86, WA4DBR 79, K4DHX 70, WB4CYN 68, WA4BFT 61, N4AET 57, K4MC 56, WD4NAO 46, W4HKB 45, AA4R 44, WD4CNR 42, K4FTB 41, K4VHQ 41, KA4DNL 36, KF4R 36, N4UE 36, W4EAT 35, WA4UTC 35, WB4VVL 34, WA4OJU 32, KZ4A 30, W4ACY 28, WB4CES 28, WD4CNS 28, WD4FCH 18, WB4VQZ 16, WD4CFZ 13, WD4JNZ 11, KC4AM 10, W4EHF 9, N4BEX 7, WB4HRR 5.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — Asst SCM & SEC: WB4UDK. SEC: WD4HLZ. STM: W4ANK. NMs: WA4SJS W4ODE. Congrats to the SC Noon Time Net which W4ODE reports doing fine, won't you join them? Congrats to our new SEC WD4HLZ. He will make SC stand out in the ARES program, won't you support him in his work? The Newberry "Hams" provided comm for a foot race and also set up a fun-expedition and Amateur Radio exhibit at the Little Mountain Reunion. A good time was had by all. The North Augusta-Belvedere Radio Club provided comm for Whiskey Road foot race. Checkins/traffic: SC SSBN 1259/186, Blue Ridge 2M Net 1190/43; SC Noon Time Net 249/49; Lancaster County 2-Meter Net 172/12; Western SC Emergency Net 177/9; Newberry County ARES Net 78/5; CNN 276/53; SC ARES Net 41/0. Traffic: (Aug.) K4ZN 290, W4ANK 196, W4OCX 132, WD4PPM 118, W4NTO 92, W4ODE 87, W4FMZ 83, W4NQL 75, W4MTK 50, KA4AUR 41, K4FRX 38, N4EE 18, WA4VYS 17, K4LYU 17, WA4ABZ 16, WB4UDK 16, WA4MIY 10, WD4EDM 8, WA4JWS 5. (July) W4ANK 59, WA4MIY 13, WA4JWS 8, WD4DOL 5.

VIRGINIA: SCM, Rick Genter, K4BKX — ASCMs: W4YE & N4NK. SEC: N4AZI. STM: WA4STO. Chief OO: W4HU. Chief OVS: N4CD.

Net	kHz	Time (PM)	Sess.	QTC	Mgr.
VSBN	3947	6:00	31	234	KY4K
VSN	3680	6:30	29	121	WB4KSG

VN-E	3680	7:00	30	192	KB4N
VN-L	3680	10:00	28	109	KB4N
VLN	3947	10:15	31	194	WA4YIU
VNTN	3907	Noon	29	79	N4LE

WB4DBK is living with new bride in Mission Home while he continues with studies at UVA. W4TZC reports that it is too hot to operate; I think a lot of us would agree with that. W4YE is busy getting new school ready to open. WA4CCK W4JK WA4LJI and KY4K busy with emergency traffic. KC4IH made DXCC. WA4ISA and WB4LAB report equip. down but both W4LXB and WB4FNW are back on the air. WA4EQW is handling traffic mobile! Many of us participated in the VAPCO/OEES drill. I have a nice plaque from Governor Dalton as a token of the state's appreciation that will be on display at Virginia Beach Convention. The governor's office couldn't offer enough praise and gratitude. We should all be proud. KB4N is taking flying lessons, we thought you were already flying on the VN-GL and don't break a leg. K4BKX and WA4FDV hope to be back on the air very soon; we'll keep you posted. Hopefully this HOT summer is about over and we can all leave that yard work for snow shoveling and more hamming! PSHR: WA4CCK 207, KY4K 131, KZ4K 123, WA4STO 110, W4JK 108, W4NWM 98, WA4LJI 75, N4AZI 63. REMEMBER that WA4STO is now taking all traffic reports! Traffic: W4JK 604, WA4STO 519, WB4PNY 430, WA4CCK 352, K4KNP 300, KZ4K 287, WA4LJI 280, WB4FLT 215, W4SUS 181, W4SQO 177, W3BBN 164, KY4K 123, W4NWM 85, AA4CK 73, K4JM 73, KB4KSG 69, W4YVG 68, N4ZAI 60, N4RF 60, WA4YIU 56, N4YQ 53, KB4N 52, K4EJ 47, N4LF 41, WB4FNW 40, W3BBQ 37, WD4FTK 37, N4NK 36, W4OKN 34, WA4OWC 33, WB4ZTJ 32, K4VWK 28, WB4UHC 27, W4DM 25, WB4DQZ 25, KB4OF 24, K4DHB 21, KA4ETG 21, N4CJL 20, WB4ODZ 19, WA4EQW 16, N4CIR 15, W4JAZ 13, N4BJX 12, WB4MAE 12, WA4PBG 12, WB4ZNB 12, WB4RWT 11, WB4KIT 10, KA4HLI 9, W4KXE 8, WD4DUI 8, WA1VRL 7, WB4BAT 7, WD4KQJ 7, W4LXB 7, WD4RDF 6, WA4RTS 6, KB4OB 5, K4JST 4, KM4X 4, K4JRT 3, WA4ISA 2, K4ITV 2, WD4NEI 2, WA4WQC 2, W4YE 2, N4DW 1, KC4HN 1.

WEST VIRGINIA: SCM, Karl S. Thompson, K8KT — Morgantown area hams received excellent press for help provided during recent flooding. Net operations were handled via K8LG/R. (Thanks WA8GYU). Chas. hams provided comm. for annual Sternwheel Regatta. ARES/RACES Net meets 2nd & 4th Thurs following WVPN. Statewide coverage sought on KFC's 87/47 net at 8:30 Mon. nights.

Net	Freq.	Time(Z)	QNI	Trf	Sess.
Hillbilly	14290	1700 Su	194	58	6
CW	3567	2300 Dy	150	47	31
Phone	3990	2200 Dy	459	88	31
Midday	3990	1800 Dy	256	61	31
Novice	3730	2230 Dy	18	14	18
Blk. Dia.	25/85	0000 Tu	12	1	3

Traffic: KD8G 75, W8FZP 49, AI8I 40, K8MHR 39, K8QEW 38, KA8ETV 36, N8AJC 27, W8HZA 16, WB8TDA 13, WB8TJN 12, W8CNF 10, K8KT 10, W8YP 9, WD8LOY 8, K8ZDY 7, WD8ENS 6, WB8UDY 6, W8FG 4, KD8G 4, KD8X 4, WD8MJE 1.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Pointer, KØDJ — SEC: WØACD. STM: WBØMCL. NM: KØCNV WØHE WØHXB KBØZ WDØAIT. Combined picnic for Columbine, TWN and CWN at Dillon had several meeting for the first time and provided a face behind the on the air callsign. OVS WØETT reported many openings on six meters with W1's being the more prominent signals. Also, congrats to VHFers WØIJR KØEU and KØAYK for WAS on six. ARES groups gearing up for projected early snows. If winter extremes are like this summer, they should be very busy! CCARC has designated 144.590/145.190 MHz an open pair as of this writing; interested parties should contact WBØCJX, ARRL frequency coordinator, about PL tones for this pair since it is being strongly recommended. The idea of vhf code practice on 147.480 MHz is being proposed for the Denver area to benefit those who wish to upgrade. If interested in this idea, contact KØOSF or WDØBZA. Net tfc: Columbine 26 sessions, QNI 953, QTC 127, informals 208, QNF 1057; CWN 31 sessions, QNI 184, QTC 135, QNF 867; HNN QNI 1634, QTC 168, informals 316, QNF 1378. Traffic: (Aug.) WØWYX 1931, NØBOP 1584, WAØHJZ 890, WBØMTA 234, WDØAIT 170, KØDJ 157, WØLAE 155, WØHXB 116, WAØYNP 114, WØLQ 58, KBØZ 58, WØNFW 45, WØRE 45, WØGO 22, KDØM 11, KØCI 9. (July) WBØMTA 153.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs: WD5AHH & KG5L. Southwest Net (SWN) meets daily on 3583 kHz, at 1930 local and handled 198 msgs with 154 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 kHz at 1800 local and handled 171 msgs with 980 stations in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local handled 113 msgs with 732 checkins. Yucca 2-Mtr Net handled 14 with 526 checkins. Alamo Club making good progress on their new building. Santa Fe Club looking forward to their Hyde State Park Picnic. New 222.34/223.94 Repeater is working beautifully from Los Alamos. Lots of new 220 rigs on the air. Traffic: W5UH 420, W5DAD 352, W5JQV 153, KG5L 112, W5ENI 106, N5NG 104, KA5DDW 91, W5VTL 16.

UTAH: SCM, Royce Henningson, K7QEQ — SEC: WB7FCB. STM: W7OCX. The Juab ARC set up an operating station and display at the Juab County Fair for 3 days and was manned by KB7HY KA7DLH KA7FCW and K7MOC. W7OCX reported that the Odgen ARC at its annual steak fry awarded W7GPN a special plaque for his work with the Odgen repeater and band conditions on 40 meters for the Beehive Net were terrible most of the month. Apparently not much else went on during the month as I didn't receive any other reports. Traffic: K7HLH 236, WA7MEL 87, WA7KHE 78, WA7JRC 49, W7RO 17, W7OCX.

WYOMING: SCM, Chester C. Stanwaity, W7SDA — WB7BKM who is in the Air Force, has just left for a years tour of duty in Alaska. WA6DCI/7 now resides in Riverton. KB7JZ and K7CRL are now the proud owners of new TS120's. After a three month summer vacation the Cedar MOuntain Amateur Radio Club has resumed their monthly meetings. WB7NHR reports the Wyo. Cowboy Net held 21 sessions with 536 QNI and 12 QTC. WAØPEJ reports the Jackalope Net held 26 sessions with 361 QNI and 0 QTC. Traffic: W7LYA 402, WA7GYQ 237, WB7NHR 67, K7TFW 20.

SOUTHEASTERN DIVISION

ALABAMA: SCM, James M. Bonner, K4UMD — SEC: W4IBU. The N. Ala. Hamfest was a great success. All en-

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joyed talking to Harry J. Dannals, President of ARRL; Frank Butler, W4RH, Director Southeastern Division and W3AZD, DXCC of ARRL. It was real good to have all these gentlemen at the 26th Annual North Ala. Hamfest. On September 7th Montgomery had their hamfest, it was a good one, hope you didn't miss it. AENI reports 45 QNI in 3 sess. New Novice KA4RJE and KA4PZY upgraded to Tech. Ala was again 100% into Gulf State Emergency Net with N4AZ K4DJY KB4GA WB4LOX KA4NSV W4USB KA4EEE. liaison into AENB CW Net. W4CKS W4ZYY WA4JDH N4KKN WA4PIZ WA4RAJ went into DRN5, Ala. was 100% represented. AENM Net had 2830 QNI in 36 sess., 437 QTC. New members into AENM Net: K4RIX K4OE. All nets are growing in memberships. Your SCM glad to see that. AENB Manager reports QNI 202, QTC 51, QTR 589 minutes. W5KLV, manager DRN5, reported Ala. 100% by W4CKS W4FN. W4RNP tells me he will be back on 75 now that he is moved. On July 25th the Enterprise ARC supplied telephone service for city police. The Club received a letter of thanks from the city of Enterprise. AENB Net: 31 sess. QNI 214, QTC 81, QTR 547 minutes. We are all real proud of the increase in our CW NETS. We hope all participated in the October SET drill. We all need the training and been lucky so far this year without tornadoes and hurricanes. Traffic: WA4JDH 1248, W4CKS 120, WD4DHI 49, K4AOZ 48, WA4JPK 31, W4IBU 22, AA4J 21, K4UMD 26, WA4RMP 24, WB4EKJ 17, KC4GS 12, K4HJM 11, K4EWD 9, WB4TVY 8, WA4ZPZ 6, N4DMA 5, KA4NXG 5, K4HJX 2.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM: K4VHC. SEC: K4SWJ. ASEC: WB4HXE. STM: W4WXA. Chief OBS: W4BIA.

Net	Freq.	Time (All EST)	Mgr.
GCN	3995	0700 Dy 0800 Su	K4DMK
GSN	3595	1900 & 2200 Dy	W4PIM
GTN	3718	1815 Dy	Vacant
GSS BN	3975	1830 Dy	WB4ZVX
ARES	3975	1700 Su	WD4ADV
GA TFC "A"	7243	1200 Dy	W4GH
GA TFC "B"	3957	1830 Dy	W4GH
GERN (RTTY)	3620	2030 Fri	WA4ZHC

Tnx to WA3NAZ for FB job while STM. He's back in J-Land furthering education. W4WXA new STM & GSN now has W4PIM as NM. Tnx guys. Need NM for GTN, volunteers contact W4WXA. New BGMRC officers: WA4PUP, pres.; WD4PAG, vice pres.; WD4EWE, secy/treas.; WD4NJY, act mgr.; K4ERE, fin dir. NE GA ARC furnished communications between NWS & Athens Airport when Ma Bell's cables were cut. WA4ZHC trying to establish FB RTTY net. Still needs more stations. Plans are to use 40 meters during summer. KC4IN went from Novice to Extra in 4 years time. Great. The section's OBS are W4BIA W4CMX W4FIZ WD4LYV & WA4ZHC. Need more around the state, contact me if you can help. SGARC active as usual. Club needs more new members, contact WD4ERM. With hot weather gone, net QNI's should increase. Pick a net & start checking in. WA4PUP proud of his new Extra. Convers Group continues with variety of activities. WA4LHT moved to Va. on a new job. Albany RC active & membership on increase. K4BAI finally settled in new home & back steady on GSN. K4VHC plans another Christmas treat from the North Pole for the youngsters. Information will be available on section nets when the season arrives. Appointees please send in your reports to me by the 6th of each month. It sure will help me. I hope that all of you have a very Happy Thanksgiving. Traffic: WA3NAZ/4 124, W4WXA 115, W4PIM 107, WB4RUJ 59, K5TF 59, WD4ADV 40, K4JNL 40, W4FIZ 39, K4EV 37, W4BIA 26, W4HON 24, N4UZ 13, K4PIK 10, W4ELO 6, KA4ATM 5, K4BAI 5, AK4T 3, WA4LHT 2.

NORTHERN FLORIDA: SCM, Billy Williams, N4UF — STM: N4WA. SEC: WA2GIN. NM: N4BZH WD4DNC. ASCM: WB4QBB W4BSP WD4ASW WA4OEM WA4CRI. Very sad to learn of the death of W4FZX. He served as FBC and FMTN officer and was Asst. SCM N. FL. Good turnout at Pensacola Hamfest. NOFARS and Jax amateurs installed an ht antenna system at Red Cross HQ and got good publicity on TV news. W4IZ operating from Jax Fair again. The 75/15 repeater in Daytona now signs K4BV/R and is being upgraded by KB4T and DBARA Tech Com. East Pasco ARES Net active daily at noon on 28/88. QENS cert issued to N4AXN. NFPN cert to WD4PYT WB4WMR WA4IBV N4PL and N4BOY. New OES is WB2OUK. New DEC for West Central area is W4UEA of Dunellon. WD4BIW is Asst. DEC for Fla. Crown area. N4CYV appointed OO and W3IDO OTS. WA4FVD passed General exam. KB4HF and KF4W did well in 10-M contest. AA4ES experimenting with new antenna system. TARS sponsoring club vests. Tallahasse Area DX Net active Thurs. at 1930 local on 28.7 MHz. KC4MM is new EC for East Pasco Co. Beaches operators provided communication for Jax Beach Marathon. Anyone interested in an ARRL appointment, please contact me. For those who hold same, please report regularly. After 3 months of non-reporting, most appointments fall into the inactive category as far as my records are concerned. A simple radiogram will maintain active status. OVS should report unusual vhf and uhf openings as they occur. Clubs reporting are GARS, GCARC, TARS, HCARA, NOFARS, RANGE, OPARC, BARS, DBARA, LMARS. Appreciate the input. Keep it coming. Traffic: WD4HIF 557, N4PL 495, WA4CRI 133, WA4EYU 114, W4KIX 100, N4WA 95, N4BZH 86, W4MGO 77, W4JL 76, W4SIZ 64, WD4IIO 52, WB4TZR 47, K4RNS 27, N4AXN 30, WA4SIZ 28, W3IDO 24, WB4DTS 18, N4UF 22, KF4U 11

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SGL — Asst SCM: W4KGJ. SEC: AA4WJ. STM: K4TH. The SCM election results are in and you ARRL members in the section have re-elected me. I shall begin my 4th term on October 1st. The score was 1042 to 851 — representing almost 50% turn out of eligible voters. Apparently interest level was higher than usual. My thanks to all those who voted for me and to the opposition for helping to focus attention on the issues. Several of the points coming into focus were: 1. Florida amateurs feel like they belong to Florida more so than to Southern Florida Section or Northern Florida Section. They want cooperation and good fellowship throughout Florida — no fights, no "artificial" division into sections. 2. ARRL is members. Headquarters, Directors and other officials serve the members. 3. Members do not want to be dictated to. They want the hired help at Newington, and other officials, to sense the desires of the membership and act accordingly — not issue edicts which are not in accordance with their desires. 4. "Orders" coming out of Newington, and other levels of management, are subject to question and may be ignored if you don't like 'em. Rules, after all, are to be made "with the consent of the

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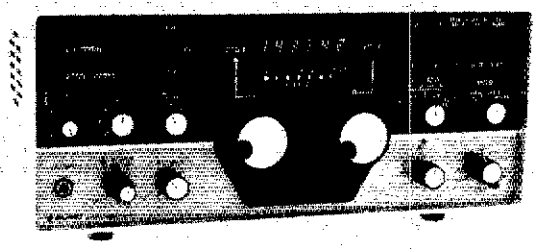

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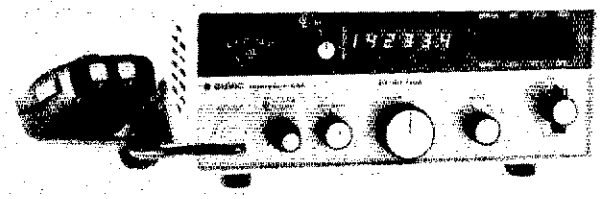

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governed." Consider almost any of the rules: This rule (or law) is not mine. I didn't make it. They didn't even get my consent. Maybe I even voted against it. Who do they think they are, telling me what I've got to do? Now, the ARRL ought to have a good Field Organization to take care of all the jobs that need to be done. I expect the SCM to write up a complete summary of Section Activities each month, but don't expect me to take time from my busy schedule to report my station activities. They should ensure that the QSL Bureaus send me my cards promptly, the clubs have films to show, nets operate efficiently to serve every community, the ECs furnish all the emergency communications needed locally and the NTS handles the long-haul, etc. But they have no right to expect me to give up what I'm doing to help with these things. After all, I paid my dues, so I expect them to provide membership services. But wait. Who is "them"? "They" are us. If "we" don't do the job, who will? Nobody! That's who! South Hillsborough (County) Amateur Radio Klub, SHARK, held a traffic origination demonstration at Ruskin Mall with 15 members involved originating 19 messages. W4JM now has his 2-el quad operational at 50 ft. W4ROA reports a new "cw" net on 146.31/91 repeater 0100Z Wednesdays. WB4PBF upgraded to General. Congrats. WB4RLU mailed over 1400 letters to radio amateurs asking for volunteers to man Red Cross shelters in event of emergency. He got about 10% response. He has 55 to 60 shelters needing communicators. W4IYT laments difficulty in getting cw ops on QFN and GN. Come on, you Miami cw ops, let's give him a hand and help with NTS coverage. Just back from Melbourne Hamfest where our plan for section-level participation in 4-cycle NTS for SET Oct. 18-19 was generally approved. A new Florida Intermediate Speed Net (FIN) was approved and will operate daily at 5:30 P.M. on 7090 kHz. WB4FVV is manager. There was considerable pressure to postpone Southern Florida SET exercise because of Tampa Hamfest Oct. 18-19, but because of nationwide test of 4-cycle NTS, we decided to do our SET Oct. 19 in abbreviated form allowing time for hamfest Oct. 18. Traffic: W3CUL 2976, W4MEF 766, W3VR 637, WD4AWN 599, K4SCL 376, WD4COL 347, K4TH 298, WB4FVV 283, W4LX 265, WA4PFK 263, K4ZK 164, W4GPL 148, WB4WYG 132, K4EUK 129, W4IRA 92, KA4LNA 89, WB4AID 85, WB4PIB 84, N4ET 80, WA4EIC 78, WA4HXU 67, W4DVO 50, W3TLV 50, W4KMN 42, KA4BBA 40, W4IYT 38, WB4GCK 33, W4ESH 32, KA4ASZ 31, W4ROA 24, W4SMK 24, WA1IOG 23, WB4NCH 21, KM4G 20, WB4FVN 17, WB4NJU 17, W4WYR 14, WD4LWT 11, W4MML 8, WB4SNX 8, WB4GSV 5.

WEST INDIES: SCM, Julio Negroni, KP4CV — PRARC repeaters on the move. El Gato (34/94) now on Cerro Punta, highest point in PR with excellent coverage all throughout PR and VI. Will soon have new equipment thanks to KP4HY. KP4FHC is the repeater trustee and has done an excellent job at this difficult site. The Marquesa repeater will soon be moved to Cubuy and will operate on (10/70). ARES Nets are being held weekly Thurs. 8:30 P.M. AST on 3900 kHz and 146.34/94. New appts: SNC — KP4U WP2ABQ NP4D; DEC — KP4BG; OBS — KP4DJ. New Novice course starts Oct. 17 at PRARC San Patricio. Moved request to hold West Indies Section Convention in conjunction with PRARC Convention April 26, 1981. Traffic: NP4D 136, KP4DJ 69, KP4U 21, KP4FBT 14, KP4EMY 3.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Willard L. Haskell, AC7D — SEC: N7EH. STM: W7EP. K7NTG and XYL, K7OBR, have been vacationing in XE-Land. Hope they bring lots of pictures back. For all RCs. Mable has made outstanding presentations at local clubs in the Tucson area re: their many tours throughout the country. Club program chairpersons may keep this in mind! I receive many indv. tfc. rpts each month from hams in AZ, but few break them down as to number sent, rec, orig and dely. This info is important in order that I and ARRL can get the complete statistics!! Further, I'm sure that some of you have qualified for PSHR, Public Service Honor Roll. The guidelines can be viewed within the Public Service part of any QST mag. Give it some thought, and keep me posted! Congrats to K7JKM and XYL, just celebrated their 44th Wedding anniversary — with thunder and lightning on the 24th of Aug. ion that day lightning struck their stone wall and threw stones all over their yard — no one hurt fortunately. K7GNV and W7LUX have been running tests on 1296 MHz. Preliminary results are very encouraging. Tests between Flag and Phoenix are in process! Net activities: SWN QNI 154, QTC 198; A-10, QNI 901, QTC 169, W7EP, STM, made PSHR agn in Aug — good show! Traffic: (Aug.) W7EP 160, K7MC 90, WA7KDE 42, K7JKM 40, KA5DDW 27, WA7MM 18, K7NMQ 16, WA7JCK 10, WA7NXL 8, W7LBW 5, N7AUX 2, WB7QOM 2, (July) K7UXB 43, W7AMM 19.

LOS ANGELES: SCM, Stan Broki, N2YQ — ASCM: N6UK SEC: WB8FAK STM: W6INH. Three new appointees this month: K6MHE EC, K4WGW OO, and W6TOG OO. Keep 'em coming. K6INK was elected secy/treas. of YLRL for 1980. She is running secy/treas. of QCWW. Good luck. W6RO reported 120 operators at the Queen Mary during Aug. WB6MKA El reports upcoming bikathon support in Sept. by the SGV ARES. Additionally T-hunts are held monthly. The Southwestern Division Convention was an exciting event with over 2000 attendees. The banquet was sold out. I was pleased to meet many of the section appointees and had an exciting three days at the Marriott. Murphy's Alumni Assoc. had an exceptional booth and hospitality suite. It was the Presidential suite on the 17th floor of the Marriott overlooking the L.A. International Airport. They had fountains of good cheer and lots of good fellowship. The Southern Cal DX Club hosted a breakfast and K5YY gave an interesting talk on his recent trips into the Pacific. WB6VHS Weekly Net, Monday, 9:30 P.M. 146.52 San Fernando Valley. WB6PWA Weekly Net, Thursday 7:00 P.M. South Bay. Planning simulated earthquake emergency Oct. 4 for SET. N6AWF was a winner in front of the Cerritos Planning Commission on Aug. 13th when he and a packed audience of concerned hams got the commission to rethink the antenna laws in Cerritos. Additionally, during the SW Division Convention, his son won the Pre-Reg. Prize. I wonder if he will get to use it? OOs: K6CL 3 reports sent out, N6HE 1 and R6KA with 50. N6VI got a 4 KW generator for his portable station. The station will have a 65-foot tower and he plans to have it going during VHF QSO Party. WB6VHS is getting ready for the upcoming bicentennial celebration for the city of Los

Angeles. Traffic: K6INK 101, KB6FC 95, K5DY 89, WA6LVO 77, W6BRO 62, K6OWA 62, W6INH 48, N6PZ 45, K6CL 28, W6BWG 26, WA6OCM 77, N6HE 11.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW, SEC: W6INI. Asst SEC: N6RD. ECs: SD County WB6HFE (Northern), WD6CSS (Southern), W6OGC (Eastern), W6INI (Central); Imperial County W6JHG. new call sign: WB6SUA to KO6Z. ARES members are urged to attend training sessions on second Saturday of each month, following pancake breakfast. Breakfast 0800-0845, meeting at 0900. Come to either or both. Place: Normal Heights United Meth Church, 4650 Mansfield. Visitors welcome. WA6PJG won a TS-520-SE at annual Palomar ARC picnic. SANDRA has a "Buy-A-Brick" campaign to help finance new repeater building on Mt. Otay. Poway ARS had videotape program of Field Day activities. Poway ARS has found a better mousetrap! It's their 2-mtr repeater which failed when mice were zapped in the power supply. SANDRA spon-

gored swap meets are held on 1st Sat. of each month at Santee Drive-In at 0700. Palomar ARC conducts T-hunts on 2nd and 4th Saturdays with AD6Z and WB6OZT coordinating. Traffic: (Aug.) WB6PVH 261, N6GW 244, W6HUJ 160, KM6I 120, WB6MLB 55, K6HAP 54, N6RD 51, N6AT 33, KO6Z 20, KA6DNF 14, WA6COL 12, WB6FTY 4, WA6UFY 3. (July) K6HAP 69, WA6UFY 3.

SANTA BARBARA: SCM, Robert N. Dyruff, W6POU — Special Gazette distributed by VGG & Simi Settlers ARC. SBARC Wouff-Hong cast incl. WB6AGU (Eagles), KA6HUR, W2HD. Symposium in SBAR studied ARRL org. needs, recommended local-area, full-service ARRL "branches." Was attended by ARRL officers, Dirs., SCMs, affil. club prexies, HQ reps. SLO City clubs support EC K6DZT as county awaits nuclear plant startup. K6FI named training head. SLO & SBAR Counties introduce multi-agency ARES units. Ventura Co. completes ARES/RACES plan by N6MA for hospitals and new Go. Center. WB6RVA WB6QKF W6RIC complete week of ARC Dis. Inst. courses. New ECs: N6SH-MARS; WB6 LMX-Ojai. Traffic: WA6MBZ 269, N6YH 132, N6WP 128, W6ZRR 101, N6MA 18.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — Asst. SCM: AE5C. STM: W5VMP. SEC: W5GPO. NMs: AA5J AE5I N5BT W5HMR. Our new SEC is Charlie Byars, W5GPO, 4217 Meadowbrook, Wichita Falls, TX 76308. As soon as the transfer of SEC records has been made, he will be in contact with all ECs re reporting and new plans for ARES in our section. Our feature club of the month is the KILOCYCLE CLUB of Ft. Worth. 1980 officers are: W5OMQ, chmn.; W5KSX, prog. dir.; WA5OLV, secy/treas.; WB5SKI, Interference; WB5YMB, FD & emerg. The KC Club is one of the oldest clubs in the south, and boasts their very own club house and stn at the Oak Grove Airport, south of town. The club meets the third Thursday of each month, @ 7:30 P.M. local time. The membership is active in numerous public service activities plus all the traditional radio club functions. If you are within driving distance of the Oak Grove Arpt. you should look into joining this super org. Write: Kilocycle Club; P.O. Box 6881; Ft. Worth, TX 76115 for more info. Texas Slow Net in Aug. had QNI 318, QTC 59 in 31 sess. The D/FW Metro Tfc. Net reached a new milestone with QNI 519! QTC 93/81 in 31 sess. N5AWG/DFW NM and all the loyal members are to be congratulated for this FB service to the D/FW area. PSHR for Aug.: WD5JYI AE5I KA5AVQ N5BT WA5QFD WD5IVD WD5FUE W5VMP N5CFK W5HMR W5CTZ KB5UL N5AWG and AA5J. Traffic: N5BT 252, W5TI 252, AA5J 183, WB5BKM 140, WD5JYI 114, WD5EUE 113, W5CTZ 98, W5HMR 65, K5QKM 64, AE5I 60, WD5IVD 60, N5AWG 58, K5PC 50, WA5QFD 50, N5CEK 37, KB5UL 28, WA5INJ 23, KA5AVQ 21, W5VMP 15, WB5YYK 13, KB5WK 8, K9MX 2.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Asst SCM: Ray Miller, W5REC. Reports received from 9 section nets show good participation for summer months. Reports received from 28 OTS; 2 OBS; 2 OOs and 1 OVS. W5VXU and KI5P have 34 in Novice class at Altus, also gave Amateur Radio demo, at Mangum recently. OLZ Net Controls: K5CXP WB5EAY K5JGZ W5RB WA5JGU N5AZO & WD5IDB welcome you to join them any evening. NØIN serving as alternate NCS; WB5EAY & W5RB both QNI'ed 28 out of 31 times in August. WA5OUV & WD5IRB will also welcome you on the earlier phone nets. Big things cooking in Northwest Oklahoma, with 2 Repeaters being improved with new solid state machines and standby power. Also, linking with machines in Southern Kansas this gives 7 N.W. Oklahoma counties plus the Panhandle some of the best 'Sky Warn' coverage, also working on linkup to Oklahoma City, Ponca City and Tulsa clubs provided communications for 'Raft Races' on the Arkansas River recently. Also some very nice kudo's from Red Cross and others for the various FB operations conducted by ARES and other groups. Excellent performances are some of the best PR that we can get. Is your antenna ready for winter? Have a good Thanksgiving. Traffic: WB5NKC 440, WB5NKD 295, W5REC 233, W5RB 158, KB5EK 148, K5CXP 137, K5OWK 120, WD5IRB 111, WA5FSN 70, WA5OUV 67, WD5UDB 65, W5UYH 58, KF5A 39, WD5IFB 38, W5VXU 37, K5CAY 34, W5SUG 33, WB5EAY 28, W5VLW 25, W5VOR 23, K5MGD 20, W5AS 17, WA5UTO 16, WB5ELG 13, NØIN 13, W5HKL 12, WD5IRR 9, W8JJ 1.

SOUTHERN TEXAS: SCM, Roger Coday, N5FN — Asst SCM/STM: N5TC. SEC: AK5N. OO reporting this month, WA3DVC. There was a great deal of activity generated in the section this month by Hurricane Allen. Thanks to all those stations participating. A special vote of thanks to all those stations who kept the various nets operating. This was the first time since becoming SCM that I have activated the Section Emergency Plan. For those of you who are not affiliated with an ARES unit, the basics of the plan are as follows: Health and Welfare-Incoming and Outgoing-Texas Traffic Net (3961 kHz) night. 7290 Tfc Net (7290 kHz) daytime hours. Civil communications (law enforcement, Red Cross, Civil Defense, etc.), incoming/outgoing, Central Gulf Coast Hurr. Net, 3935 kHz nights and 7240 kHz days. Backup for civil communications will be supplied by the West Gulf Hurricane Net, 3945 kHz. The South Texas Emergency Net will operate as needed in affected areas and supply WX information on 3955 kHz. Emergency transmit frequencies FROM THE AFFECTED AREAS ONLY, 3967 kHz nights and 7283 kHz days. I am interpreting affected areas to mean coastal cities as areas that receive the direct or near direct hit from the hurricane, tornado, industrial accident, and etc. During Hurricane Allen, all the above nets operated admirably. Now on to other news. WA5RVT has been named trustee of the Brazosport ARC. New officers for TCARS are WA5BUC, pres.; WD5HOC, vice pres.; KA5ERG, treas.; KA5BHM, secy. K5RVF reports he attended National Conv. and had a visit with W7MAI. K5RG reports the purchase of a new 3 kW portable generator. WB5TAY is now operating his Yaesu FT 707 mobile. K5AZ has become the trustee of the Univ. of Houston ARC with the departure of K5AAK. Thanks to K5HZR W5KR KC5M and others who sent in several nice write ups about amateur activity during Hurricane Allen. These reports will be compiled and forwarded directly to the League. Traffic: W5KLV 489, WB5YDD 379, WB5YRV 218, W5SBE 162, KB5NX 116, WB5MMI 115, NSTC 113, K5PE 110, WB5CIT 96, KB5TC 92, W5BGF 74, WD5DOR 41, WD5GKH 39, WB5TAY 37, K5RG 32, N5FN 27, AK5M 21, AK5N 21, W5KR 18, WA5HVI 18, WB5EFJ 17, WB5BSB 16, WD5AAH 10, KAØCSM 3, KD5O 2, K5RVF 2.

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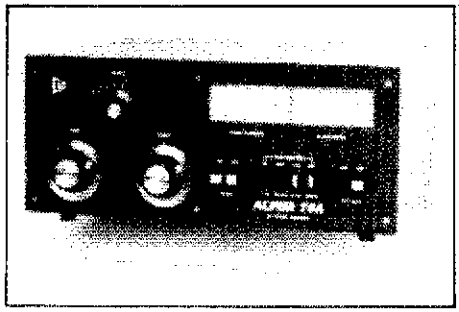

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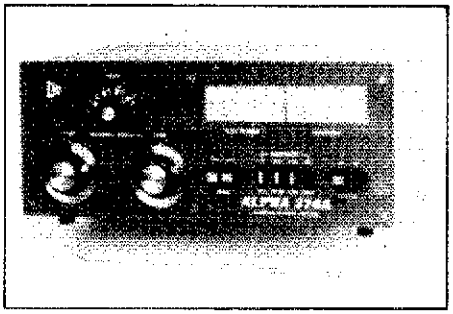

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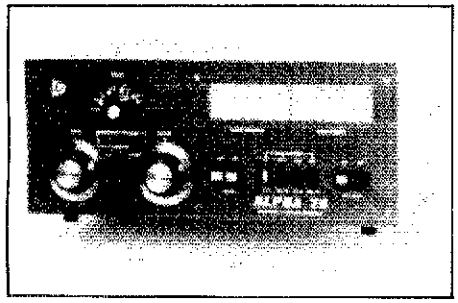

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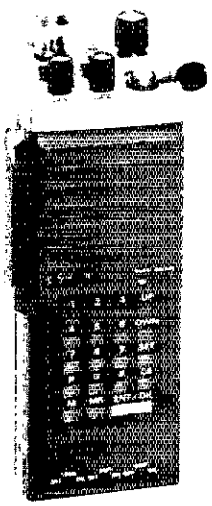

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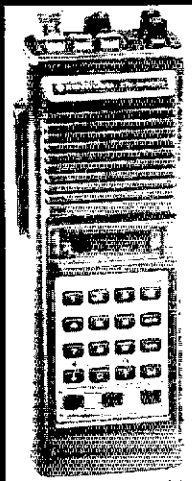

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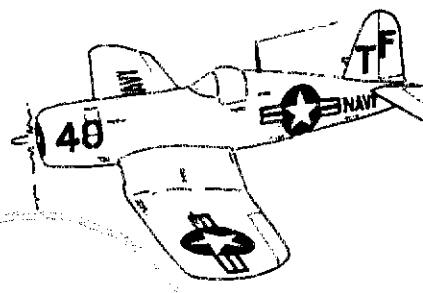

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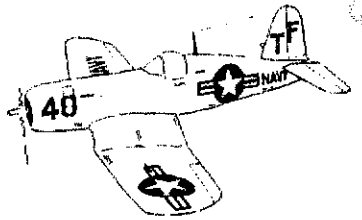

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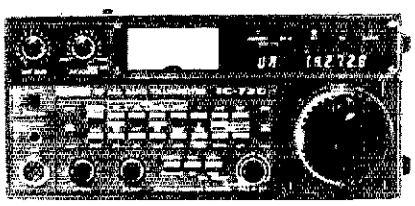

IC-720 Digital HF Transceiver with .1 to 30 MHz General Coverage Receiver. Covers all 9 HF Ham bands with at least 100 kHz each side. Broad band tuned & All Solid-State, including finals. Output Power SSB/CW - variable 10 to 100W continuous on all bands (10 to 40W - AM). 6 digit LED readout with 100 or 10 Hz resolution. Dual built-in Digital VFOs, AM, CW, SSB & RTTY filters plus narrow CW option. Passband tuning, RIT, VOX, semi break-in CW, metered ALC, fast/slow AGC, noise blanker, 20db RF attn., WWV, speech processor & full metering. Wired for computer & remote control. Built-in DC supply, optional AC supply/spkr. With mic. Req. 13.5 VDC/20A. ..... **Regular $1149.00**

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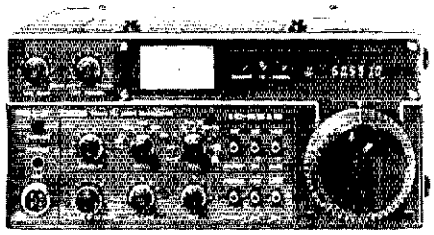

IC-551 All mode Microprocessor controlled 6 meter Transceiver. 50.000 to 53.999 MHz. w/100Hz/1 KHz resolution on SSB/CW and 10 Khz/1 KHz on FM. 6 Digit display. Output var. 1 to 10W. 3 memory channels w/variable speed scan and two Digital VFOs for split operation & variable offsets. Noise blanker, 13.8 VDC/117 VAC power supplies. 4½"h x 9¾"w x 10½d, 13½ lbs. ..... **Regular $449.00**

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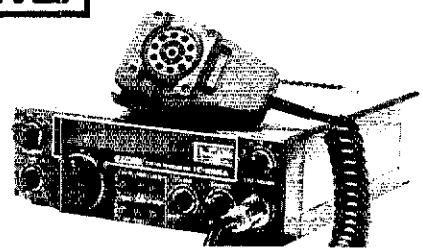

IC-255A 2meter FM Transceiver. Microprocessor controlled. Covers 143.800 to 148.195 in 15 or 5 KHz steps. 25 or 1 W output. Five memory channels with memory scan, adjustable rate and auto stop. 600 Khz offsets plus programming of any split with two built-in VFOs. Requires 13.8 VDC @ 5.5A. 7⅛"w x 2½"h x 9"d, 5½ lbs. ..... **Regular $389.00**

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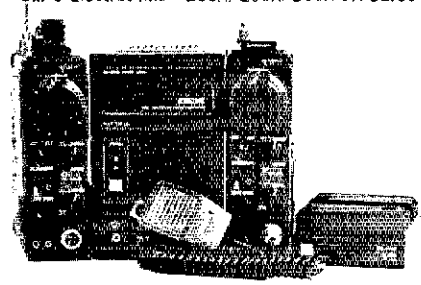

IC-202S (right) 2 meter portable SSB Transceiver. 3W PEP output. Uses regular "C" cells, optional Nicad pack/chgr or AC supply/spkr. With hand mic. whip antenna and strap.... **Regular $249.00**

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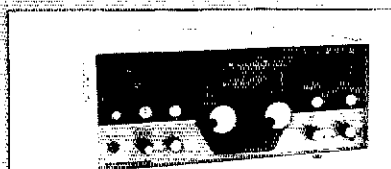

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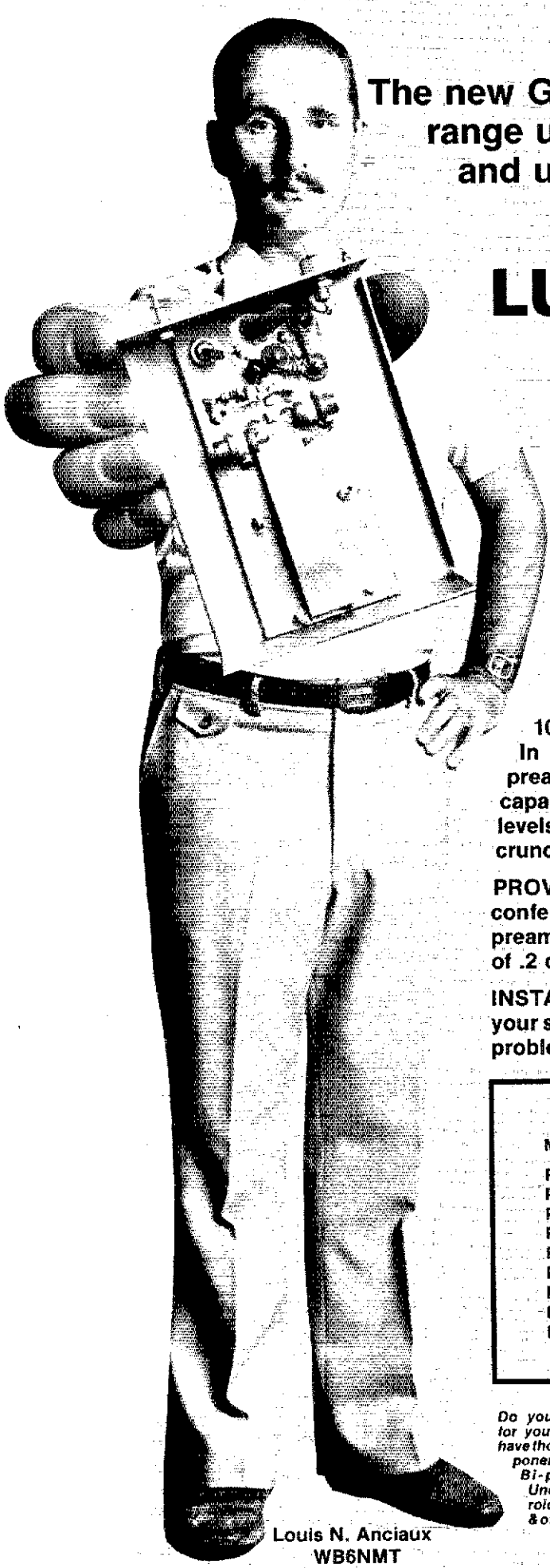

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PA 220	9 dB	1.9 dB	+1 dBm
PAD 220	19 dB	1.9 dB	+1 dBm
PAG 220	24 dB	0.2 dB	+11 dBm
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TWO Cardwell transmitting variable capacitors. Air-spaced 3800 volt. New in makers boxes. One split-stator 37-1250 mmfd a section. One single-stator 45-1115 mmfd. Best offer U.P.S. Want Collins R390A mechanical filter F455-N-40. Write ZL3DX 11 Glenavon Place, Christchurch 4 New Zealand.

WANTED SR160 or SR500 or SB33 with mobile mounting rack. Jan Harbeck DL8VT Pastorat Stellau D-2211 Wrist, FRG.

SPIDERS for boomless quads. Heliarc welded aluminum. Al's Antennas, 1339 South Washington Street, Kennewick, WA 99336.

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SERVICE by W9YKA. Professionnal grade lab, FCC 1st class license. Amateur and industrial ssb-fm equipment. Repairs, calibration, modifications, consultation. Reasonable rates; Write or call Robert J. Orwin, Communications Engineer, P. O. Box 1032, La Grange Park, IL 60525. 312-352-2333.

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ARGOS — Amateur Radio Component Service. VHF/UHF high power amplifier kits, parts and accessories. High voltage power supplies. Proven performance in world-wide use. Dowkey, Eimac, Bird, KLM. Sase for catalog. Fred Merry (W2GN) 35 Highland Drive, East Greenbush, NY 12061.

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WANTED: Pack set radios; PT-300, PT-400, MP-500, Porta Mobile. Repco, WABCO, Federal, RCA; working or non-working units needed. Also parts, cases, modules etc. for same; also need rf voltmeter; WB8IJX, Fred Slaughter, 5844 Grisell Rd.; Oregon, OH 43618 phone 419-698-8597.

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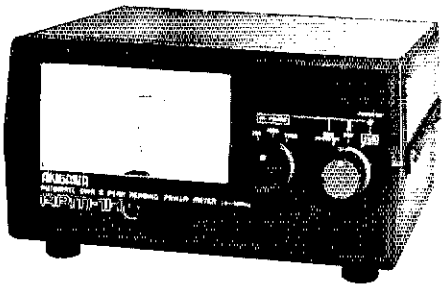

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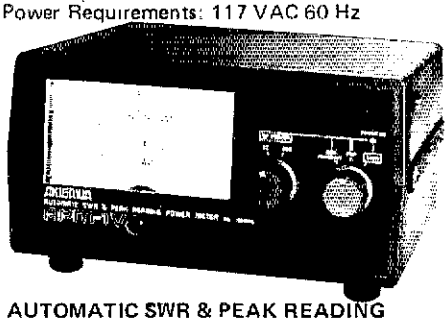
Frequency Coverage:	1.8 – 60 MHz
Input Impedance:	50 – 52 ohms
Power Range:	0 – 200, 1000, 2000W
SWR Range:	1:1 – 10:1
Power Modes:	Average & PEP
Accuracy:	±10%
Power Requirements:	117 VAC 60 Hz



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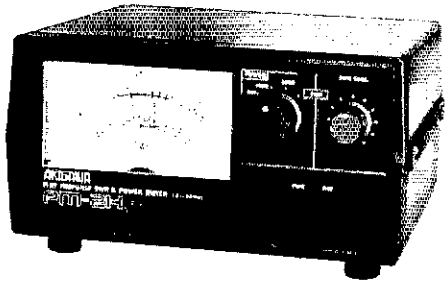
MODEL APM-1V $99.95

Frequency Coverage:	50 – 150 MHz
Input Impedance:	50 – 52 ohms
Power Range:	0 – 20, 200W
SWR Range:	1:1 – 10:1
Power Modes:	Average & PEP
Accuracy:	±10%
Power Requirements:	117 VAC 60 Hz



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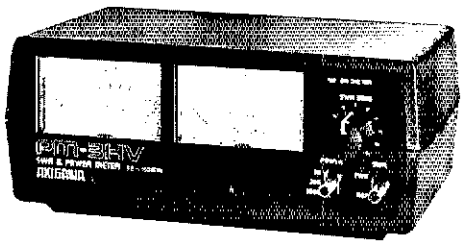
MODEL PM-2H $89.95

Frequency Coverage:	1.8 – 60 MHz
Input Impedance:	50 – 52 ohms
Power Range:	0 – 200, 1000, 2000W
SWR Range:	1:1 – 3:1
Accuracy:	±10%
Power Requirements:	None

FLAT RESPONSE SWR & POWER METER FOR VHF
MODEL PM-2V $89.95

Frequency Coverage:	50 – 150 MHz
Input Impedance:	50 – 52 ohms
Power Range:	0 – 20, 200W
SWR Range:	1:1 – 3:1
Accuracy:	±10%
Power Requirements:	None



SWR & POWER METER FOR HF/VHF
MODEL PM-3HV $54.95

Frequency Coverage:	3 – 150 MHz
Input Impedance:	50 – 52 ohms
Power Range:	0 – 20, 200, 1000W
SWR Range:	1:1 – 5:1
Accuracy:	±10%
Power Requirements:	12 VDC

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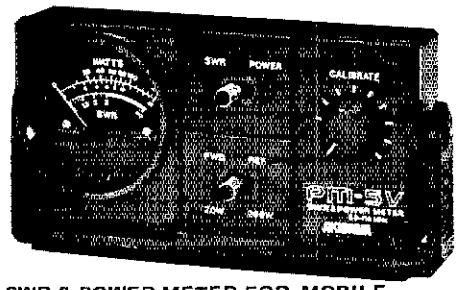
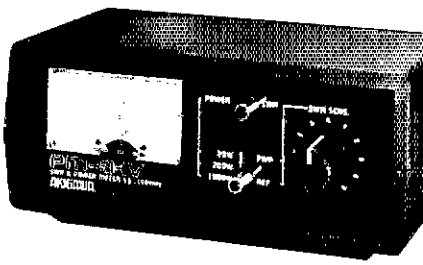


SWR & POWER METER FOR MOBILE
MODEL PM-5H (HF) $49.95
MODEL PM-5V (VHF) $49.95

Frequency Coverage:	1.8 – 30 MHz (PM-5H) 50 – 150 MHz (PM-5V)
Input Impedance:	50 – 52 ohms
Power Range:	0 – 20, 200 W ±10%
Power Requirements:	12V DC

Complete with directional coupler unit



SWR & POWER METER FOR HF/VHF
MODEL PM-4HV $44.95

Frequency Coverage:	3 – 150 MHz
Input Impedance:	50 – 52 ohms
Power Range:	0 – 20, 200, 1000W
SWR Range:	1:1 – 3:1
Accuracy:	±10%
Power Requirements:	None

Velcro for mobile mounting

MIKE COMPRESSOR WITH LINEAR AMPLIFIER
MODEL MCLA-1 $89.95

Compressor Section	
Frequency Range:	100 – 10000 Hz
Distortion:	Within 0.4%
Linear Amplifier Section	
Frequency Range:	300 – 10000 Hz
Gain:	25 dB (12V)
Power Requirements:	9 VDC

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MODEL AAF-1 $89.95

Filters:	Band Pass+Notch
Center Frequency Shift Width:	200 – 2500 Hz
Input Impedance:	8 – 600 ohms
Output Impedance:	8 ohms
Output Power:	1W max.
Power Requirements:	9 VDC 150 mA

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MODEL PR-1 $109.95

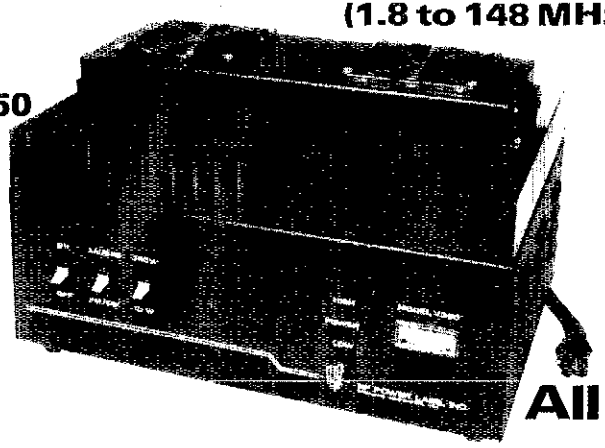
Frequency Coverage:	3 – 30 MHz
Gain:	20 dB at 7 MHz, Variable
RF Attenuation:	–20 dB & –10 dB
Input/Output Impedance:	50 – 75 ohms
Relay Power Capability:	200W CW
Power Requirements:	117 VAC 60 Hz

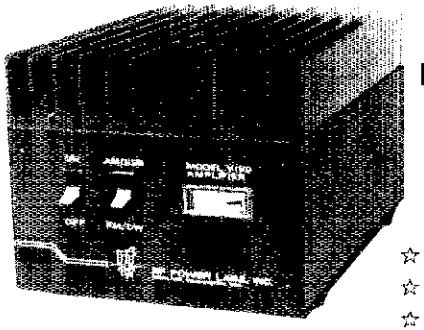
LINEAR POWER AMPLIFIERS

160 - 80 - 40 - 30 - 20 - 17 - 15 - 12 - 10 - 6 - 2 METERS

(1.8 to 148 MHz)

MODEL: V350





MODEL: V180

- ☆ Built-in 115/230 VAC Supply
- ☆ AM-FM-CW-SSB-RTTY
- ☆ 60dB Harmonics
- ☆ 60dB Spurious
- ☆ Heavy Duty Design

All Solid-State!

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- ☆ Automatic T/R Switching
- ☆ VSWR Protected
- ☆ + 13V/3A Accessory Socket
- ☆ U.S. Manufactured

MODEL	FREQUENCY	INPUT	OUTPUT	SIZE WxDxH	WEIGHT	FAN KIT REQUIRED	PRICE
**C500X	2-22MHz	15-40W	500W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	$1395.00
A1000	160-15 Meter	50-100W	600W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	1395.00
**A1000X	160-10 Meter	15-40W	600W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	1395.00
V76	50-54MHz	8-15W	100-120W	216x330x178mm	11.7 kg (26 lbs)	No	399.00
V360	50-54MHz	5-10W	400-450W	432x330x203mm	23.4 kg (52 lbs)	Yes	1085.00
V70	144-148MHz	10-15W	75-90W	216x330x178mm	11.7 kg (26 lbs)	No	349.00
V71	144-148MHz	1-3W	75-90W	216x330x178mm	11.7 kg (26 lbs)	No	399.00
V180	144-148MHz	5-15W	170-200W	216x330x178mm	13.5 kg (30 lbs)	CW & FM	599.00
V350	144-148MHz	10-20W	350-400W	432x330x203mm	23.4 kg (52 lbs)	Yes	1085.00
F110	Fan Kit, 115VAC			135x135x50mm	1 kg (2.2 lbs)	—	$ 39.00
F220	Fan Kit, 230VAC			135x135x50mm	1 kg (2.2 lbs)	—	39.00
*F135	Fan Kit, 115VAC			381x140x89mm	3.2 kg (7 lbs)	—	75.00
*F235	Fan Kit, 230VAC			381x140x89mm	3.2 kg (7 lbs)	—	75.00
RM-1	19 Inch Rack Adaptor			483x3x178mm	1 kg (2.2 lbs)		29.00
*RM-2	19 Inch Rack Adaptor			197x32x28mm	.5 kg (1.1 lbs)	—	19.00

* Used with the V360, V350, A1000, A1000X, C500X /
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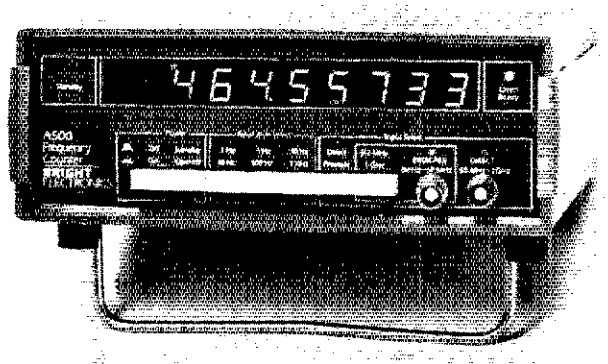

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Resolution 50Hz-50MHz (Best available gate times vary)	.1Hz	1Hz
50MHz-500MHz	10Hz	10Hz
500MHz-1100MHz	NA	100Hz
Accuracy over Temperature	.1 PPM 17°C.-30°C.	.1 PPM 17°C.-30°C.
Sensitivity 50Hz-50MHz	1-10MV	1-10MV
50MHz-500MHz	10-50MV	10-50MV
500MHz-1100MHz	NA	50-100MV
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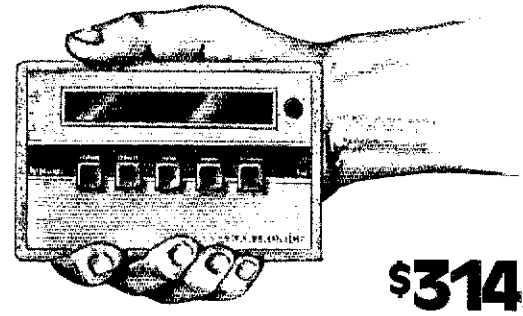

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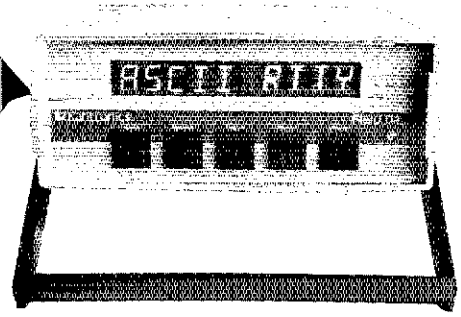

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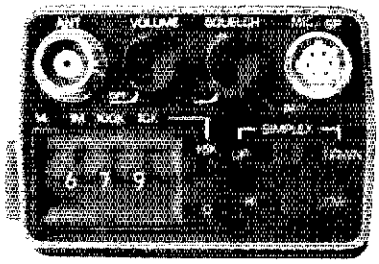

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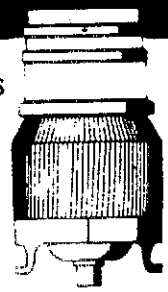

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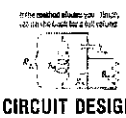

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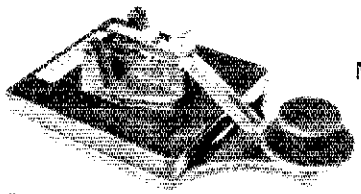

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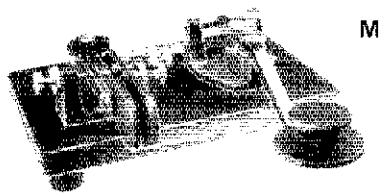

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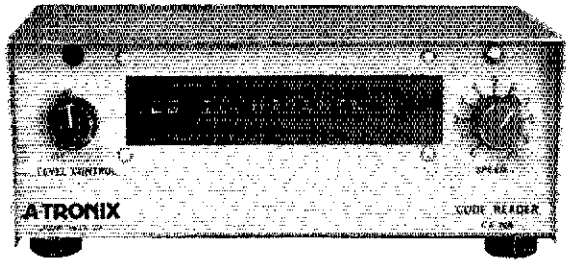

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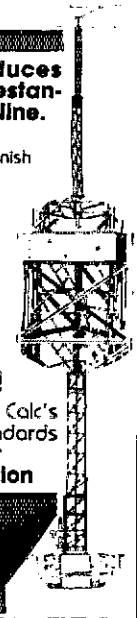

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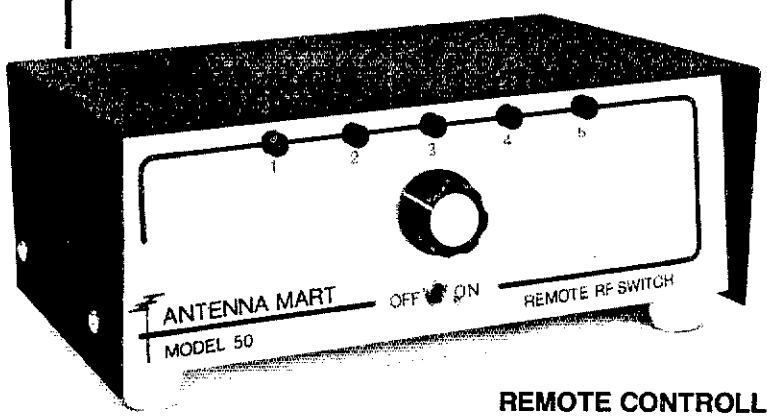

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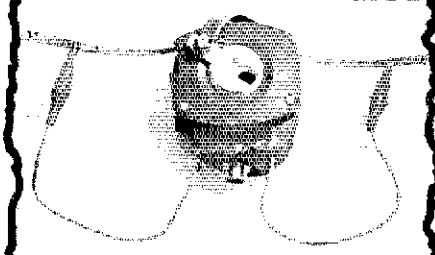

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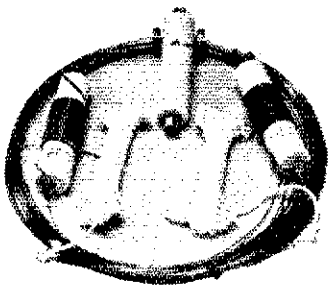

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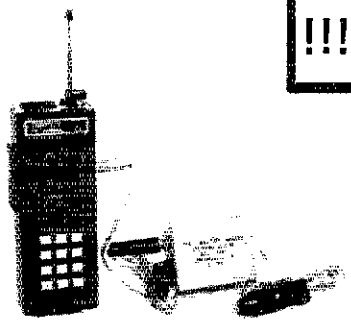

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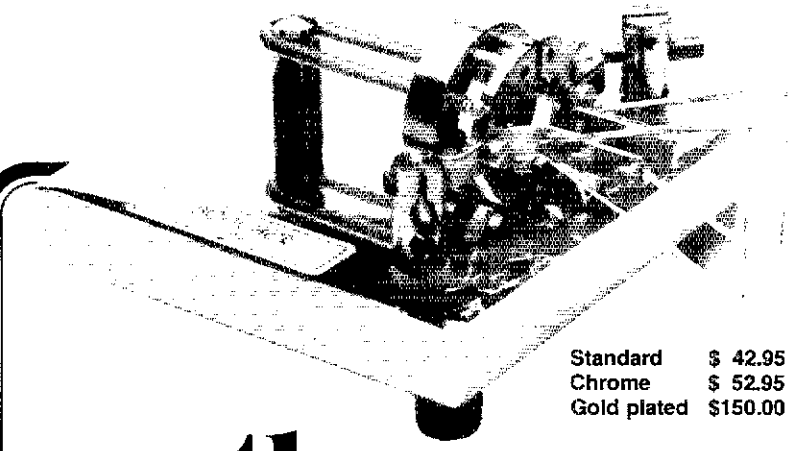

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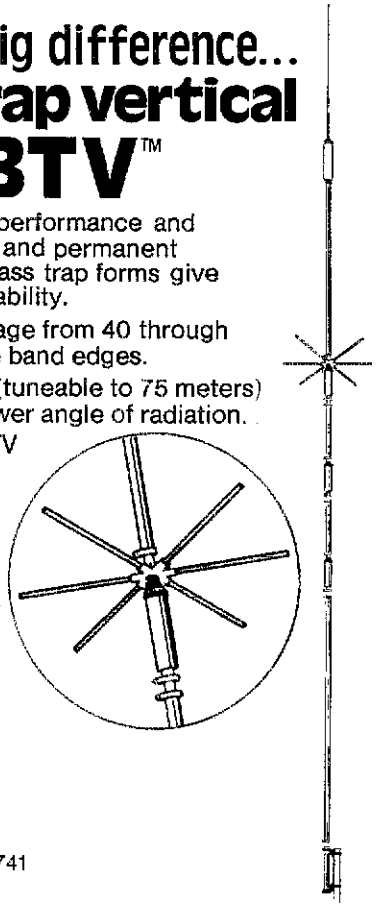
For the big difference in performance, it's the Hustler 5-BTV antenna.



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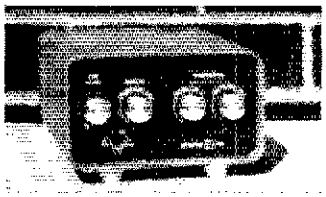
** Plus a Special Patented CW Processor **



SL-56
Audio Active Filter
(3.5 × 5.5 × 7.5 Inches)

The brand new SL-56 Audio Active Filter supercedes our SL-55 in both concept and performance. Consolidation of many components has allowed us to make 13 operational amplifiers (compared to 6 in the SL-55) into a filter guaranteed to out perform any other at a cost only slightly higher than the SL-55. The features of the SL-56 are so advanced from its predecessor that calling it the SL-55A is not justified. Unlike other filters that simply offer a choice of one or two filter types at a time (notch, bandpass, etc.) SL56 provides what is really needed - the simultaneous action of a 6 pole 200 Hz fixed highpass filter and a 6 pole 1600 Hz fixed lowpass filter with a 60 dB notch which is tunable over the 200-1600 Hz range. This 3 filter combination is unbeatable for the ultimate in QRM free SSB reception. Adjacent channel QRM is eliminated on the high and low sides at the same time and does not introduce any hollowness to the desired signal. On CW the SL-56 is a dream. The lowpass, highpass and notch filters are engaged along with the tunable bandpass filter (400-1600 Hz) providing the needed action of 4 simultaneous filter types. The bandpass may be made as narrow as 14 Hz (3dB). Additionally, a special patented circuit follows the filter sections which allows only the peaked signal to "gate itself" through to the speaker or headphones (8-2000 OHMS). Receiver noise, ring and other signals are rejected. This is not a regenerator, but a modern new concept in CW reception. The SL-56 connects in series with the receiver speaker output and drives any speaker or headphones with one watt of audio power. Requires 115 VAC. Easily converted to 12 VDC operation. Coal black cabinet and wrinkle gray panel.

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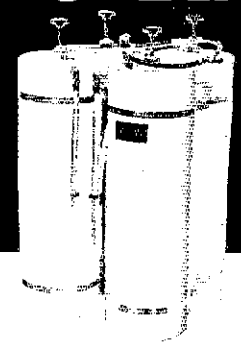

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WANTED: Midland 13-509 220 Rig or equivalent. B. Kampe, WA1POI, 203-666-1541, 7:30 AM - 5:30 PM EST Mon-Thurs.

FOR SALE: Argonaut 509, P.S. 251 (never used), linear 405, ammeter 207 key, antenna tuner MFJ 16010, all mint, all for $400. Also ps POS-1220 Z, 20 A, reg. $40. Also Palomar R-X noise bridge mint $25. Hustler vertical 3 band plus appx. 50 ft. coax $25. WD5DOG, 1106 Greenbriar, Lafayette, LA 70503.

SELL — heathkit SB200 amplifier with 10 meters. Excellent condition. $290. I ship. KB5XW, 405-738-5344.

MINT Collins 75-S-3-B. $575. WA5YTX 505-988-4681.

MINT Collins S-Line, 75S3B w/factory mod, 32S3B, 312B-4 console, 516F2, with all cables and books, $1500; Magnum Six processor, $100; Icom-245 $265; Clegg FM27-B $125, SB220 $450, all U-ship. Wanted 901DM accessories and TS180. K3ZA 215-486-0490 or K3JFZ 302-856-3704

FT-101B: excellent condition 10-160M, cw filter, mic, only used occasionally, $550. K2TSD 201-270-4379, 30 St. Thomas Ave., Toms River, NJ 08753.

RTTY Info-Tech M-150 keyboard and M-75 Video Converter $295. K4CUU 205-766-4175.

DRAKE T4XC, R4C, MS-4, AC-4, 7079 mike, keyer, 250 Hz filter, $975. TR-22C, mobile mount, crystals $145. WBØMKE, 636 Clayton, Denver, CO 80206. 303-399-7570.

HEATH HW-101, HP-23-C, cw filter, manuals, some spare tubes. Carefully maintained clean late model in peak operating condition. Satisfaction guaranteed, $375, delivered. AJ2A Elenore, RD 1, Canajoharie, NY 13317. 518-673-5030.

FOR SALE: complete ham station, Collins, Drake, Hallicrafter, all clean and excellent condition, some as new; accessories, Yagis, towers, very reasonable. S.a.s.e. for list and prices. Paul C. Tamas, 843-1/2 N Alfred Street, Los Angeles, CA 90069.

TO SETTLE estate — Yaesu FT-901DM transceiver, Yaesu SP-901P, 20-meter beam Hy-Gain 204BA, Tx and Rx tubes — all kinds, and meters. Write for list. Approx. 1000 QST and CQ Mag., assorted years. No reas. offer ref. Tony Kindle, Perth Rd., Amsterdam, NY 518-843-0369.

KENWOOD TS-120S $525. ICOM IC-202 $200. Genave GTX-1T with accs. $195. N4APN 615-970-3684.

SELL: Heath HW18-3 xceiver 160 meters with Heath ac HP23 power supply homebrew VFO homebrew speaker all excellent working cond. tubes good you pay shipping $75 for all WA5WBN, P. O. Box 447, Corrales NM 87048 505-898-3230

HEATH SB-102, SB-600, HP-23, $350. 312-459-4557. N9AFF.

KENWOOD TS-820S, cw filter, new in box, TS-520S, cw filter and dc-dc power supply. K2OG. Call days 609-451-7709.

TOWERS — 90' crank-up, tilt-over aluminum, $1,500. 70' steel self-supporting, $550. Both dismantled and in good condition. Two-meter, 32-element array, $60. No reasonable offers refused. Ron, W8JPG, 216-699-9975.

FOR SALE: Collins R390 receiver $385. TMC ssb conv MSR-9 $115. Drake R4B receiver $345. Heathkit DX60B transmitter $80. Dentron Super Tuner $85. HyGain trap dipole 5BDQ $45. Archer TV rotator $45. All manuals. Call 914-769-6228 evenings or weekends WB2DPF.

VHF: TS799 SP-$400; TS600 — $400; Standard 146A HT + TT pad — $100. WB3CDE 215-847-5065.

SELL National NCX5 MKII matching p/s and VX501 VFO. Crystal calibrator, mint $425. Drake 2C-2CQ receiver & speaker/Q multiplier, calibrator noise blanker mint $225. Henry Vander 516-735-5804.

WANTED: New or used Newtronics Cliff-Dweller dual band 80-40 meter antenna. G. Mitchell, K6ZE, 1901 50th St., San Diego, CA 92102

WANTED: New or like new 4CX1000A or 4CX1500B. W9QYH, 1605 Ridge Rd., Green Bay, WI 54304.

COLLECTORS "Bug" key, Electro-Bug has pulsed magnet for 'dits.' Best offer considered. WØCPM estate, 1729 So. 86 Ave., Omaha, NE 68124.

DRAKE T4XC with AC4 $450. Kenwood TS700A with internal preamp $400. All excellent. M.N. Busch, 233 Hamlin Road, North Brunswick, NJ 08902 201-297-3585.

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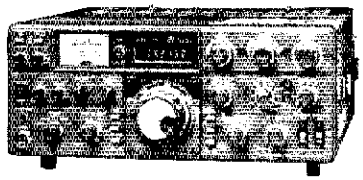
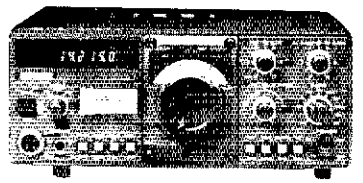


KENWOOD TS-830S



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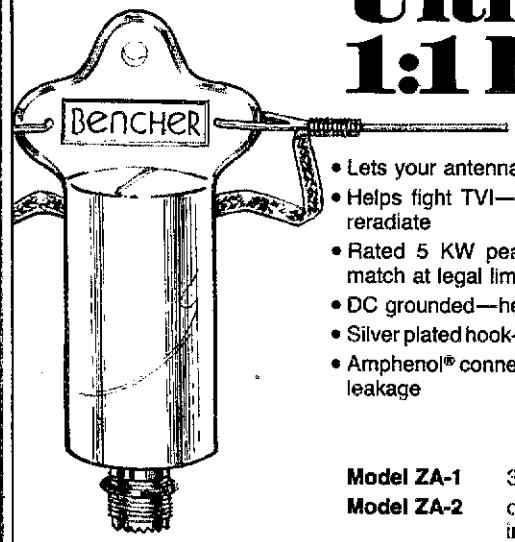

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5	4 band, 8 channel crystal	$ 94
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BX-64	Free standing-64' (6 sq. ft.)	$ 349
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HBX-56	Free standing-56' (10 sq. ft.)	$ 335
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HDBX-48	Free standing-48' (18 sq. ft.)	$ 299
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FK2568	68' 25G Foldover tower	$ 799
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FK4558	58' 45G Foldover tower	$1029
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1/2	EJ (1/2" Eye & Jaw Turnbuckle)	$14
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RG8X	Bertex min. 8 Low Loss Foam	$14/100 ft. $60/500 ft.
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Alliance U-100	$ 38
C.D.E. CD-45-2 (8.5 sq. ft.)	$ 99
C.D.E. HAM-4 (15 sq. ft.)	$ 169
C.D.E. Tailtwister (30 sq. ft.)	$ 249

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Fuzzbuster III	$ 99	Fuzzbuster Elite	$ 169
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Super Fox Remote..	$ 279		

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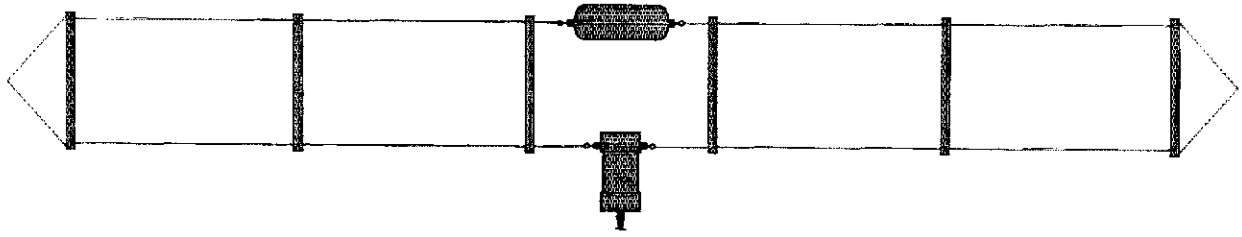

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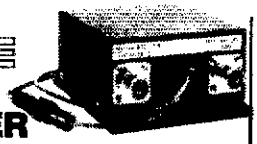

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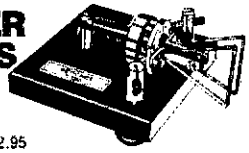

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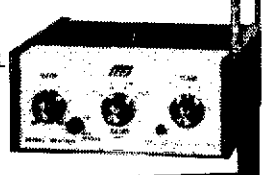

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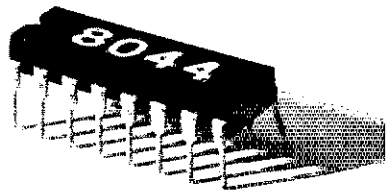

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COLLINS 75A-4 (SN 5,561): recently aligned and serviced by K1MAN; very good condition; $400 or best offer. Ed Schmults, W2VNA, 68 Pheasant Ln., Greenwich, CT 06830; 203-661-3167

COLLINS S line 32S-1 transmitter, 75S-1 recev 200 cyl cw filter, 516F2 power supply, 316BS speaker winged $600. Ray Tompkins, 26 Sylvan Ave., Terryville, CT 06786 203-582-5915.

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DIGITAL TR7 with SL300 filter AUX7 board, PS7 power supply, RV7 VFO 444 mike, MN2700 tuner, Clipperton amplifier, $2,400. Used only as receiver for short time. R. Area 305-885-9024

SATELITE 70 MHz Demodulator Circuit Board. Audio and video outputs. Uses easy to obtain parts. Circuit board, schematic, instructions $20. Thomas M. Haynie Route 2, Box 496B Honea Path, SC 29654 1-803-338-9594.

YAESU FT-101Z with cw filter. Near new. $595. Ten-Tec Argonaut 515 with cw notch filter. Mint. $329. WB7VOO 602-298-4820

SELLING Swan 350 with VOX cw sidetone $250 K9JPS 126 Eau Claire Wausau WI 54401 715-845-7007.

HEATH HW-101 (cw filter) HP-23, mike, manuals $300. John WA1AGN 618-746-4255 after 5 CST.

WANTED: Hammarlund SP-600-VLF or SP-600-JLX. State price and condition. Robert Holzaptel, WA8GJH, 7249 Old National Road Est, Richmond, IN 47374.

GLEGG HT146 2 meter with nicads, desk charger, external microphone, case, rubber duckie, manual, 52/52, 16/76, 19/79, 25/85, 31/91 $130; Dentron 80-10 AT Random Wire Tuner $30; VHF Engineering PA2501H amp 1 in 25 out $40. KA4DKH; 102 Westridge; Tallahassee, FL 32304

COLLINS filters: F455FA05 $95, F455FA08 $75, X455Q200 $125, F455J31 $50, F455J05 $95, Randy Schaaf, Box 301, DePere, WI 54115.

SELL: Kenwood VFO-520S. Matches TS-520 and TS-520S. Mint. $86. Bill, W3IGU. 215-688-2976

DRAKE T-4X, R-4A, AC-4, MS-4, plus all cables and manuals. Original owner all mint, $700. Dick Wilson, KV4B, 8800 Oak Valley Lane, Chattanooga, TN 37421. 615-892-4181.

GLEGG FM-27B 2 meter fm transceiver, 25 watts, 146-148 MHz, Fully synthesized. Touch Tone pad $180. WB8YTQ, John Slavik, 906 Broadway, Bedford, OH 44146. 216-232-8132.

TR7/DR7 modification information for transmitter coverage of WARC-MARS (transmit complete from 1.5 -30 MHz). Color photo and description of modification. Takes minutes, no circuit board removal. Please include call letters with remittance $20. Gene DeFoe, WA7SRI. Box 211, Shoshoni, Wyoming 82649

SELLING: Perfect HW-8 and HWA-7-1-PS Added two speakers (one internal with switch), pin connector for battery operation. Ant. and p.s. connectors changed to Amphenol and American Phenolic type. All in one cabinet with handle. Also: SWR/wattmeter — Heath HW2102 (50 Mc to 160 Mc) best offer. W2VLH.

71' TRI-EX T-471 crank-up tower with winch, guys, manual. Good, older tower. $300. KA5IFU, Jack Nichols, 1105 Dallas, Plainview, TX 79072 806-293-8067.

WANTED: Johnson Viking "Kilowatt" with instruction manual, matching accessory desk and three drawer pedestal. Must be mint condition. John Crosby, K4XA, P. O. Box 463, Albany, Georgia 31702. 912-883-7373.

HEATHKIT SB401 180 watt transmitter, mint. Total operating time 15 hours. $225. W1IKL 177 Clinton Dr., South Windsor, Conn 06074.

YAESU FR Dx 400 receiver (2-160 m) $250; FL Dx 400 transmitter (10-80m) $250. Free Johnson TR Switch with pair Justis W3QQ, Box 275, Bear DE 19701.

HEATHKIT HR-1680 ssb/cw rcvr, HS-1661 matching speaker Excellent $175 E-Z Way telescoping tilting tower forty feet $150. K1YZ 617-358-7450.

WANTED: KWM2A, with power supply. Good condition, reasonable price. WA3LKY, L. Daniels 22 Ridge, Lansford, PA 18232

ANTIQUE Diamond T radio, no tubes, rough but restorable; A-K model 60; A-K model 61; A-K model 30; Balkite model A-5, last four with tubes and in good condition. $75 each. Box of antique headfones, condensers, coils, dials, cabinet fronts, tubes etc. $40. Farrand, tall, thin, oval speaker $45; two A-K Model F-6A speakers $30. each; Magnavox table, cabinet speaker $25. A-K model H horn speaker $45. Brandes cathedral speaker $50. Expert packing and shipped UPS included. WA1IWV 207-266-5461.

WANTED: 8005 6AV5, 6BX7 tubes. Marcus, WA9IXP P. O. Box 385, Elm Grove, WI 53122, 414-475-5356.

SELL Johnson 275 MatchBox, Heathkit antenna tuner, Collins MP1 mobile supply 12 volt, antenna rotar CDE Tailtwister, Collins KWM2A mobile 351D2 mount Super Hustler 20 meter mobile antenna PL-4400A tubes, RCA Senior Volt ohmyst SkyChampion S20R 1926 ARRL Handbook W2IV, Argyle New York zipp 12809

ROSS all new specials: Icom IC2AT $249.50 IC 720 $1149, IC 255A $300, IC 701 AC, mic, $1000, IC 260A $429, IC 502A $200, Kenwood TS 130S $669.90, R 820 $900, VFO 180 $137.50 SP 180 $60, TR-2400 $347.70 TS 600 $629, TR 7800 $354.20, Drake R7/DR7 $1259.18, TR/DR7

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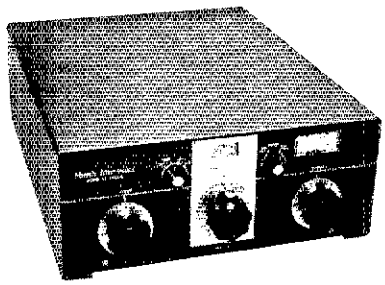

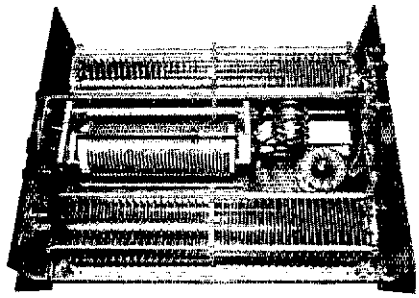

Specifications

- *Continuous tuning 10-160 meters
- *Front panel function switch -in and out - dummy load (not supplied) - ground
- *Handles any antenna system, dipoles random wires, verticals, whips, beams, open wire line
- *Built in heavy duty 4 to 1 balun, 3 cores
- *Ceramic rotary inductor, #8 gauge wire
- *Turns counter for precise tuning
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- *Provides an SWR of 1 to 1 to the transmitter
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- *12"w x 15½"d x 5"h
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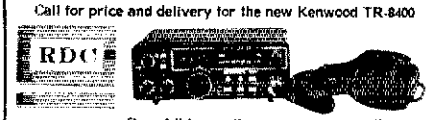

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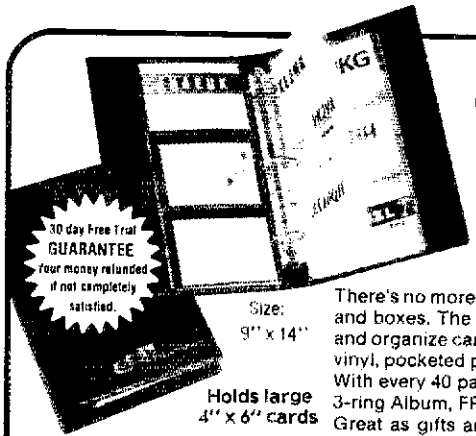

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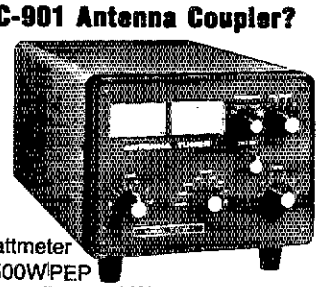

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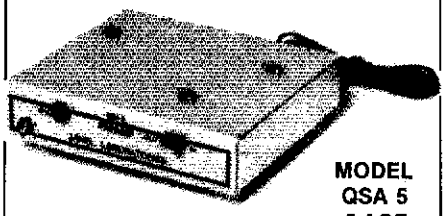

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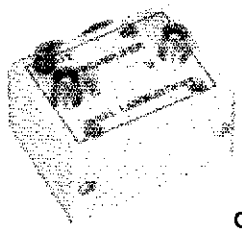

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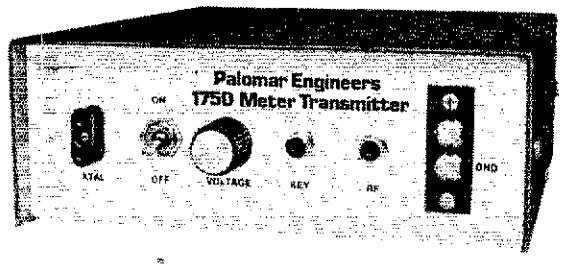

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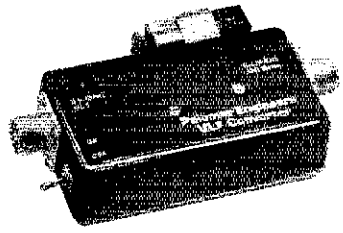

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WILSON WE-800, synthesized, with TTP and batteries. $245. W2UP, 315-473-5940 (eves), or Callbook.

HEATHKIT SB303 built in cw filter SB600 speaker manuals, extender boards. Fine condition $240. Freight negotiable. WA6NDP 714-846-0237 Huntington Beach, CA 92649.

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		100	1.8	5.9
		200	2.6	8.5
		300	3.3	10.8
		400	3.8	12.5
RG8/u Regular .77 VF	8237 28¢/ft.	100	2.0	6.6
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		900	7.8	25.6
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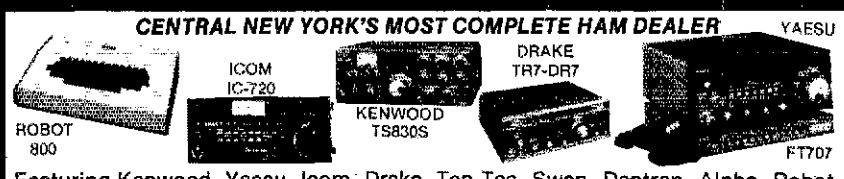

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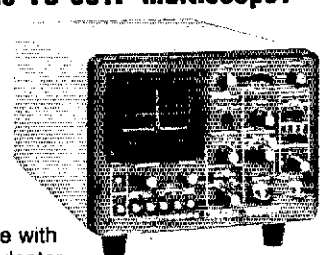

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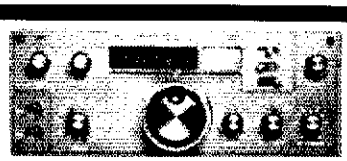

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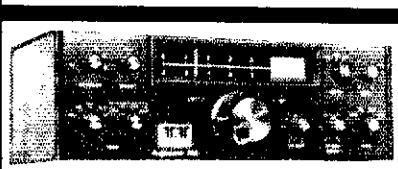

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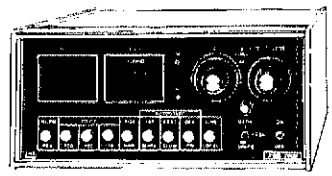

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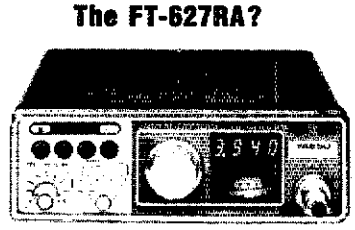

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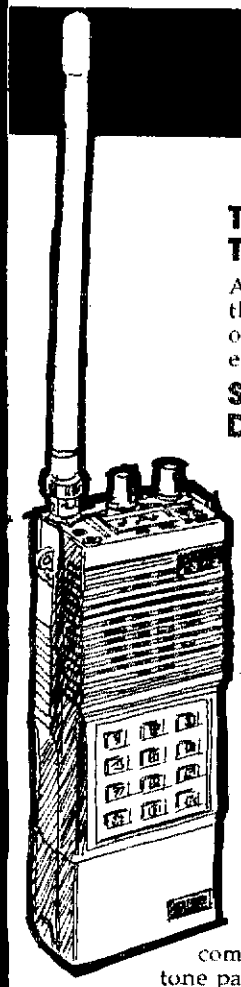

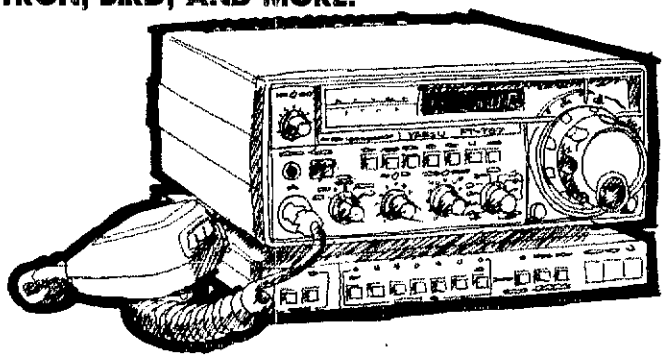

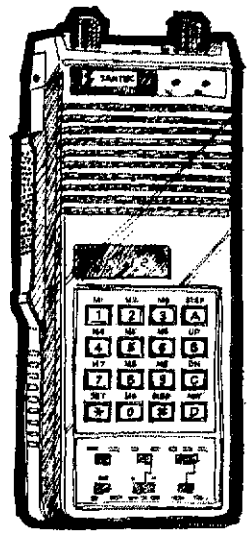

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WANTED: GPR-90 receiver Russ Smith Box 5212 Fresno, CA 93755.

ALUMINUM tower 40' $315, 80' $1095. Can be combined to 120', both $1300. New Hvy Duty 2" x 20' mast $195. W5ILR 804-483-2882.

SCANNERS: TR-9000 and IC-280 Memory Scanner $39.95, IC-280 Band Scanner $29.95, assembled/tested, installs easily, satisfaction guaranteed! ISCAN, Route 1 Box 90A, Antioch, IL 60002.

WANTED, radio direction finder installation with manual from an old C-2, C-3, T-1, T-2, Liberty, Victory, or other ship of the period. W4ZWD.

HEATHKIT SB-610 Monitor Scope $70. Swan 210 external VFO for Swan 250 six meter transceiver $70. K5EFW 505-877-2731.

FOR SALE: Hammerlund HQ170 receiver with matching speaker & manual, $125. Elmo Baese WA5WZX, 826 E. College St., Seguin, TX 78155

MOTOROLA MOTRAC X63HHT-1190A four channel vhf mobiles complete with all accessories — 80 watts output — Dage Electronics 8078 Lochdale, Dearborn Hts., MI 48127, 313-278-5179.

DENTRON MLA2500B 2kW amplifier with 10 meters — 6 months old — 15 hours operating time — like new. $745. Ross, Box 138 Sergeantsville, N.J 08557 — 609-397-3255

SELL: Collins round-emblem KWM-2 with DX speech processor, 516F-2 a.c. power supply, speaker; $950. Heath HO-10 monitorscope $50.; Clegg FM-88S 2 meter synthesized transceiver (like new) with scanner and memory including 5/8 Larson whip plus trunk and gutter mounts $410. William E. Trumbull, M.D., WA6DTP, 2021 Santa Monica Blvd., Suite 540-E Santa Monica, CA 90404, 213-829-4469.

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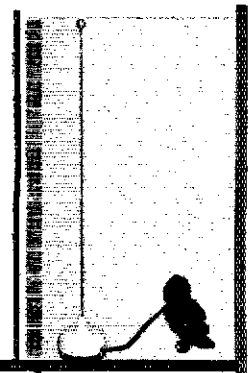

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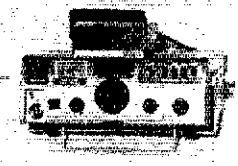

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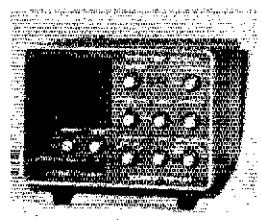

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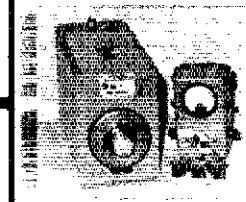

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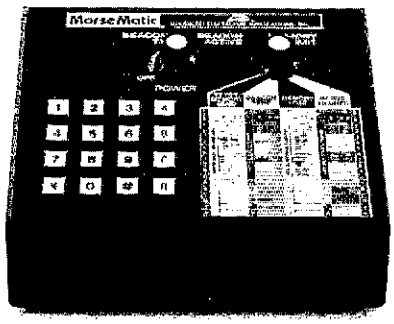

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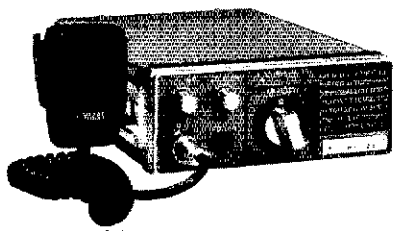

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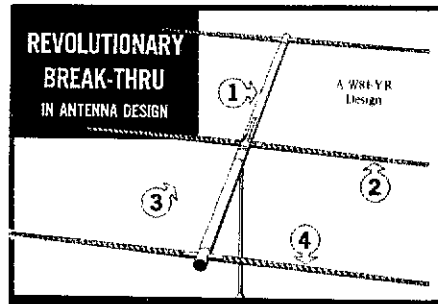

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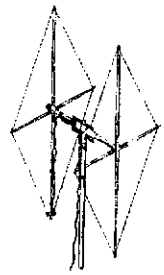

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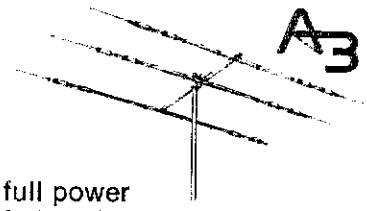

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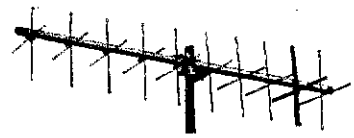

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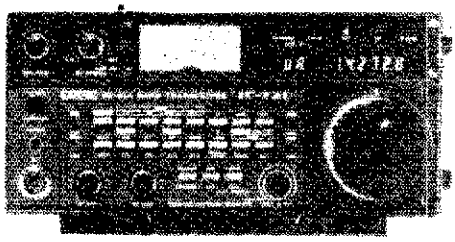

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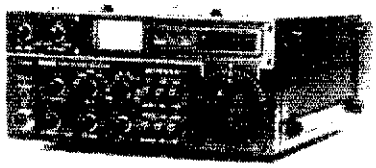

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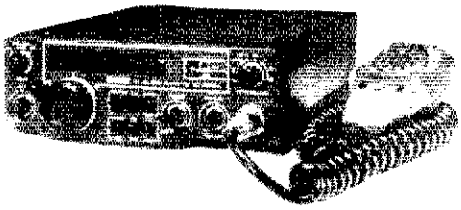

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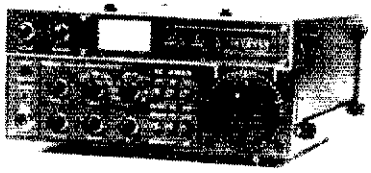

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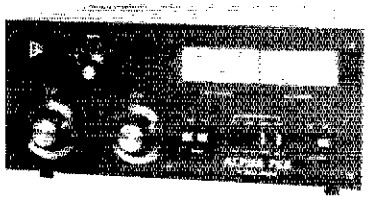

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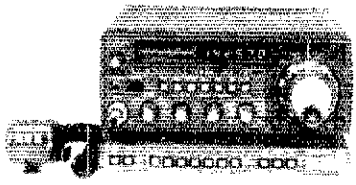

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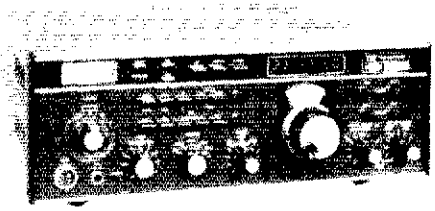

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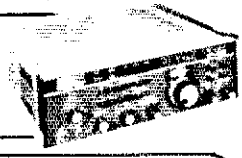

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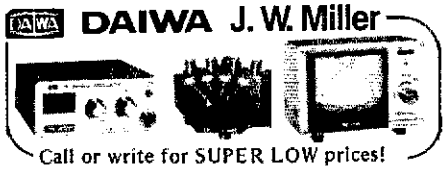

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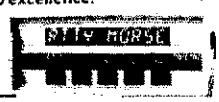

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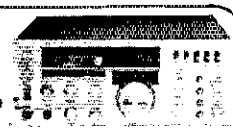

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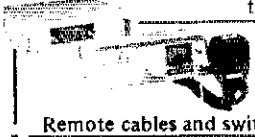

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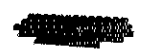

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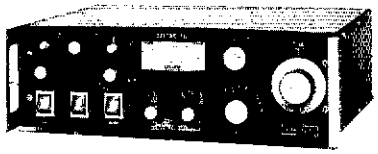

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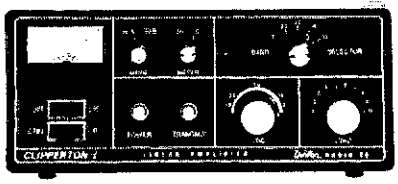

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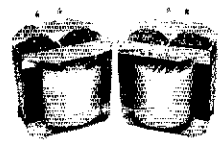

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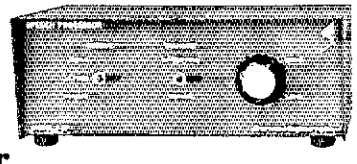

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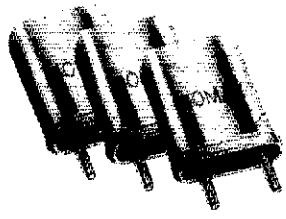

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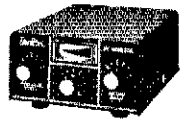

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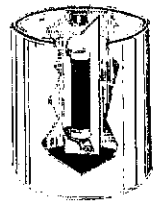

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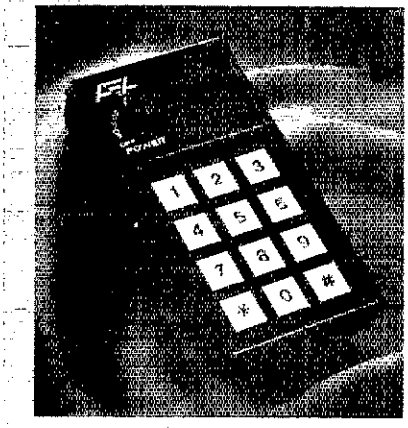

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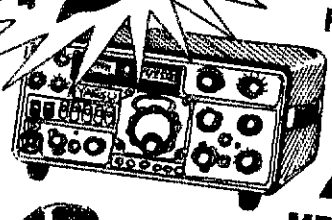

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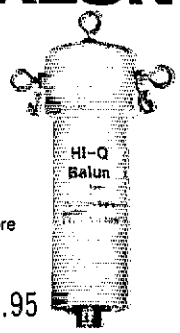

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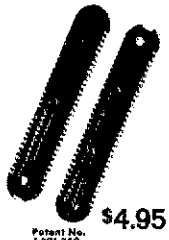
Replaces center insulator
Handles full legal power and more

$5.95 With SO 239 connector

HI-Q ANTENNA END INSULATORS



Rugged, lightweight injection molded of top quality material with high dielectric qualities and excellent weatherability. End insulators are constructed in a spiral unwinding fashion to permit winding of loading coils or partial winding for tuned traps.

May be used for
- Guy wire strain insulators
- End or center insulators for antennas

$4.95
- Construction of antenna loading coils or multiband traps

Patent No. 4,091,350

DIPOLES

MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
Dipoles				
D-80	80/75	130	$29.95	$24.95
D-40	40/15	66'	25.95	21.95
D-20	20	33	15.95	13.95
D-15	15	22'	13.95	11.95
D-10	10	16	12.95	10.95
Shortened dipoles				
SD-80	80/75	90'	21.95	17.95
SD-40	40	45'	18.95	14.95
Parallel dipoles				
PD-8010	80/40/20/10/15	130'	39.95	32.95
PD-4010	40/20/10/15	66'	33.95	28.95
PD-8040	80/40/15	140'	45.95	37.95
PD-4020	40/20/15	66'	34.95	28.95

Dipole shorteners - only, same as included in SD models

S-80	80/75	$11.95 pr
S-40	40	$10.95 pr

All antennas are complete with a HI-Q Balun or HI-Q Antenna Center Insulator, No. 14 antenna wire, ceramic insulators, 100' nylon antenna support rope (SO models only) 50-1 rated for full legal power. Antennas may be used as an inverted V and may also be used by MARS or SWLs.

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Nylon guy rope 450# test 100 feet	$3.49
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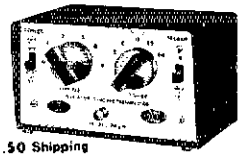

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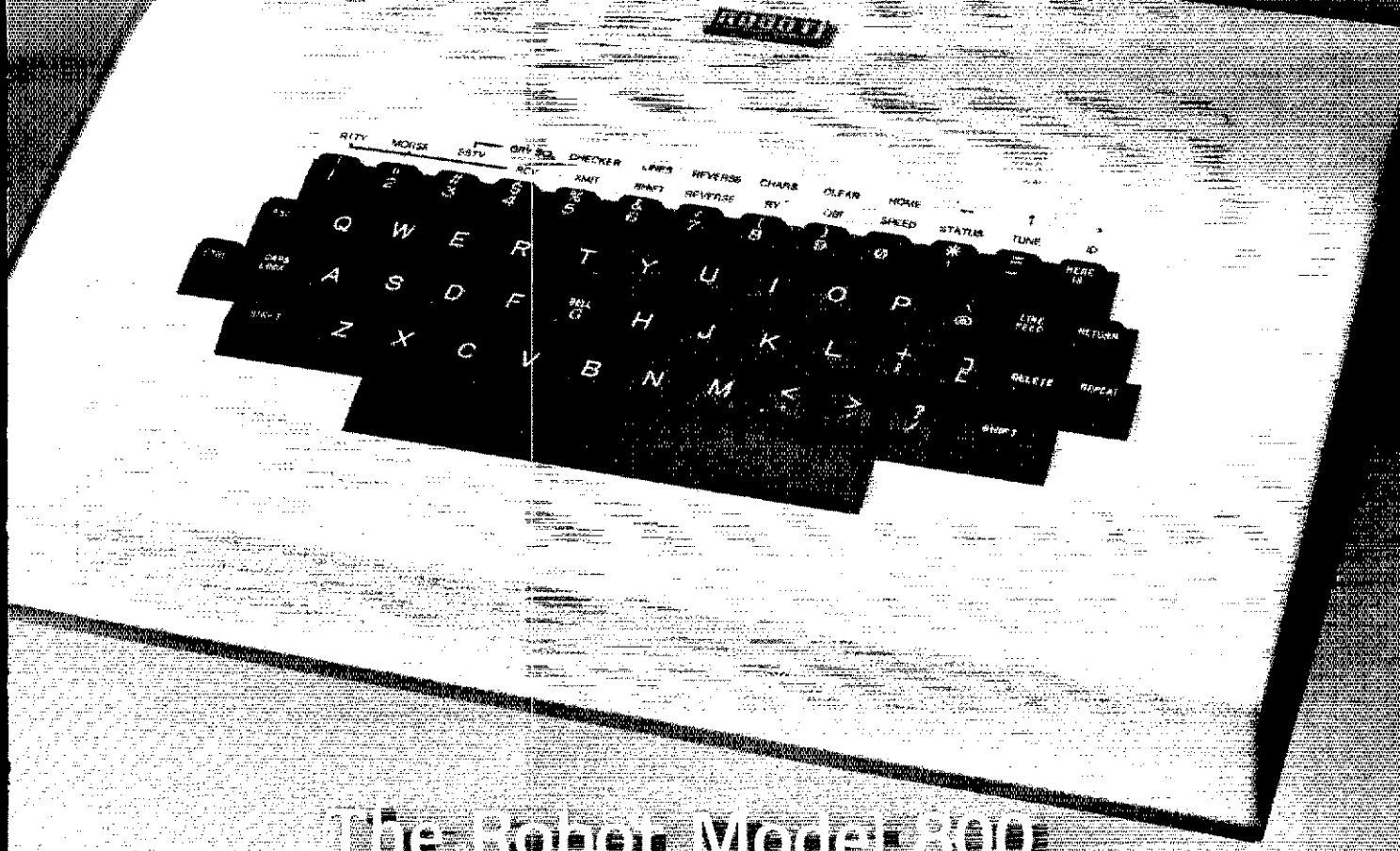

The Robot Model 800 SUPER TERMINAL

Not just a keyboard, but the first integrated specialty mode terminal.

The Model 800 Super Terminal offers a complete list of features and capabilities, including our built-in demodulator, all in one package that connects directly with your amateur station's transmitting and receiving equipment. All that's needed to have a complete operating system is the addition of a standard TV monitor.

BAUDOT/ASCII OPERATING FEATURES

DISPLAY: Full 24 line by 72 character standard TTY display.

WORD MODE: Transmits a complete word each time the space bar is depressed. Any mistakes made in the word can be edited out prior to transmission.

LINE MODE: Transmits an entire line when the carriage return line feed key is depressed. Allows editing of the entire line prior to transmission.

AUTO START: The Model 800 writes characters on the screen only after detecting the presence of an incoming RTTY or ASCII data signal. This prevents printing of unwanted random characters on the screen while tuning or during gaps in reception.

PROGRAMMABLE WRU (WHO ARE YOU) AND SELCAL FEATURES: Upon receiving a user programmed 8 character code, the Model 800 will automatically key the transmitter and transmit one of its 64 character (HERE IS) messages. Upon receipt of the user programmed 8 character SELCAL code, the Model 800 will automatically go into receive mode and store up to a full page of received information in its display memory.

HERE IS: The Model 800 has two 64 character programmable HERE IS messages.

ON SCREEN STATUS INDICATOR: A status line at the top of the screen tells the operator exactly which combination of operating modes have been selected.

ON SCREEN TUNING INDICATOR: Accurate tuning is an absolute requirement for accurate trouble-free reception during poor signal conditions. The best results are obtained when the output of the mark and space discriminator filters are equal in amplitude. The on screen tuning indicator in the Model 800 is the "plus-plus" type, which provides this information.

CURRENT LOOP KEYER FOR HARD COPY

PROGRAMMABLE NARROW SHIFT ID

DEMODULATOR: The demodulator built into the Model 800 is superior in quality to any RTTY demodulator offered on the market. The key feature which makes this claim possible is the use of separate two tone active discriminator filters for demodulation of the RTTY signal.

ADDITIONAL ASCII OPERATING FEATURES: The Model 800 will send and receive ASCII at 110 baud. It has all of the transmission and editing features of the RTTY mode.

SIMPLE TO OPERATE

One of the most important features to keep in mind with the Model 800 is that all functions that are used frequently are easily accessed by the user. Many competitive units boast elaborate features which are either not used in amateur operation or that require complicated access procedures which make them inconvenient. All of the frequently used control functions in the Model 800 are either associated with a key which is labeled with the function, or have silkscreening above the key which describes the function.

MORSE CODE OPERATING FEATURES

OPERATION: The Model 800 has all of the transmission and editing modes of RTTY during Morse code operation.

MORSE AUTOTRACK: The Model 800 automatically tracks incoming code without manual speed adjustment. The speed range for transmission and reception is 3 to 99 words per minute.

SIDE TONE OSCILLATOR: The Model 800 has a built-in side tone oscillator so that the operator can listen to incoming code as it is interpreted by the computer.

MORSE CODE TRAINER: The Model 800 can be set to generate random five letter groups of characters at any preset speed for Morse code training purposes.

SPEED INDICATOR: In addition to all of the other functions, the status line in the Morse code mode indicates the speed of the incoming code.

SSTV GRAPHICS OPERATING FEATURES

The ROBOT Model 800 allows alphanumeric characters to be typed in an SSTV format, displayed on a TV monitor, and transmitted as a normal SSTV picture. This eliminates the need for "menu board" or hand-lettered SSTV pictures, thereby freeing up the slow scan camera or scan converter for other operations.

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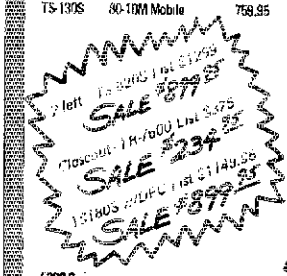
180S "DFC" Series		List Price
TS-180S	160-10M w/DFC	$1149.95
TS-180S	160-10M no DFC	984.95
DF-180	DFC	164.95
VFO-180	VFO	179.95
SP-180	External Speaker	69.95
AT-180	Antenna tuner	179.95
YK-88SSB	SSB filter	59.95
YK-88CW	CW filter	59.95
PS-30	Power supply	139.00
TS-830S	160-10M Base	929.95
TS-130S	80-10M Mobile	759.95



520S Series		
TS-520SE	160-10M base TX/CVR	629.95
DG-5	Digital display	199.00
VFO-520	VFO	155.00
SP-520	Speaker	33.00
CW-520	CW filter	69.00

HF Miscellaneous

R-1000	Gen. Cov. receiver, digital	499.95
SP-100	Speaker	44.95
TL-922A	160-15M amplifier, 2KW	1199.00

VHF / UHF EQUIPMENT

TS-600	6M SSB/CW/FM/AM	799.00
TR-9000	2-meter FM/SSB/CW	499.95
PS-20	Base station for TR-9000	74.95
B0-9	System base, power and scrid switches, mem.	39.95
TR-2400	2-meter synthesized hand-held LCD, 10 mem.	395.00
TR-7800	2-meter FM xcvr	399.95
KPS-7	AC power supply	79.95
TR-8300	70-cm FM transceiver	369.00
TV-502S	2 meter transverter	299.00
TV-506	6-meter transverter	279.00

OTHER ACCESSORIES

HC-10	Digital world clock	99.95
HS-4	Headphone set	19.50
HS-5	Deluxe headphone set	39.95
MC-50	Base mike, high/low	45.00
MC-30S	N/C mobile mike	29.00
MC-35S	N/C mobile mike	29.00
MC-45	Touch-tone Mike	49.95
PC-1	Phone Patch	59.95

YAESU

HF TRANSCEIVERS		List Price
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FT-101ZD	160-10M	942.00

SOLID STATE HF TRANSCEIVERS

FT-107M	w/o DMS/mem	1045.00
FT-707	80-10M, 200W	810.00

VHF TRANSCEIVERS

CPU2500RK	FM mob. keyb.	467.00

YAESU (cont'd)

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FT-207R	2m Hand Held	399.00
FT-227RB	2m 4 mem-YM24	380.00
FT-625RD	6m All Mode	495.00
FT-627RA	6m 4 memory	399.00
FT-720RVH	2M, 25 watt	458.00

SOLID STATE RECEIVERS

FRG-7	General Cov.	379.00
FV-707DM	Dig scan/mem	279.00
FP-707	Power Supply	162.00
FC-707	Antenna Tuner 100 dummy load	110.00

UHF TRANSCEIVER

FT-720RU	440-450 FM	499.00

ACCESSORIES FOR VHF EQUIPMENT

PB-1555	Tone squelch unit	30.00
FP-4	4amp power supply	50.00
FP-12	12amp P/S speaker	135.00
MU-225	Mem unit 225/625	165.00

MISCELLANEOUS ACCESSORIES

YH-56	Headset	15.00
FF-501DX	Lo pass filter	34.00
QTR-24D	Quartz world clock	49.00

SERVICE & MAINTENANCE MANUALS

FT-101 Series	25.00
FT-101ZD	25.00
FT-221-Series	15.00
FT-227 Series	15.00
FT-901 Series	25.00

ACCESSORIES FOR 901 / 101ZD SERIES

Note: all items can be used with the 101ZD series except (*) items.

FA-9	Fan	22.00
FM-901*	FM adapter	45.00
KY-901*	Keyer unit	45.00
MU-901*	Memory unit	124.00
DC-901*	DC-DC conv.	69.00
SP-901	Speaker	35.00
SP-901P	Speaker/Patch	76.00
FTV-901R	Trans. w/2M	389.00
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"	6M adapt. only	110.00
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FC-901	Antenna tuner	199.00
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XF8.9B	AM filter	45.00
XF8.9HCN	350Hz filter	50.00
ZD-1	Digital readout	150.00
FV-101Z	Remote VFO	175.00
DC-101ZD	DC-DC conv.	69.00

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NC-1A	15hr drop-in chgr.	51.00
NC-2	3hr drop-in chgr.	30.00
NBP-9	Battery pack	23.00
FBA-1	Battery sleeve	8.00
LCC-7	Leather c. case	35.00
TA-2	Telescope antenna	9.40
FTS-32E	32 tone CTCSS	40.00

MICROPHONES

YE-7A	Hand mike 101ZD	17.00
YD-148	Hi-lo desk mike	32.00
YD-844A	Hi-lo desk mike	32.00
YM-21	Noise cancelling	20.00
YM-22	Keyboard scan	69.00
YM-23	Keyboard encod.	69.00
YM-24	Speaker mike	32.00
YM-34	Desk mike 107/707	31.00
YM-35	Scan 107/707	20.00

ICOM

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720	9 band HF Xcvr 12V DC/Mic	1149.00
720/PS	9 band HF Xcvr, AC & 12V Sup/Mic-PS15 9 band HF Xcvr, AC & 12V Sup/Mic-PS15	1298.00

MOBILE TRANSCEIVERS

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255A	2M FM 25W Synthesized	389.00
260A	2M MBL, SSB,FM,CW	489.00
280	2M FM 10W Remotable	359.00

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2AT/NiCD	2M 800 CH, HT w/ Nicad, TT pad, Chgr.	249.50
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402	430 MHz SSB Portable	349.00
502A	6M SSB Portable	229.00

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PS15	12V Power Supply	149.00
PS20	12V Power Supply	190.00

ACCESSORIES

HM8	8 pin mike w/TTN	39.50
SM2	Desk mike	32.50

DRAKE

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R-7/DR-7	General Cov. Rcvr.	$1449.00

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TR-7/DR-7	Dig HF transceiver 160-10M	1549.00
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SL-500	500Hz CW filter for 7-line	55.00
SL-1800	1800Hz RTTY filter for 7-line	55.00
SL-6000	6000Hz AM filter for 7-line	55.00
AUX-7	Auxiliary range program board for TR-7	45.00
FA-7	Fan for TR-7/PS-7 DL-1000	29.00
RV-7	Remote VFO for TR-7	195.00
MS-7	Speaker for 7-line	39.00

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CUSHCRAFT

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PD-2	Power Divider, 2 Boomers	22.95

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ATB-34	Tri-Band 4 ele. beam	319.95
ATV-3	Tri-band vertical	54.95
ATV-4	7,14,21,28MHz Vert.	112.95
ATV-5	3,5,7,14,21, 18MHz Vert.	119.95
R-3	Tri-Band Ringo	299.95
A-3SK	Stainless Hardware for A3	39.95

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A147-4	146-148 MHz 4 el.	29.95
A147-11	146-148 MHz 11 el.	44.95
A147-20T	144 & 147 MHz 20 el	74.95
A147-22	146-148 MHz 22 el.	129.95
A220-7	220-225 MHz 7 el.	32.95
A220-11	220-225 MHz 11 el.	42.95
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A449-11	449 MHz 11 element	42.95
AFM-4D	144-148 MHz four pole	79.95
AFM-24D	220-225 MHz four pole	72.95
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AR-2	135-170 MHz Ringo	27.95
AR-6	50-54 MHz Ringo	44.95
AR-220	220-225 MHz Ringo	24.95
AR-450	440-460 MHz Ringo	24.95
ARX-2K	135-170 MHz Ranger kit	21.95
ARX-220	220-225 MHz Ringo Rgr.	44.95
ARX-450	435-450 MHz Ringo Rgr.	38.95

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LAC-2	Coax lightning arrestor double female	5.95

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A50-3	50 MHz 3 element	54.95
A50-5	50 MHz 5 element	74.95
A50-6	50 MHz 6 element	99.95
A144-7	144 MHz 7 element	32.95
A144-11	144 MHz 11 element	44.95
A430-11	432 MHz 11 element	42.95

HUSTLER

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CG-144	2-meter mobile with without mount	28.95
CGT-144	2-meter mobile w/mount	45.95
G6-144B	6 db fixed station, 2 m	89.95
G7-144	7 db fixed station, 2 m	139.95
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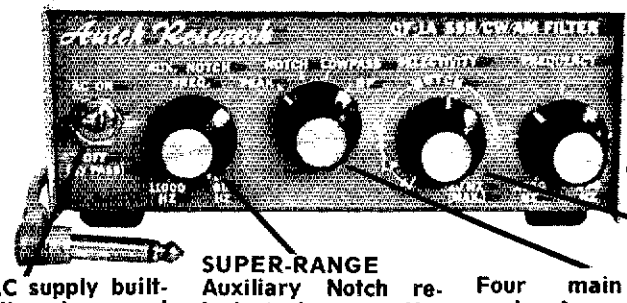

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QF-1A Active Filter

For SSB & CW

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115 VAC supply built-in. Filter by-passed when off.

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Four main filter modes for any QRM situation.

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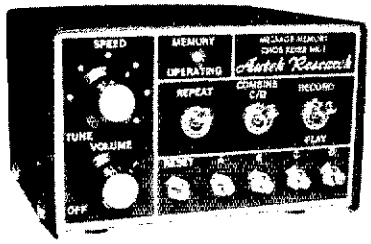
AUTEK pioneered the **ACTIVE AUDIO FILTER** way back in 1972. Today, we're still maintaining that engineering leadership. Our **QF-1A** evolved from suggestions from thousands of owners, and years of dedication to making the "ultimate" filter. No gimmicks — just something that really "works" like the 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.!

CMOS PROGRAMMABLE KEYER MAKES CW FUN!



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!

FLASH! MK-1 used to set new world's CW record. A single operator worked 3992 DXQSO's & 275 band-countries in only 48 hours! Get the choice of champions — AUTEK.

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- ☐ MK-1 Keyer at $99.50
- ☐ ME-1 Expander for MK-1 at $40 (factory installed)
- ☐ ME-1 Owner installed at $30 (save $10)

Add 4% tax in Fla. or 6% tax in Calif. Add $3 each to Canada, Hawaii and Alaska. $2 for UPS air. Add $15 each elsewhere (shipped air).

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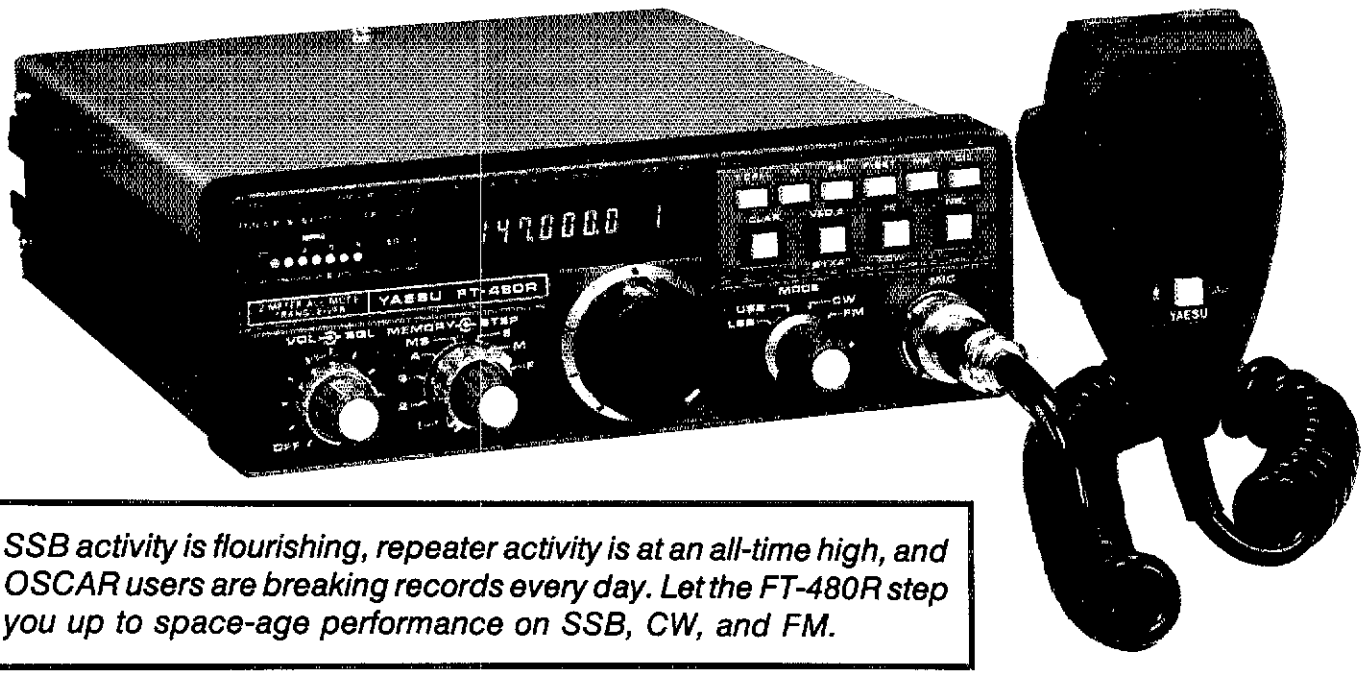

SSB activity is flourishing, repeater activity is at an all-time high, and OSCAR users are breaking records every day. Let the FT-480R step you up to space-age performance on SSB, CW, and FM.

Features

- Coverage of 143.5 - 148.5 MHz (good news for you MARS operators)
- USB, LSB, CW and FM operation are all built-in
- Four channels of memory, with priority channel
- Two VFOs for unusual repeater splits
- Convenient synthesizer steps: 10 Hz, 100 Hz, or 1 kHz per step on SSB/CW, 1 kHz, 20 kHz, or 100 kHz per step on FM
- Scanning control from microphone
- Highly effective noise blanker
- Receiver offset tuning for following Doppler-shifted signals
- SAT switch allows shifting of transmit frequency during OSCAR operation (many rigs cannot QSY on TX)
- 30 watts DC input on FM/CW, 30 watts PEP input on SSB, HI/LOW power selection on FM and CW
- Built-in tone burst generator
- Bright LED signal strength/relative power output level meter
- Easy-to-read fluorescent display of operating frequency and memory channel
- Front panel switch for zeroing synthesizer to convenient step when changing modes from SSB/CW to FM
- Requires 13.8 VDC, negative ground

Available Options:

FP-80 AC Power Supply
FTS-64E Synthesized CTCSS/Burst Encoder

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