QST

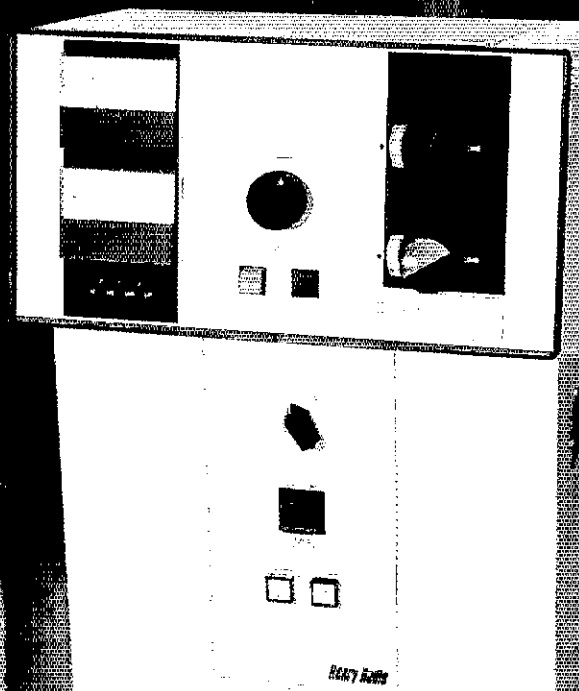
November 1982 $2.50

devoted entirely to Amateur Radio

Amateur Radio Bill signed! Page 11

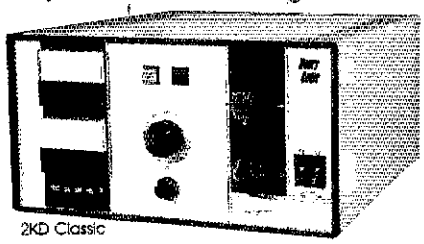
Field Day Results

The world's broadest line of linears now boasts... four new amplifiers



Now you have a choice of ten superb amplifiers spanning the spectrum from 3.5 mHz to 450 mHz. The most dazzling display of value and performance the amateur world has ever known.

Here they are! Treat yourself to the kind of amplifier you have always dreamed of owning.



2KD Classic

HF amplifiers..80 through 15 meters (10 meters included on export models)

The 1KD-5...1200 watt desk model $695

New!

The 2KD CLASSIC..2000 watt desk model. We challenge you to find a better desk model for even a thousand dollars more. $980

The 2K CLASSIC The latest and best version of the console that made the name "2-K" famous around the world. $1295

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The 2K CLASSIC "X" We can't think of any way to make this magnificent 2000 watt amplifier better. Rugged...durable...the last amplifier you may ever need to buy. $1790

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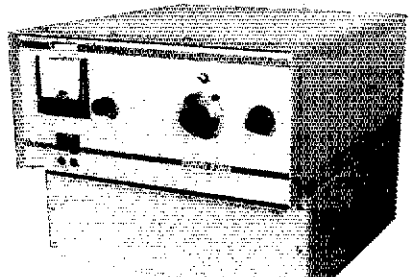

Tempo 2002, 2004
2006 similar in appearance

2K Classic, 2K Classic "X"
and 3K Classic similar in appear

For VHF and UHF:

The TEMPO 2002 for 144-148 mHz. It 2000 watt workhorse of the 2- me band. $995

New!

The new TEMPO 2004 offers 2000 wa input at 440 mHz. Few amateurs ha ever seen an amplifier capable of t powered UHF. $1095

New!

The TEMPO 2006. The same reliab design for 50-54 mHz. (For export onl $995

All three models: 2002, 2004 and 20 are also available on frequenci outside the amateur bands and are p of a unique line of high pow commercial, industrial and scienti amplifiers and transmitters f communications, plasma-generatio nuclear magnetic resonance, heatin and other special applications. Let know what your requirements are. We' here to help both in the U.S.A. ar throughout the world.

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Half or Full Duplex
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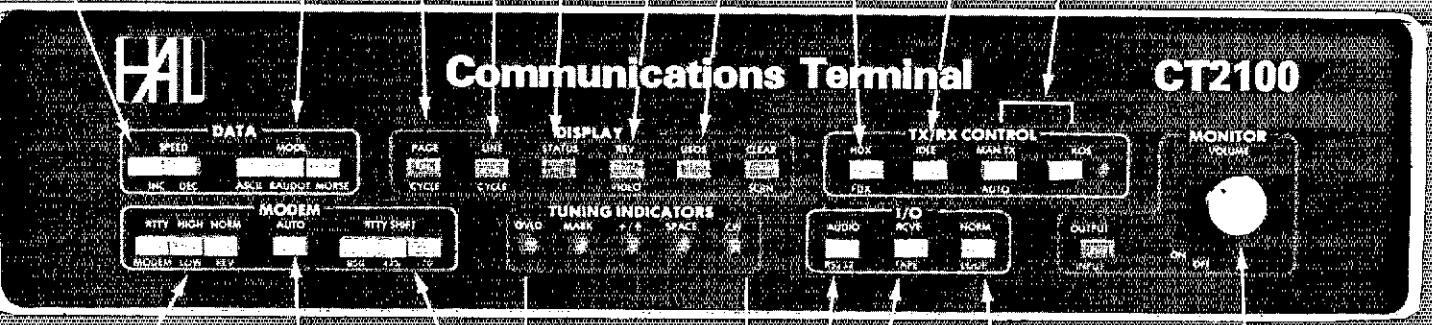

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- CT2100 Communications Terminal
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- Video Monitor
- Printer (300Bd Serial ASCII-MPI-88G)
- RM2100 Rack Adapter
- MSG2100 2000 Character "Brag Tape" ROM

CT2100

- 24 Line Display
- 2 Pages of 72 Character Lines or 4 Pages of 36 Character Lines
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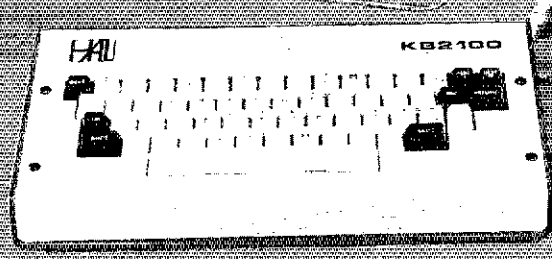

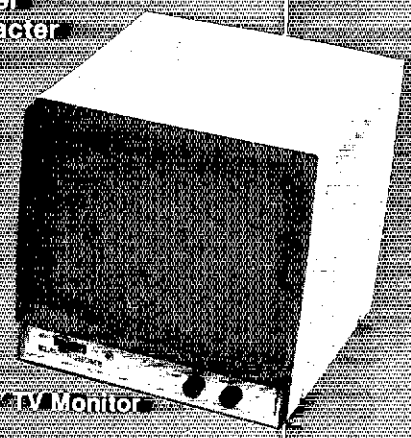

9" TV Monitor

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ICOM Handlds

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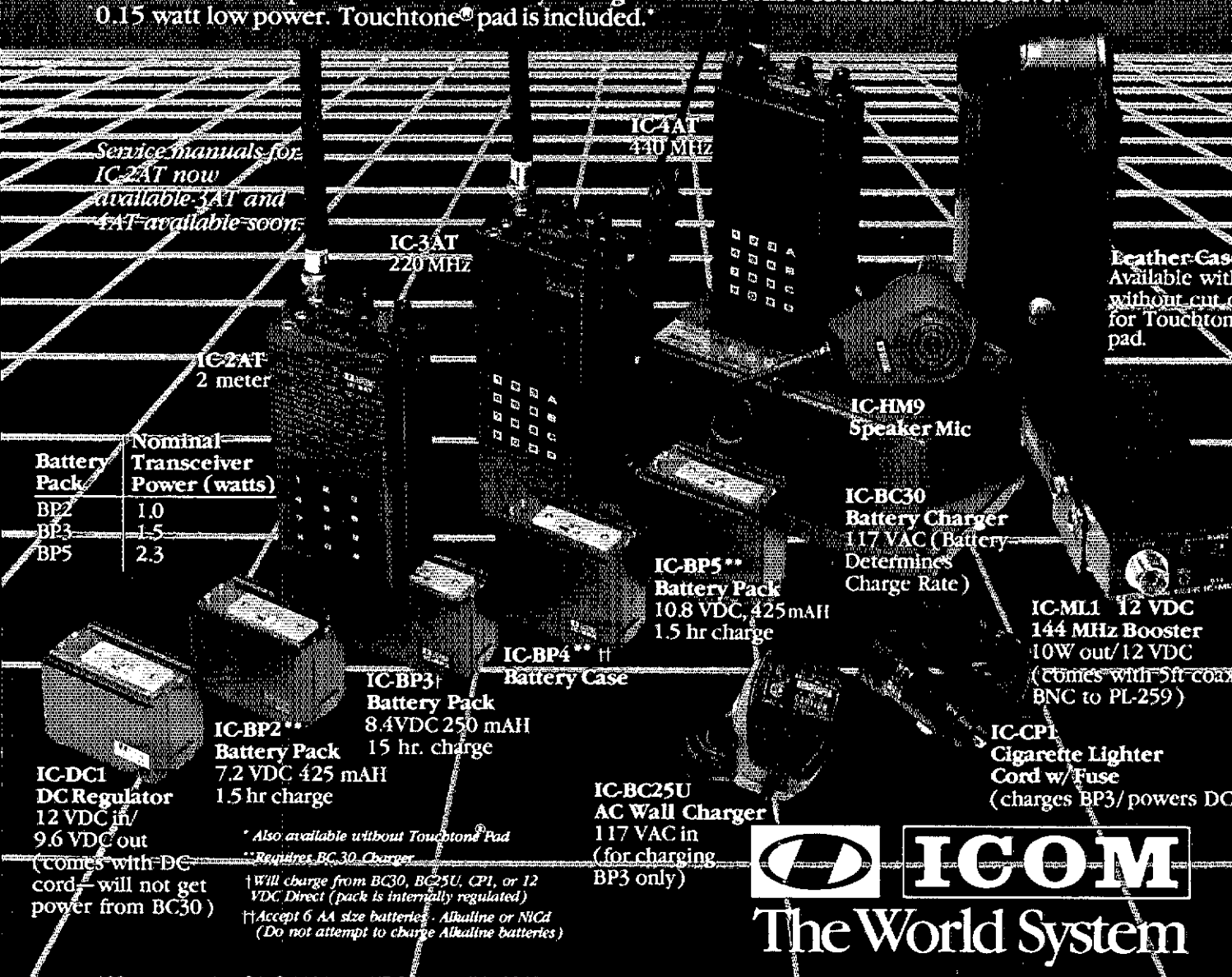
ICOM's reliable, field proven, handhelds have been the most popular handheld on the market. Here's a few reasons why:

THE TRANSCEIVERS. The IC-2AT features full coverage of the 2 meter ham band. The IC-3AT covers 220 to 224.99 MHz, and the IC-4AT has 440 to 449.995 MHz. Each radio is only 2.6in x 1.4in x 6.5in in size. Excellent audio quality is provided by a quality speaker and an electret condenser microphone. All have battery saving 0.15 watt low power. Touchtone® pad is included.*

STANDARD EQUIPMENT. Each transceiver comes complete — ready to use — with BP3 rechargeable battery, AC wall charger, flexible antenna, earphone, wrist strap, and belt clip...all standard.

THE SYSTEM. Accessories for the handheld series are interchangeable among transceivers. Slide on removable battery packs allow quick changing of batteries. Batteries may be charged while removed from the transceiver.



Service manuals for IC-2AT now available. 3AT and 4AT available soon.

Leather Case
Available with
without cut
for Touchton
pad.

Battery Pack	Nominal Transceiver Power (watts)
BP2	1.0
BP3	1.5
BP5	2.3

* *Also available without Touchtone® Pad*

** *Requires BC-30 Charger*

† *Will charge from BC30, BC25U, CP1, or 12 VDC Direct (pack is internally regulated)*

†† *Accept 6 AA size batteries - Alkaline or NiCd (Do not attempt to charge Alkaline batteries)*

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 (206)454-8155/3331 Towerwood Drive, Suite 307, Dallas, TX 75234 (214)620-2780.

November 1982 *Volume LXVI Number 11*

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OUR COVER

It's always nice to have a magnificent view, but Field Day means a great deal more. The group that operated from Angel Island in San Francisco Bay won't hesitate to tell you all about it. *(photo by N6BLN)*

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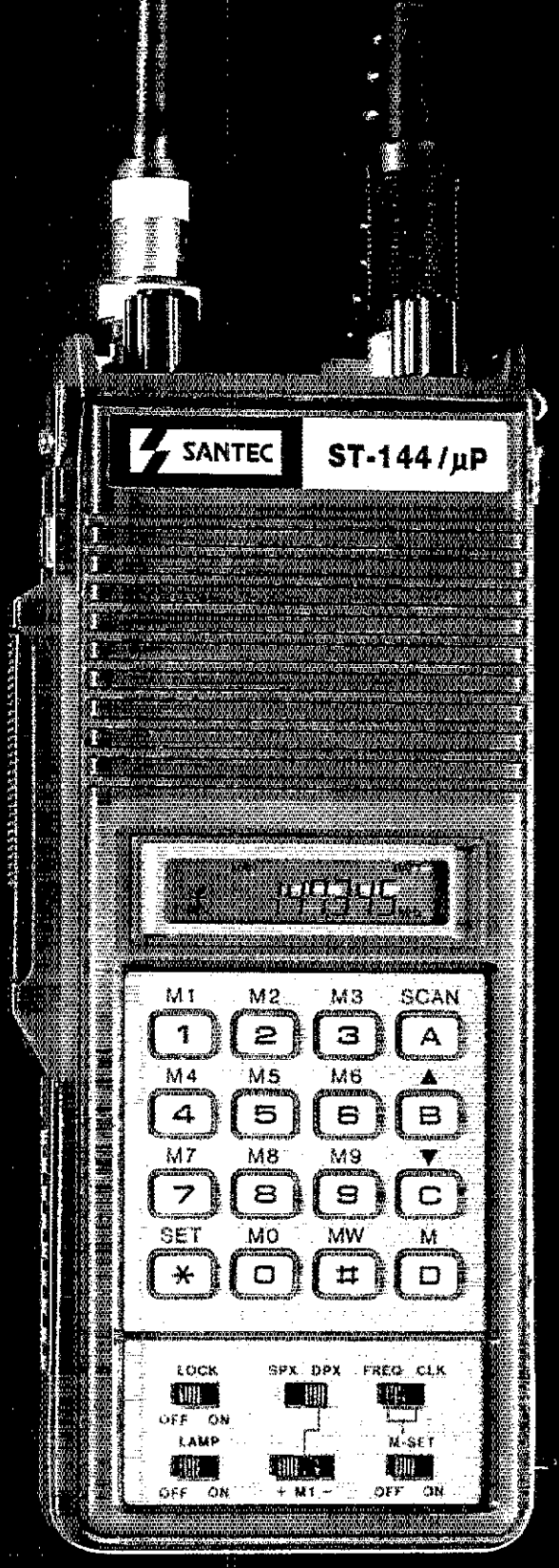
NEWS AND FEATURES

OPERATING

DEPARTMENTS



You've got to get a Santec to get it right!

Compare Santec to anything you like, and you'll see — you've got to get a Santec to get: ■ memory channels which store standard repeater offsets for instant recall ■ less than 10 ma drain in receive to conserve power while you're monitoring ■ extremely wide power options of 0.1 W, 1.0 W or even 3.5 W for varying conditions ■ an accurate 24 hour clock for instant reference ■ and a full two year extended service plan which no one else will match.

When you get a Santec, you also get: ■ the widest frequency range of any handheld ■ odd offsets other than ±600 kHz ■ variable step sizes in bandscan ■ a 500 ma battery with charger ■ a full six digit back-lighted LCD display for full frequency readout plus the memory channel number ■ the easiest keyboard entry of any handheld ■ eight modes of scan, search, manual control and open scan ■ the ability to change batteries without losing memory data ■ easily programmable bandscan ■ a frequency lock switch on the keyboard ■ an automatic low battery indicator ■ and much more.

FEATURE	SANTEC ST-144	YAESU FT-208	KENWOOD TR-2500
Size (mm)	68 x 170 x 47	61 x 168 x 49	66 x 168 x 40
Weight with Batt.	600 gm	720 gm	540 gm
Readout	LCD (full 6 digits)	LCD (4 digits)	LCD (4 digits)
Memory Channels	10	10	10
Memory of Offsets	YES	NO	NO
Memory Backup	YES, Capacitance	Yes, Lithium Batt.	Yes, Lithium Batt.
Search Mode	YES	NO	NO
Step Size	5-100 kHz	5 or 10 kHz only	5-30 kHz
Battery	Quick Change Pack 500 ma-hr, 9.6 V	Quick Change Pack 450 ma-hr, 10.8 V	Slide-on Pack 400 ma-hr, 8.4 V
Frequency Coverage	142-148.995 Tx (149.995 optional) 142-149.995 Rx	143.5-148.495 Tx Rx	143.9-148.995 Tx Rx
Power (max)	3.5 W High 1.0 W Med. 0.1 W Low	2.5 W High 0.2 W Low	2.5 W High
Priority	YES (in Mem/Scan)	Yes (Priority Ch.)	NO
Clock	YES	NO	NO
Computer Current Saver	YES (~ 10 ma)	NO (20 ma)	NO (27 ma)
Display	6 Digits + Mem. #	4 Digits + Mem. #	4 Digits

New! Affordable Price! See your Authorized Santec Dealer for details.

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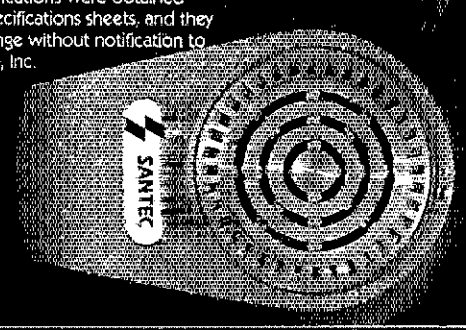

Shown with optional SM-3 speaker microphone.

Accessories for SANTEC Handheld Radios
clockwise from upper left
- Leather Case (ST-LC)
- Base Charger & Power Supply (ST-5BC)
- Remote Speaker (MS-50S)
- Mobile Charger (ST-MC)
- Speaker Microphone (SM-3)

The ST-144 μP is approved under FCC Part 15

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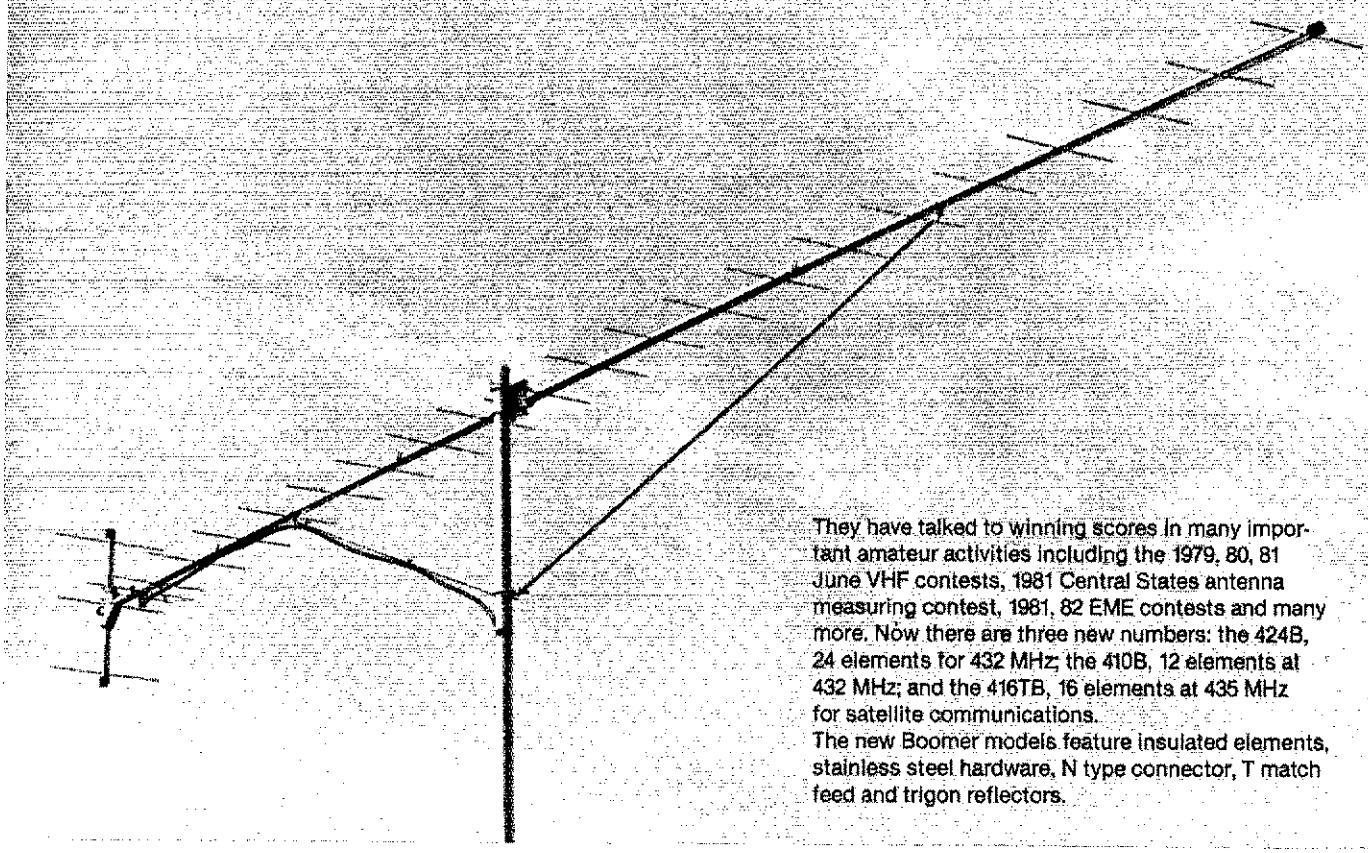


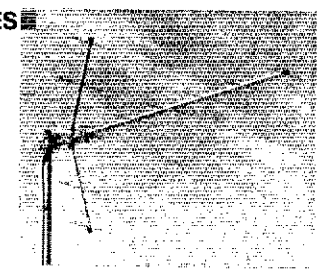
They have talked to winning scores in many important amateur activities including the 1979, 80, 81 June VHF contests, 1981 Central States antenna measuring contest, 1981, 82 EME contests and many more. Now there are three new numbers: the 424B, 24 elements for 432 MHz; the 410B, 12 elements at 432 MHz; and the 416TB, 16 elements at 435 MHz for satellite communications.
The new Boomer models feature insulated elements, stainless steel hardware, N type connector, T match feed and trigon reflectors.

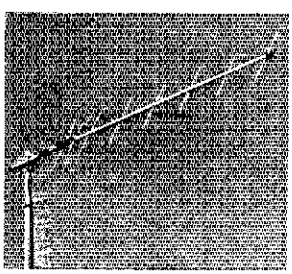
SPECIFICATIONS AND FEATURES

424B:
424-435 MHz, 7.8λ, gain *maximized, F/B ratio *excellent, beamwidth 19°, length 17.42 ft. 5.2 m.

410B:
424-435 MHz, 2.2λ, gain *maximized, F/B ratio *excellent, beamwidth 33°, length 6 ft. 1.83 m.

416TB:
428-438 MHz, Circular Polarization 2.2λ gain *maximized, F/B *excellent, beamwidth 34°, length 6.7 ft. 2.03 m.





MORE BOOMER NUMBERS

32-19	144-146 MHz	19 elements
214B	144-146 MHz	14 elements
214FB	145.5-148 MHz	14 elements
228FB	145.5-148 MHz	28 elements
220B	220-223 MHz	22 elements
617-6B	50-51 MHz	6 elements

Our list of model numbers also includes a full line of Boomer power dividers and stacking kits. See your dealer for all of the numbers, then talk to your friends throughout the world with Boomer antennas.

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CUSHSIG

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"Cents-ational."

IF shift, digital display, narrow-wide filter switch

TS-530S

The TS-530S SSB/CW transceiver is designed with Kenwood's latest, most advanced circuit technology, providing wide dynamic range, high sensitivity, very sharp selectivity with selectable filters and IF shift, built-in digital display, speech processor, and other features for optimum, yet economical, operation on 160 through 10 meters.

TS-530S FEATURES:

- **160-10 meter coverage, including three new bands**
  Transmits and receives (LSB, USB, and CW) on all Amateur frequencies between 1.8 and 29.7 MHz, including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- **Built-in digital display**
  Large, six-digit, fluorescent-tube display shows actual receive and transmit frequencies on all modes. Backed up by analog subdial.
- **IF shift**
  Moves IF passband around received signal and away from interfering signals and sideband splatter.
- **Narrow/wide filter combinations**
  Any one or two of three optional filters . . . YK-88SN (1.8 kHz) SSB, YK-88C (500 Hz) CW, YK-88CN (270 Hz) CW . . . may be installed for selecting (with "N-W" switch) wide and narrow bandwidths on CW and/or SSB.
- **Wide receiver dynamic range**
  Greater immunity to strong-signal overload, with MOSFET RF amplifier operating at low level for improved IMD characteristics, junction FETs in balanced mixer with low noise figure, and dual resonator for each band.
- **Built-in speech processor**
  Combines an audio compression amplifier with change of ALC time constant for extra audio punch and increased average SSB output power, with suppressed sideband splatter.
- **Two 6146B's in final**
  Runs 220 W PEP/180 W DC input on all bands.
- **Advanced single-conversion PLL system**
  Improved overall stability and improved transmit and receive spurious characteristics.
- **Adjustable noise-blanker level**
  Pulse-type (such as ignition) noise is eliminated by built-in noise blanker, with front-panel threshold level control.
- **RF attenuator**
  The 20-dB RF attenuator may be switched in for rejecting IMD from extremely strong signals.
- **Optional VFOs for flexibility**
  VFO-240 allows split-frequency operation and other applications. VFO-230 digital VFO operates in 20-Hz steps and includes five memories and a digital display.
- **RIT/XIT**
  Front-panel RIT (receiver incremental tuning) shifts only the receiver frequency, for tuning in stations slightly off frequency. XIT (transmitter incremental tuning) shifts only the transmitter frequency, for calling a DX station listening off frequency.

More information on the TS-530S is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

Matching accessories for fixed-station operation:

- SP-230 external speaker with selectable audio filters
- VFO-240 remote VFO
- AT-230 antenna tuner/SWR and power meter
- MC-50 desk microphone

Other accessories not shown:

- VFO-230 remote digital VFO with 20-Hz steps, five memories, digital display
- TL-922A linear amplifier
- SM-220 Station Monitor
- KB-1 deluxe VFO knob
- PC-1 phone patch
- HS-5 and HS-4 headphones
- HC-10 digital world clock
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters and YK-88SN (1.8 kHz) SSB narrow filter
- MC-30S and MC-35S noise-canceling hand microphones

KENWOOD
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Specifications and prices are subject to change without notice or obligation

Top-Notch.

VBT, notch, IF shift, wide dynamic range

TS-830S

Now most Amateurs can afford a high-performance SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 meters (including the three new bands). The TS-830S 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:

- **160-10 meters, including three new bands**
  Covers all Amateur bands from 1.8 to 29.7 MHz (LSB, USB, and CW), including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz...
- **Wide receiver dynamic range**
  Junction FETs (with optimum IMD characteristics and low noise figure) in the balanced mixer, a MOSFET RF amplifier operating at low level for improved dynamic range (high amplification level not needed because of low noise in mixer), dual resonator for each band, and advanced overall receiver design result in excellent dynamic range.
- **Variable bandwidth tuning (VBT)**
  Continuously varies the IF filter passband width to reduce interference. VBT and IF shift can be controlled independently for optimum interference rejection in any condition.
- **IF notch filter**
  Tunable high-Q active circuit in 455-kHz second IF, for sharp, deep notch characteristics.
- **IF shift**
  Shifts IF passband toward higher or lower frequencies (away from interfering signals) while tuned receiver frequency remains unchanged.
- **6146B final with RF NFB**
  Two 6146B's in the final amplifier provide 220 W PEP (SSB)/180 W DC (CW) input on all bands. RF negative feedback provides optimum IMD characteristics for high-quality transmission.
- **Built-in digital display**
  Six-digit large fluorescent tube display, backed up by an analog dial. Reads actual receive and transmit frequency on all modes and all bands. Display Hold (DH) switch.
- **Adjustable noise-blanker level**
  Built-in noise blanker eliminates pulse-type (such as ignition) noise. Front-panel threshold level control.
- **Various IF filter options**
  Either a 500-Hz (YK-88C) or 270-Hz (YK-88CN) CW filter may be installed in the 8.83-MHz first IF, and a very sharp 500-Hz (YG-455C) or 250-Hz (YG-455CN) CW filter is available for the 455-kHz second IF.
- **More flexibility with optional digital VFO**
  VFO-230 operates in 20-Hz steps and includes five memories. Also allows split-frequency operation. Built-in digital display. Covers about 100 kHz above and below each 500-kHz band.
- **Built-in RF speech processor**
  For added audio punch and increased talk power in DX pileups.
- **RIT/XIT**
  Receiver incremental tuning (RIT) shifts only the receiver frequency, to tune in stations slightly off frequency. Transmitter incremental tuning (XIT) shifts only the transmitter frequency.
- **SSB monitor circuit**
  Monitors IF stage while transmitting, to determine audio quality and effect of speech processor.

More information on the TS-830S is available from all authorized dealers of Trio Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

KENWOOD
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Matching accessories for fixed-station operation:

- SP-230 external speaker with selectable audio filters
- VFO-230 external digital VFO with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/SWR and power meter
- MC-50 desk microphone
- HC-10 digital world clock
- 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 filters for 8.83-MHz IF
- HS-5 and HS-4 headphones
- MC-30S and MC-35S noise-cancelling hand microphones

Other accessories not shown:

- TL-922A linear amplifier
- SM-220 Station Monitor
- PC-1 phone patch

Specifications and prices are subject to change without notice or obligation.

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JAY A. HOLLADAY,* W6EJJ, 5128 Jessen Dr.,
La Canada, CA 91011 (213-790-1725)

Vice Director: Peter F. Matthews, WB6UIA, 3403
S. Walker Ave., San Pedro, CA 90731 (213-547-5816)

West Gulf Division

RAYMOND B. WANGLER, W5EDZ, 642 Beryl Dr.,
San Antonio, TX 78213 (512-733-9632 home,
512-684-5111 business)

Vice Director: Thomas W. Comstock, N5TC,
1700 Dominik, College Station, TX 77840 (713-693-1181)

*Executive Committee Member

Section Communications Managers of the ARRL

Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 16 divisions of the League are further arranged into 73 administrative "sections," each headed by an elected Section Communications Manager. Your SCM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of amateur radio operating interests. Whatever your license class, your SCM has an appointment available. Check with your SCM (below) for further information. Section boundaries are defined in the booklet *Operating an Amateur Radio Station*, free to members.

Canadian Division

Alberta — E. Roy Ellis, VE6XC, P. O. Box 2, RR 1, Fort Saskatchewan T8L 2N7
British Columbia — H. E. Savage, VE7FB, 4553 West 12th Ave., Vancouver V6R 2R4 (604-224-5226)
Manitoba — Peter Guenther, VE4PG, Box 178, Morris R0G 1K0 (204-746-6502)
Maritime-Nfld — Donald R. Welling, VE1WF, 36 Sherwood Dr., St. John, NB E2J 3H6 (506-696-2913)
Ontario — L. P. Thivierge, VE3GT, 34 Bruce St. W., Renfrew K7V 3W1 (613-432-5967)
Quebec — Harold Moreau, VE2BP, 80 Principale, St. Simon Co., Bagot J∅H 1Y∅ (514-798-2173)
Saskatchewan — W. C. "Bill" Munday, VE5WM, 132 Shannon Rd., Regina S4S 5B1 (306-586-4963)

Atlantic Division

Delaware — Harold K. Low, WA3WIY, Rte. 6, Box 66, Millsboro 19966 (302-945-2871)
Eastern Pennsylvania — Karl W. Pfeil, W3VA, 211 Schuylkill Ave., Tamaqua 18252 (717-668-3533)
Maryland-D.C. — Karl R. Medrow, W3FA, 702 W. Central Ave., Davidsonville, MD 21035 (301-261-4008)
Southern New Jersey — William C. Luebkemann, Jr., WB2LCC, 116 Country Farms Rd., Marlton 08053 (609-983-8844)
Western New York — William Thompson, W2MTA, RD 1 Rock Rd., Newark Valley, 13811 (607-642-8930)
Western Pennsylvania — Otto Schuler, K3SMB, 3732 Colby St., Pittsburgh 15214 (412-231-6890)

Central Division

Illinois — David E. Lattan, WD9EBQ, RR 1, Box 46E, Makanda 62958 (618-529-1578)
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, WB∅HOX, 3101 N.W. 18th Ave., Rochester 55901 (507-288-2437)
North Dakota — Dean R. Summers, KQ∅C, 304 4th Ave. NW, Mandan 58554 (701-663-0130)
South Dakota — Fredric Stephan, KC∅OO, Box 772 · Wind Cave Ranch, Hot Springs 57747

Delta Division

Arkansas — Dale E. Temple, W5RXU, 1620 Tarrytown Rd., Little Rock 72207
Louisiana — John J. Meyer, N5JM, 112 Sherwood Forest, New Orleans 70119 (504-482-3493)
Mississippi — Paul C. Kemp, KW5T, 3581 Beaumont Dr., Pearl 39208 (601-939-7612)
Tennessee — John C. Brown, NO4Q, P. O. Box 37, Eva 38333 (901-584-7531)

Great Lakes Division

Kentucky — David L. Vest, KZ4G, 2314 Oak St., Flatwoods 41139 (606-836-4116)
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

Eastern New York — Paul S. Vydareny, WB2VUK, 259 N. Washington, North Tarrytown 10591 (914-631-7424)
N.Y.C. & Long Island — John H. Smale, K2IZ, 315 Kensington Ct., Copiague 11726 (516-226-4835)
Northern New Jersey — Curtis R. Williams, W5DTR/2, RD 3, Box 175, Fox Run Rd., Califon 07830 (201-832-2821)

Midwest Division

Iowa — Bob McCaffrey, K∅CY, 3913-29th St., Des Moines 50310 (515-279-9848)
Kansas — Robert M. Summers, K∅BXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Missouri — Larry G. Wilson, K∅RWL, 5415 E. 97th St., Kansas City 64137 (816-966-8953)
Nebraska — Shirley M. Rice, KA∅BCB, 510 East 16th St., Scottsbluff 69361 (308-632-4337)

New England Division

Connecticut — Peter Kemp, KA1KD, 5 Greenwood Ave., Bethel 06801 (203-743-9580)
Eastern Massachusetts — Richard P. Beebe, K1PAD, 6 Tracy Cir., Billerica 01821 (617-667-5609)
Maine — Clevis O. Laverty, W1RWG, 17 Fair St., Norway 04268 (207-743-2353)
New Hampshire — Robert Mitchell, W1NH, Box 137-A, Chester 03036 (603-895-3456)
Rhode Island — Gordon F. Fox, W1YNE, 13 York Dr., Coventry 02816 (401-828-6045)
Vermont — Robert L. Scott, W1RNA, 9 Laroe St., Swanton 05488 (802-868-4944)
Western Massachusetts — William Hall, W1JP, Prospect Hill Rd., Brimfield 01010 (413-245-7140)

Northwestern Division

Alaska — Richard Henry, AL7O, P.O. Box 451, Tok 99780 (907-883-5507)
Idaho — Dennis L. Hall, KK7X, 1614 Montana Ave., Coeur D'Alene, 83814 (208-667-3591)
Montana — L. C. "Les" Belyea, N7AIK, P. O. Box 327, Belgrade 59714 (406-388-4253)
Oregon — William R. Shrader, W7QMU, 2042 Jasmine Ave., Medford, 97501 (503-773-8624)
Washington — Joseph N. Winter, WA7RWK, 819 N. Mullen St., Tacoma 98406 (206-759-9857)

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 7750, Reno 89510 (702-322-7988)
Pacific — R. A. "Army" Curtis, AH6P, P.O. Box 4271, Hilo, HI 96720 (808-959-8985)
Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland, CA 95695 (916-666-1465)
San Francisco — Robert Odell Smith, NA6T, 320 Park St-P.O. Box 1425, Fort Bragg, CA 95437 (707-964-4931)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Ross W. Forbes, WB6GFJ, P.O. Box 1, Los Altos, CA 94022 (415-948-5193)

Roanoke Division

North Carolina — Ian C. Black, WD4CNR, Rte. 5, Box 79, Murphy 28906 (704-837-5684)
South Carolina — James G. Walker, WD4HLZ, Rte. 2, Box 432, Marion 29571 (803-423-3645)
Virginia — Phil Sager, WB4FDT, 1629 Stanley Pl., Falls Church 22043 (703-734-2987)
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr., Charleston 25312 (304-776-4352)

Rocky Mountain Division

Colorado — Lawrence E. Steimel, W∅ACD, 1750 Roslyn St., Denver 80220
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd., N.E., Albuquerque 87112
Utah — Leonard M. Norman, W7PBV, 933 South Cedar Knolls, Cedar City 84720 (801-586-9859)
Wyoming — Richard G. Wunder, WA7WFC, Box 2807, Cheyenne 82001 (307-634-7385)

Southeastern Division

Alabama — Hubert H. Wheeler, W4IBU, 2100 Buckingham, Huntsville 35803 (205-881-9168)
Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave., Columbus 31904 (404-322-2856)
Northern Florida — Billy F. Williams, Jr., N4UF, P.O. Box 9673, Jacksonville 32208 (904-744-9501)
Southern Florida — Richard D. Hill, WA4PFK, 3800 S.W. 11th St., Ft. Lauderdale 33312 (305-583-6932)
West Indies — Julio Negroni, KP4CV, Georgetown, No. 269, Rio Piedras, PR 00927 (809-764-8099)

Southwestern Division

Arizona — Erich Holzer, N7EH, 3526 E. March Pl., Tucson 85713 (602-326-8976)
Los Angeles — Stanley S. Broki, N2YQ, 2645 North Marengo Ave., Altadena, CA 91001 (213-798-8827)
Orange — Fred Heyn, WA6WZO, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Robert N. Dyruff, W6POU, 1188 Summit Rd., Santa Barbara, CA 93108 (805-969-3073)

West Gulf Division

Northern Texas — Phil Clements, K5PC, 1313 Applegate Ln., Lewisville 75067 (214-221-2222)
Oklahoma — Leonard R. Hollar, WA5FSN, RFD 1, 710 South Tenth St., Kingfisher 73750 (405-375-4411)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La., Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us . . ."

No Time for No-Code

The more we talk to people around the country, the clearer it becomes that a no-code amateur license is an idea whose time has *not* come.

At the same time, it is equally clear that we must do more to swell our ranks with the bright young people whose attention is increasingly diverted into computers.

A contradiction? We don't think so. Let's look more closely at these two important issues.

Amateurs generally oppose the idea of a no-code license, even if it were to convey only limited vhf privleges. Why? Some no-code proponents say it's because hams all suffered and struggled to learn the code, so they want everyone else to suffer and struggle, too. But while this may be a factor in some people's thinking, there is a lot more to it than that.

Amateurs believe it is imperative that there be an effective filtering device to restrict access to an amateur license. The FCC frequently points to our proud record as the least troublesome of the radio services, and to our ability and willingness to police our own ranks. Indeed, under the provisions of the just-enacted Public Law 97-259, the Commission will be relying even more heavily upon volunteers to monitor for serious rules violations. Hams ask, How can we be expected to shoulder this responsibility if a license can be obtained essentially for the asking? Not that a no-code license is necessarily a "cheap" license, if the written exam is prepared and administered properly; but *amateurs have lost confidence in written exams as a filtering device*, because *even some FCC officials* are willing to state publicly that the present written exams have been compromised and are not achieving their intended purpose.

Rebuilding confidence in the examination process is an important objective of another part of P.L. 97-259, which authorizes the use of volunteers in the preparation and administration of amateur exams; but it's going to take a long time — perhaps years — before the amateur community regains its faith in the written exams. Is the code test the most appropriate filtering device? Maybe not; but at the moment, amateurs are saying, it's all we have.

By and large, hams don't buy the argument that the Morse code is a relic of a bygone age. Even those who don't use it in their day-to-day operating are quick to point to examples of its effectiveness. Does this mean every ham ought to be forced to learn Morse? Perhaps not, since it is certainly possible to contribute to Amateur Radio without ever using the code; but it provides an important common denominator which aids in amateurs' acceptance of one another, and five words per minute is not seen as an excessive entry requirement.

Finally, amateurs question how the FCC can ask us to accept the burden of administering exams as volunteers, while simultaneously proposing a class of license that is so clearly unpopular with the very people from whom that pool of examiners will be drawn. From the standpoint of getting this ambitious volunteer program off the ground, the timing could hardly be worse.

Despite all this, one very useful purpose has been served by all the talk about a no-code license: It has focused attention on the importance of ensuring that Amateur Radio attracts more of the bright young people who have been its strength over the years. If you ask a cross-section of longtime hams how old they were when first licensed, you will find that a majority were teenagers or younger. If you ask this group how many ended up pursuing careers related in one way or another to that early interest in Amateur Radio, once again you'll get a majority response. We've done just that at meetings around the country, and the result is always the same. This is an important justification for the Amateur Service: that it unconsciously and painlessly channels youthful energies into ultimately useful pursuits.

The effects of increased competition for the attention of potential radio amateurs, especially in that age bracket, are all too apparent. Yet, exciting things are happening in Amateur Radio. Amateur satellites bring two-way satellite communication directly into the home or classroom; amateur television provides an interactive dimension that is missing from other home video pursuits; new emergency communications capabilities add a new dimension to community service; competitive activities tap our most productive and creative juices; burgeoning packet radio networks let us talk to *people* with our computers, not just to machines. Add these to the traditional opportunities for direct, person-to-person communication across the barriers of geography and politics, and to the discovery of "how it works" that comes from hands-on experience, and you have what ought to be a winning combination! Even the "obsolete" Morse code can be promoted in a positive fashion: What other language is so readily understood by computers and humans alike? It may be years before home computers will understand more than a limited vocabulary of human speech, but today they can be "taught" to understand hand-sent Morse perfectly.

The task we *ought* to be addressing is not the design of a new class of amateur license, thus adding to a licensing structure that is already too complex for the Commission's alleged deregulatory tastes. Rather, it is *to convey to today's young people the challenge and excitement that is Amateur Radio.* And let no one say that the challenge and excitement no longer exist! Anyone who sincerely believes that has had blinders on. The best part is that we can tackle *this* task without waiting for one word of the FCC Rules to be changed. A Commission that is willing to entrust us with monitoring and examination responsibilities ought also to be willing to entrust us with deciding how Amateur Radio should be promoted. Or will the Commission give us responsibility only when this suits its own purposes? — *David Sumner, K1ZZ*

League Lines...

The FCC has proposed changes in its maximum authorized power rule, 97.67. The change, proposed in PR Docket 82-624, would define transmitting power in terms of peak envelope power (PEP) output. The Commission suggests 1500 watts PEP maximum output as a rule because it would not require a reduction in power used by most amateurs. However, double-sideband a-m (amplitude modulation) would be affected. FCC proposes a five-year "grandfather" period; after that, the new definition for maximum authorized power would be in effect for a-m. At press time no comment deadlines had been set. W1AW may have updates. Details in next month's "Happenings."

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, New England, Northwestern, Rocky Mountain and Southwestern. Ballots were in the mail October 1 to ARRL Full Members of record September 10, 1982, 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. There are uncontested nominations for director and vice director in the Roanoke and West Gulf Divisions; therefore, members in those divisions will not be receiving ballots. Details appear in this month's "Happenings."

The U.S. Air Force is in the process of expanding its experimental over-the-horizon backscatter (OTH-B) radar system. The system is designed to detect and track aircraft at ranges of 500-1,800 miles. In addition to expanding the experimental station at Moscow/Caratunk, ME, plans are to establish new stations at locations on the West Coast and in the South. See April 1980 QST, page 39, for a description of the efforts made to avoid interference to hams and other radio services.

Division-level members of the League's Field Organization should receive the inaugural issue of The ARRL Letter within a few days of the October 29 mailing. The ARRL Letter is the League's new general-interest biweekly newsletter sent free to division-level volunteers. Other ARRL members (only) may purchase a yearly subscription for $19.50. An advertisement detailing the offer appears on page 182 of this issue. The ARRL Letter will report news of interest to League members. Any member having news to be considered for inclusion in The ARRL Letter should contact the ARRL Public Information Office at 203-666-1545. This number may be used 24 hours per day, seven days per week.

UoSAT-OSCAR 9, the Amateur Radio scientific satellite, has been restored to normal operation. See page 25 for a complete report.

QEX: The ARRL Experimenter's Exchange welcomes state-of-the-art technical articles on analog and digital subjects including: Amateur Radio applications of microcomputers, RTTY (packet, AMTOR and Baudot), Amateur Radio equipment from hf through millimetric waves, spread spectrum, ATV, propagation and advanced circuit design. Mail manuscripts to: Editor, QEX, 1524 Springvale Ave., McLean, VA 22101. If you're not a QEX reader, see September 1982 QST, page 132, for subscription information.

More progress on getting U.S. amateurs access to 10-MHz band! Latest word is that the FCC commissioners may consider an interim allocation of 10.1-10.15 MHz to the Amateur Service sometime in early November. W1AW may have updates. W1AW bulletin schedules for the winter months appear on page 67 of last month's QST.

Aside from the new band on 10 MHz, the 1979 World Administrative Radio Conference allocated two other hf bands to the Amateur Radio Service: 18.068-18.168 MHz and 24.89-24.99 MHz, effective in the middle or late '80s. WARC-79 also allocated 902-928 MHz on a secondary basis and allocated several more bands for use by the Amateur Satellite Service. FCC will not make permanent changes to its Table of Allocations until ratification is complete. However, we are making progress toward this goal! The Senate Foreign Relations Committee has approved ratification of the Radio Regulations and Final Protocol of WARC-79. Action by the full Senate could come during the post-election session, which should convene around November 29 and adjourn just before Christmas. ARRL members may wish to write their Senators asking them (1) to urge the leadership to bring up Senate Treaty Document (STD) 97-21 early in the post-election session, and (2) to vote in favor.

Repeater owners and operators: The deadline for registering your machine is November 1. Time is running out fast. Have you submitted the information for inclusion in the 1983-84 edition of the Repeater Directory yet? Form CD-240 is available for an s.a.s.e. from Hq.

"RFI Bill" Becomes Law; Amateur Radio Benefits!

Intended primarily as an RFI problem-solver, P.L. 97-259 is much, much more. A decade of effort by hams and their supporters means a brighter future for Amateur Radio.

By W. Dale Clift,* WA3NLO

If you're an Amateur Radio operator, odds are that you'll get more out of your hobby because of a new law called P.L. 97-259. For example, you may be concerned about unqualified people becoming licensed. This law will help keep standards high. If you've wondered why the FCC doesn't issue licenses for more than five-year terms to cut down on its paperwork, stop wondering. This law will permit licenses to run for 10 years. If you've ever had an RFI problem, you'll be relieved to know that the FCC now has authority to require that home electronics equipment will have to meet RFI-susceptibility standards. If you're upset about the damage done to our good name by the tiny but disruptive minority within Amateur Radio, the FCC will now be able to seek out and punish offenders more swiftly. If you've been forced to wait patiently for some sort of action from an understaffed FCC office, a change is in the wind: FCC will at last be able to use the services of volunteers. If you've signed up to take an amateur exam, only to find that you'll have to drive 150 miles to get to it, you'll be glad to hear that there will be many more exam opportunities — in every state, Puerto Rico, overseas territories and even in some foreign countries.

All of this won't come to pass overnight, of course, but neither did the law that makes these improvements possible. Getting P.L. 97-259 on the books took perseverance and a concerted effort by many people. It took resolve in the face of setbacks — and there were plenty! The making of a law is a story of people, places and politics.

President Reagan shown here with Senator Goldwater, K7UGA, promptly signed the Goldwater-Wirth Amateur Radio legislation into law. *(Official White House photo by Karl H. Schumacher)*

How It Came to Pass

Amending the Communications Act of 1934 is no easy task. Many powerful individuals and groups have tried and failed to overcome the inertia of nearly 50 years, the length of time this law has governed wire and radio communications in the United States. Ten years ago, Amateur Radio leaders resolved to bring it up to date. The growing problem of radio-frequency interference (RFI) continued to seriously threaten the well-being of the Amateur Radio Service. Incidences of RFI to home electronic equipment were on the upswing, as were incidences of radio amateurs being blamed for causing the interference.

The 1960s and 1970s had brought an RFI problem of huge proportions. The fact that consumers were buying more electronic devices for their homes, plus the boom in the sales of Citizens Band (CB) transceivers, increased the probability that a home electronic device would be located near a transmitter. Nonetheless, amateur operators got the undeserved blame for many instances of RFI. The League tried to explain to disgruntled consumers that in typical RFI situations involving radio amateurs, RFI results from design deficiencies in the affected device. But consumers found it difficult to accept the concept that an apparently "passive" device, such as a TV or stereo, could be a "source" of interference. After all, when the ham was not transmitting, there was no problem!

The 1970s also brought a new concept

*Deputy Manager, Membership Services, ARRL

in local and state government regulation. A few local governments began adopting ordinances that made it "illegal" to interfere with television or radio reception. These laws usually were based on a "causing a public nuisance" concept, and no one wanted to hear an Amateur Radio operator try to explain that an RFI problem was the fault of the affected device. If a ham living in one of these communities were operating his or her station and a neighbor experienced interference, the ham was breaking the law. It was an open and shut case, as far as these local governments were concerned.

Amateur Radio needed a solution to the problem of its being blamed for the inability of electronic devices to reject unwanted radio signals. ARRL leaders monitoring the political and technological trends knew that, with time, the RFI situation would only get worse. Amateur Radio operators would bear more and more of the undeserved blame for a growing RFI problem, and local and state governments would bow to local political pressure and enact laws that would hamstring amateur operation. The FCC, however, did not have the authority to set minimum RFI-rejection standards for home electronic devices. Amateur Radio needed a law that would amend the Communications Act to give the Commission this authority. Amateur Radio also needed a law that would make it clear, once and for all, that matters involving RFI are preempted by the Federal Government and are not subject to regulation by state or local governments.

The first RFI bill was introduced in 1972, during the 92nd Congress, by Representative Charles M. Teague (R-California). H.R. 16916 became known as the Teague "filter bill," because it would have required that "apparatus designed to receive broadcasts" shall meet FCC standards to be adopted so that "all interference from any amateur station operating on its assigned frequency [will] be filtered out." The 92nd Congress adjourned without taking any action on H.R. 16916, so in January of 1973 Rep. Teague reintroduced his filter bill into the 93rd Congress. The new bill was designated H.R. 3516, and *QST* published it, urging all League members to write to their congressmen in support of the measure.

Despite efforts from League members, Hq. staff and other amateur operators, the Teague filter bill remained bottled up in committee. The 93rd Congress adjourned, and the second RFI bill died. In a sad twist of fate, Rep. Teague also died. Amateur Radio had lost a stalwart friend who understood the problems facing radio amateurs.

The fallen baton was picked up in the 94th Congress by Representative Charles A. Vanik (D-Ohio). On May 15, 1975, Rep. Vanik, with the assistance and urging of Ted Cohen, W4UMF (now N4XX), of the ARRL RFI Task Group, introduced H.R. 7052. An improved version of the Teague filter bill, the Vanik Bill caught the attention of another congressman, Representative Gilbert Gude (R-Maryland). Rep. Gude asked to be listed as a cosponsor.

Storm Clouds Brewing

The new bill also drew the attention of some other people — people who did not share ARRL's enthusiasm for giving FCC the authority to establish rf susceptibility standards for consumer electronic equipment. The first hint of an organized effort to defeat the foundling Amateur Radio legislation was reported to League members in the August 1975 issue of *QST*. On page 37 of that issue, Ted Cohen wrote:

> There are indications that manufacturers of home-entertainment equipment have begun to fight the legislation embodied in H.R. 7052. Their arguments are that RFI cases are too infrequent to call for such legislation, and further that the costs for reducing the susceptibility of their equipment (which they will, of course, pass on to the consumer) are too high and may jeopardize the marketability of some products.
>
> Both arguments are fallacious! . . . Further, with respect to the costs involved in susceptibility reduction, we estimate that even the inclusion of a high-quality, high-pass filter in a television receiver will cost the consumer no more than $5, *if the filter is installed at the time of manufacture.*

Consumers found it difficult to accept the concept that a TV or stereo could be a "source" of interference.

Thus began the League's fight with the Electronic Industries Association (EIA) over RFI legislation. The July, August, September and October 1975 issues of *QST* covered ARRL's efforts to get H.R. 7052 out of committee and on its way to becoming law. Members were urged to contact their congressmen and enlist their support of the Vanik Bill. The organized opposition from the well-financed EIA was disheartening, however.

Then, in February of 1976, Amateur Radio advocates of the Vanik Bill got a boost from Senator Barry Goldwater, K7UGA (R-Arizona), the only licensed radio amateur in the U.S. Senate. Sen. Goldwater introduced S. 3033 to be the companion legislation for the Vanik Bill. Now the 94th Congress had two RFI bills. Sen. Goldwater described the RFI situation eloquently when he introduced his bill on the floor of Senate:

> Mr. President, I am pleased to introduce today a companion bill to legislation proposed by Congressman Charles Vanik of Ohio to drastically reduce the amateur and CB radio bugaboos of television interference, hi-fi interference, and other radio frequency interference to home electronic equipment. Most consumers do not understand that when they may encounter interference with their home television or radio set after an amateur or citizens band radio operator moves next door, the source is not a defect in the equipment of their neighbor but with their own radio or television . . . *(Congressional Record,* February 25, 1976)

Still, support for the proposed RFI bills was not enough to overcome the organized lobbying efforts of the EIA. When the 94th Congress adjourned, the Vanik and Goldwater bills died.

Undaunted, Sen. Goldwater introduced an RFI bill in the 95th Congress: S. 684. May 1977 *QST* carried the complete text of the bill, and ARRL members were alerted that the RFI bill had been resurrected. Shortly after Sen. Goldwater introduced S. 684, Representative Adam Benjamin, Jr., (D-Indiana), introduced H.R. 8079. The Benjamin bill served as the House counterpart to S.684; the two bills were identical.

EIA opposition continued, but another influential organization, the Society of Broadcast Engineers (SBE), threw its support behind the League. Explaining its support, SBE noted:

> The quality of the broadcast signal is worthless if it is interfered with. This is particularly true of television, where SBE technicians strive for the state of the art in transmission of both picture and sound, only to have their work bollixed up by receivers which were not properly designed to begin with and which cannot discriminate between the desired and undesired.

Rep. Vanik, who was by this time no stranger to radio amateurs, introduced a new, improved bill into the 95th Congress, H.R. 8496. *QST* continued to urge League members to write to their congressmen. The Vanik bill, the Benjamin bill and the Goldwater bill — it was becoming confusing! And still *another* RFI bill was introduced! Representative Joseph L. Fisher (D-Virginia) introduced H.R. 11812. According to his legislative assistant, Adele Faber, the congressman introduced the bill as a *direct result* of the number of letters that his office had received regarding the problem of RFI. Radio amateurs' voices were being heard, but they were not being focused.

Finally: A First Congressional Hearing

For the first time there was a congressional hearing on RFI. The Senate Subcommittee on Communications, obviously taking note of the lobbying activity over RFI, decided that it wanted to hear about the RFI problem. On June 14, 1978, an ARRL delegation led by President Harry Dannals, W2HD, testified in support of S.684. Sen. Goldwater chaired the session held before a standing-room-only crowd. FCC Chairman Charles D. Ferris was the first to testify, and it soon became apparent that the FCC commissioners, themselves, were sharply divided on the issue of RFI-rejection standards for consumer devices. President Dannals made the League's position clear: Hams wanted

RFI-rejection standards for consumer equipment because they were tired of being scapegoats for radio-frequency-interference problems. Diametrically opposed to the League's position was the EIA spokesman, J. Edward Day, a former postmaster general of the United States. Mr. Day disputed the League's characterization of the RFI problem. Figures of RFI cases presented by the League were too high, RFI legislation simply was not needed, and imposition of such legislation might wreak havoc in the electronics industry, according to Mr. Day. The 95th Congress adjourned, and the RFI bills died.

Picking Up the Pieces

Sen. Goldwater called for representatives of the three main groups — industry, hams and FCC — to meet to help him pick up the pieces from the 95th Congress and decide what should be done in the 96th. There were no compromises. ARRL *still* wanted legislation. The EIA was dead set against it. The FCC, however, reported that it would be issuing a Notice of Inquiry on RFI. "Not enough," commented Hal Steinman, K1FHN, of the ARRL staff. "We know what the problem is; it's just a matter of *doing* something about it."

The struggle for RFI legislation continued. Representative Lionel Van Deerlin (D-California) introduced a bill, H.R. 3333, designed to rewrite the Communications Act completely. His bill proposed to give the "Communications Regulatory Commission" the authority to regulate the RFI susceptibility of home electronic equipment, but the rest of the bill was a hotbed of political controversy. Senators Goldwater and Ernest F. Hollings (D-South Carolina) also introduced S. 622 and S. 611, respectively. In the short space of one year, an ARRL delegation testified before Congressional committees three times in support of provisions for Amateur Radio. The League took every opportunity to get RFI legislation added to other measures, and even tried to get RFI provisons added to another Van Deerlin bill, H.R. 13015.

In the meantime, the ugly specter of local RFI legislation continued to rear its head. Texas State Representative Sam Hudson introduced Texas House Bill 75, which would have allowed civil actions to be brought against anyone "interrupting the transmission or reception of radio or television [signals]." An overwhelming response by Texas radio amateurs writing to Rep. Hudson resulted in the withdrawal of the bill, but the experience showed that a clear statement of federal preemption of RFI matters was needed more than ever. There were also smaller "brush fires" of local governments adopting restrictive antenna ordinances for the stated purpose of legislating RFI problems out of existence. Other amateurs were facing private lawsuits filed by neighbors, under a nuisance theory, because the amateurs allegedly caused RFI.

Going For Broke

ARRL efforts to amend the Communications Act were further complicated by the fact that amateurs needed legislation to cope with other problems. By 1980, Amateur Radio was facing the serious problem of FCC staff cutbacks amid a growing need for FCC services in administering and preparing amateur examinations and in monitoring the airwaves for rules violators. Representative William E. Dannemeyer (R-California) introduced H.R. 8445, designed to permit the FCC to use volunteers for the purpose of monitoring rules violators, but the bill died in committee when the 96th Congress adjourned. Not discouraged, he introduced H.R. 2203 into the 97th Congress. However, it, too, was limited to providing statutory authority for the FCC to use volunteers in the preparation and administration of amateur exams, and in monitoring the amateur airwaves for rules violators.

It soon became apparent to ARRL leaders that Amateur Radio needed one unified effort encompassing all the needed amendments to the Communications Act: FCC authority to adopt RFI-rejection standards, to use volunteers in the administration and preparation of amateur exams, and to enlist volunteers for monitoring the airwaves for rules violators.

Amateur Radio also needed legislation to exempt amateur transmissions from Section 605 of the Communications Act, the "secrecy provisions," to prevent a legal technicality from getting in the way of reporting rules violations efficiently. Also, getting the FCC the statutory authority to grant licenses for 10-year terms instead of the five-year maximum would free FCC resources for these other, higher-priority activities.

ARRL members went into action and let their congressmen know that they wanted them to support S. 929 and H.R. 5008.

Perry Williams, W1UED, ARRL Washington Area Coordinator, and Robert M. Booth, W3PS, ARRL General Counsel, asked Sen. Goldwater if he would be willing to sponsor yet another bill. Yes, the Senator was willing, and he suggested that the League's staff work with the staff on the Senate Subcommittee on Communications to prepare the bill.

ARRL's "wish list" made its appearance early in 1981 as Senate Bill 929. The only thing S. 929 did not contain when it passed the Senate in September was ARRL's hope for giving the FCC the authority to require a license at the point of sale for transmitters, to deal with the growing problem of "bootleggers" on the airwaves. That, the Senate staff decided, had best be left for another time; it was so controversial, it could have sunk the whole bill, ARRL was told.

Soon after the Senate adopted S. 929, Representative Timothy Wirth (D-Colorado) introduced H.R. 5008, a companion bill that contained essentially the same provisions as S. 929, along with FCC's "Track 1" (non-controversial) legislative requests. League staff identified weak areas in House support of the bills and made urgent, direct appeals to League members in certain congressional districts. ARRL members let their congressmen know that they wanted them to support S. 929 and H.R. 5008. League field officials, such as assistant directors and public information assistants, conducted their own grass roots campaigns among League members. Other League members went into action across the country.

Victory in the Final Round

In the fall of 1981, *QST* reported that S. 929 had passed the full Senate unanimously. On June 2, 1982, its counterpart in the House, H.R. 5008, sailed through the House Committee on Energy and Commerce. This Committee action was seen as the last major political hurdle; now, League and Congressional staffers had to watch for technical delays and the danger that the Congressional session might end before there was final action on the legislation.

Finally, on August 19, 1982, the U.S. Congress gave its approval to the Amateur Radio legislation. S. 929 and H.R. 5008 were passed as part of an authorization bill, H.R. 3239.The final hurdle would be the President, himself. On September 13, 1982, President Reagan signed H.R. 3239 into law. Amateur Radio and the League had won the final round.

The many years of effort and disappointment have given way to one large feeling of accomplishment and hope. It is not possible to list all those who helped in meeting this goal — it would be far too long. If *you* were one of those who helped, however, even if it was only to write a letter to your congressman, you can be proud. Thank you for the service you have given. It's not an exaggeration to say that the enactment of P.L. 97-259 begins a new age for the Amateur Radio Service in the U.S.

A High-Power Cavity Amplifier for the New 900-MHz Band

Be ready for the new 900-MHz amateur band when it's ours to use! The road to QRO is paved with resonant cavities and other forms of uhf plumbing.

By Robert I. Sutherland,* W6PO and William I. Orr,* W6SAI

The 1979 WARC (World Administrative Radio Conference) assigned a portion of the 900-MHz region to the Amateur Service in Region 2, which includes the United States, Mexico, Canada and the Central and South American countries. As of this writing, the band has not yet been positioned in the spectrum nor authorized for amateur use in the U.S. Even so, knowing that it will eventually be available raises questions of interest to vhf-minded amateurs.

What will the propagation characteristics of the new band be? Will it resemble 432 MHz or 1296 MHz, the companion bands? Or neither? What circuit techniques apply to the new band? How can power be generated at this frequency to make "tropo" and "moonbounce" (earth-moon-earth) communications practical?

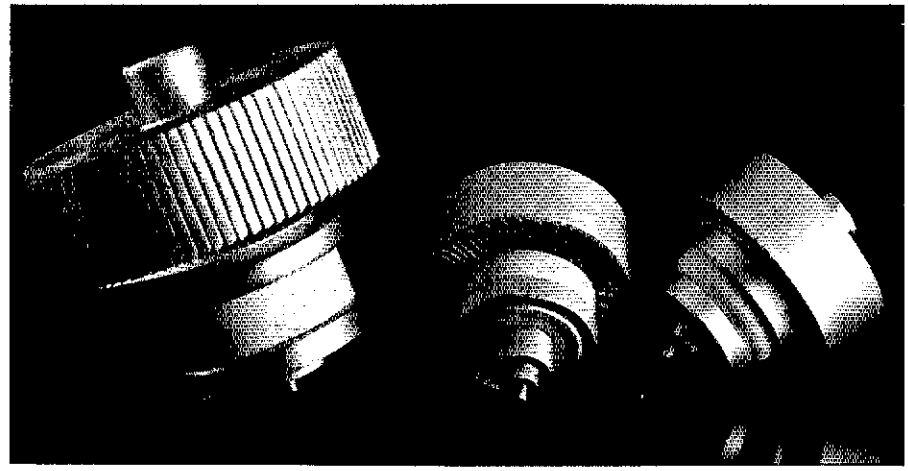


Fig. 1 — Uhf tubes, left to right: 8938 triode with a plate dissipation of 1500 W and rated for more than 1500 W of output at 400 MHz; the 3CX400U7, used in the CV-2805 cavity at 900 MHz; and a 3CX600U7, for over 380 W of output at 800 MHz (rated to 1000 MHz).

The 900-MHz Band Looks Good!

At first glance, the proposed 900-MHz band has a lot going for it. A given antenna type is about half as large as it would be at 432 MHz. That's good news for the enthusiast with the small back yard. Receiver noise figure can be as good at 900 MHz as it is at 432 MHz. Coaxial lines are less lossy at 900 MHz than they are at 1296 MHz. Standard antenna designs work well at 900 MHz, whereas some of them become "squirrely" at 1296 MHz. As every 1296-MHz enthusiast knows, generation of appreciable transmitter power at that frequency is a formidable task. Not so at 900 MHz.Several uhf transmitting tubes will deliver the goods at 900 MHz (Fig. 1), and circuit design is straightforward.

Taking everything into consideration, it seems as if the forthcoming 900-MHz assignment is a "natural" for radio amateurs, since the equipment required to make use of this portion of the rf spectrum is available now. All amateurs require is the *authority* to use this new, interesting band.

A 900-MHz Power Amplifier

Described in this article is a simple power amplifier that is intended for moonbounce communication at 900 MHz. In fm or cw service it provides over 200-W output, and in ssb service it provides over 300-W PEP output. Drive power is about 20 W peak in either case. For those interested, a block diagram of the complete EME station is given in Fig. 2.

The amplifier is essentially a quarter-wave rectangular resonator used in conjunction with a 3CX400U7 high-mu power triode. The tube operates at 1500 to 2000 V. A three-quarter-wave coaxial line assembly is used for the input circuit. Drive power is obtained from a solid-state circuit and a 3CX100A5 cavity amplifier. This is a basic uhf cavity amplifier design that was pioneered by EIMAC and used with success at frequencies above and below the forthcoming amateur band.[1]

The general operating characteristics of the 3CX400U7 tube are listed in Table 1. A combination of high amplification factor and minimum grid interception provide good power gain in cathode-driven service. Coaxial terminals and continuous cone-shaped internal supports for the grid

[1]Notes appear on page 16.

Table 1

Operating Characteristics of 3CX400U7 at 900 MHz

Tube Parameters	*Ssb*	*Fm/Cw*
Plate voltage	2000-V dc	1500-V dc
Cathode bias†	12.0-V dc	12.0-V dc
Filament voltage	6.3-V ac	5.0-V ac
Plate current	400-mA dc	400-mA dc
Grid current††	– 10 mA dc	– 10 mA dc
Useful power output	320 W	230 W

†Varies with class of service
††Approximate

*Varian/EIMAC Division, San Carlos, CA 94070

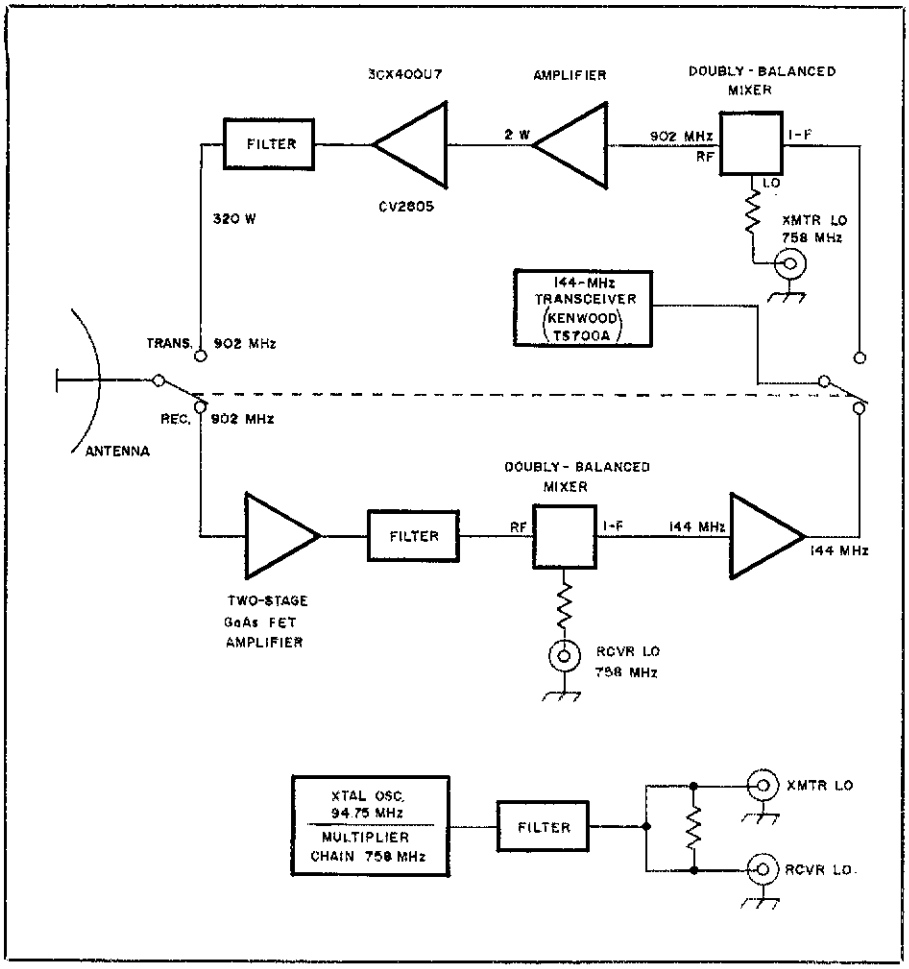


Fig. 2 — Block diagram of the planned EME station at W6PO. A 144-MHz transceiver is used as the station control unit.

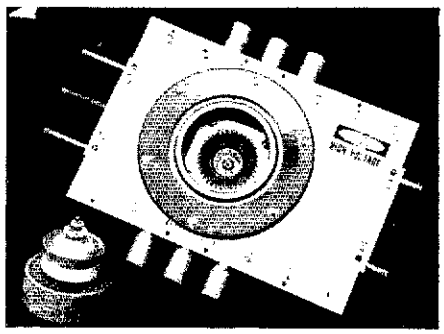


Fig. 3 — Top view of the CV-2805 cavity for 900 MHz. A 3CX400U7 provides more than 300 W of ssb output power. A phenolic ring surrounds the tube-anode collet and holds the circular plate-bypass capacitor (see text).

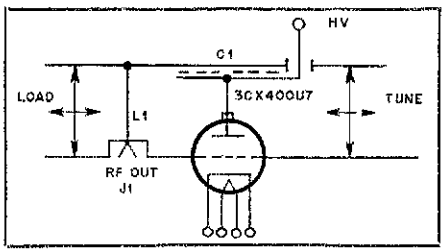


Fig. 4 — Plate circuit of the 1/4-wavelength rectangular resonator. Tuning is by means of sliding walls. The left wall (marked *load*) varies the output coupling by changing the cavity area between L1 and the wall. Resonance is obtained by moving the right wall *(tune)*, which varies the volume of the cavity. The two walls are adjusted in unison, much like the tuning and loading controls of an hf-band amplifier. A large plate is separated from the top of the resonator by means of a thin insulating sheet. It serves as a plate bypass capacitor.

and cathode elements of the 3CX400U7 provide the lowest possible inductance between tube elements and the external circuitry.

The Cavity Plate Circuit

The plate circuit of the CV-2805 amplifier (Fig. 3) is a quarter-wave adjustable cavity. Output coupling is magnetic. A loop is formed between the cavity walls and a post that terminates in the coaxial output connector. Coupling between the output loop and the cavity is varied by moving a wall of the cavity. A simple threaded drive shaft does the job. The degree of coupling is determined by the cavity area enclosed by the post and the cavity walls (Fig. 4). Plate-circuit resonance is established by changing the volume of the cavity by means of a second sliding wall. Contact between the movable walls and the cavity is maintained by preformed finger stock. The two walls are adjusted in unison, much like the conventional loading and tuning controls of an hf amplifier.

The Input Circuit

A simplified drawing of the input circuit is shown in Fig. 5. As shown at A, the circuit is a 3/4-wavelength-long coaxial line. Nearly a quarter wavelength of the circuit is inside the tube, loaded by the tube input capacitance, so that the use of a quarter-wave line is out of the question; insufficient line exists outside the tube to couple to or to effectively tune. An additional half wavelength of line is added to provide room for the tuning capacitor (C1) and the coupling capacitor (C2), which are both placed near the high-impedance portion of the line. The rf short at the bottom of the line is reflected one-half-wavelength up the line, placing the cathode and grid of the tube at a high-impedance point, with the proper 180° phase difference betwen the elements. Since the outside of the assembly is at dc ground potential (Fig. 6), the rf short at the bottom end of the line is made up of a very-low-impedance bypass capacitor, which provides dc isolation for the cathode-return circuit. Fig. 5B shows the same circuit folded back upon itself to conserve length. This is the configuration used in the CV-2805 cavity. The filament leads are brought out through concentric tubes at the center of the assembly; the tubes act as rf chokes to isolate the filament circuit.

Cooling The Cavity

Air for anode cooling is introduced from a cowl or chamber through the three short tubes on each side of the output cavity. The air then exhausts through the finned anode. The short tubes are dimensioned to serve as a "waveguide beyond cutoff" rf filter in the air openings. This prevents the loss of rf power through these ports. Approximately 11.5 cfm of air is required when the tube is operating at sea level and at the full anode dissipation rating of 400 W. The pressure drop across the anode cooler at this flow rate is about 0.2 inch of water. These figures are based on an incoming air temperature of 50° C and a maximum tube-anode temperature of 225° C.

Heater-Cathode Operation

The nominal heater voltage for the 3CX400U7 is 6.3. For operation above 300 MHz and at full power or key-down cw service, the voltage should be reduced as the cathode receives additional heat from rf charging currents and transit-time effects. In this cavity, operating heater voltage is 5.0 for continuous service. During warmup and standby periods, heater voltage is held at 6.3. Nominal heater voltage is applied for a minimum of 60 seconds before plate voltage is applied and operation commences. For best life expectancy and the most stable performance, it is suggested that the heater

voltage be held to the final desired value with ±2%. For ssb service and low duty cycle cw, heater voltage is maintained at 6.3.

The Metering Circuits

Conventional grid- and plate-metering circuits are used, with protection provided for the meters by means of reverse-parallel shunt diodes. A zero-center meter is used in the grid circuit because a normal grid-current indication can be negative, depending on plate-circuit loading. This negative current is the result of tube characteristics and transit-time effects at the frequency of operation. A simplified metering diagram is shown in Fig. 7.

Amplifier Adjustment

Before operation is attempted, the cavity-amplifier controls should be set by means of a preturning chart. The cavity frequency rises as the tuning wall is moved inward toward the tube. During tuneup, an rf directional coupler should be placed in the drive line from the exciter. A Thruline® wattmeter, or equivalent monitor, is placed in the output line to the dummy load. Filament and bias voltages, and cooling air, are applied to the cavity. A filament voltage of 6.3 is applied for 60 seconds, followed by the anode voltage of 2000, maximum. Plate current with no drive signal will be approximately 50 mA. When about 10 W of drive is applied, the plate current should rise to 300 to 400 mA. There should be an indication of output power on the Thruline® wattmeter.

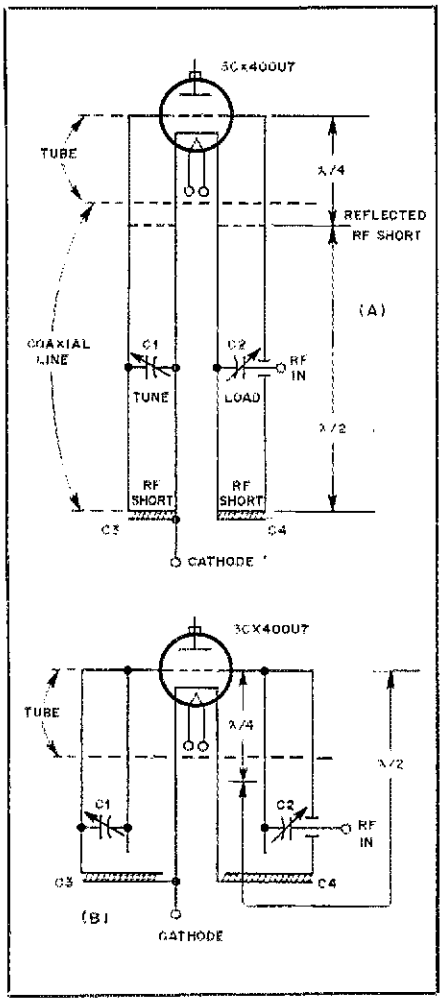


Fig. 5 — At A, the circuit is a 3/4-wavelength coaxial line. Nearly a quarter wavelength of the line is inside the tube — loaded by the tube input capacitance. It is difficult to couple to the short line section, which is external to the tube, so an additional half wavelength of line is added to provide room for tuning capacitor C1 and coupling capacitor C2. The rf short at the bottom of the line (C3, C4) is reflected a half wavelength up the line. This places the cathode and the grid at high impedance, with the proper phase difference between the elements. At B, the same circuit is folded back on itself to conserve length.

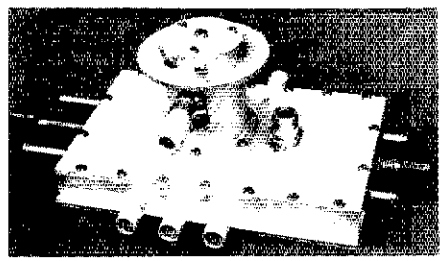


Fig. 6 — View below the CV-2805 cavity. Input-loading capacitor C2 is adjusted by sliding the coaxial fitting in and out of a sleeve. A clamp around the joint locks the adjustment. The plate rf connector is at the side of the input cavity. Filament and cathode connections are made at the end of the input cavity. The assembly is made from heavy silver-plated brass stock to limit thermal expansion.

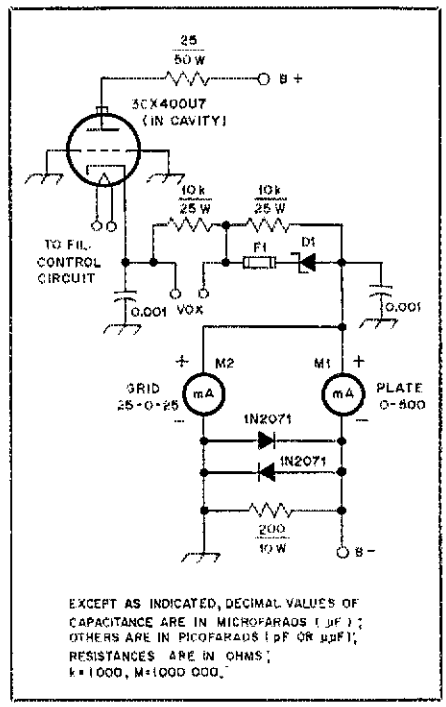


Fig. 7 — Amplifier metering circuit. Metering is done in the power supply return lead. The high-voltage negative line is a few mV above ground to allow insertion of the meters. Reverse-connected diodes protect the meters from overload.

Under no circumstances should there be rf drive with no plate voltage, as the full drive power will be dissipated in the grid. The tuning and loading controls are now adjusted for maximum output, and both of them are varied until maximum output is achieved. The filament voltage is now dropped to 5.0 for continuous duty or fm operation. It is held at 6.3 for ssb service.

The next step is to adjust the input tuning and matching controls under full-power conditions. The input probe capacitor and the tuning control are adjusted for minimum reflected power. These adjustments are interlocking, so they must be done alternately, tuning for minimum power reflection in the drive line. When this is achieved, the output tuning control should be reset for best power output.

Operation Notes

The tube anode is bypassed effectively in the cavity, so no special precautions are required for application of high voltage to the tube. Connection is made most easily to the center cap of the anode, and it is recommended that a 25-ohm, 50-W current-limiting resistor be used in the high-voltage lead to protect the tube in the cause of a fault condition.

Application of plate voltage should be interlocked with the rf drive in a suitable manner so that the drive signal cannot be applied to the cavity in the absence of plate voltage. It is suggested also that the equipment include an air interlock, so no voltages can be applied to the cavity unless there is an adequate flow of cooling air. For ssb service, the bias should be a fixed value and may be obtained with Zener diode(s) in the cathode circuit.

Finally, it must not be forgotten that absorption of rf energy by human tissue is dependent on frequency. Under 300 MHz, most of the energy will pass completely through the human body with little attenuation or heating effect. At 900 MHz, however, a noticeable heating effect exists, and a prudent operator will stay clear of the antenna field. More information on rf effects on the human body can be found in note 2.

Notes

[1]The brochure entitled "EIMAC Cavity Amplifiers," and data sheets for the CV-2805 and the 3CX400U7 are available at no cost by writing to: Application Engineering Dept., Varian/EIMAC Division, 301 Industrial Way, San Carlos, CA 94070.

[2]The following references should be helpful to those seeking further information:

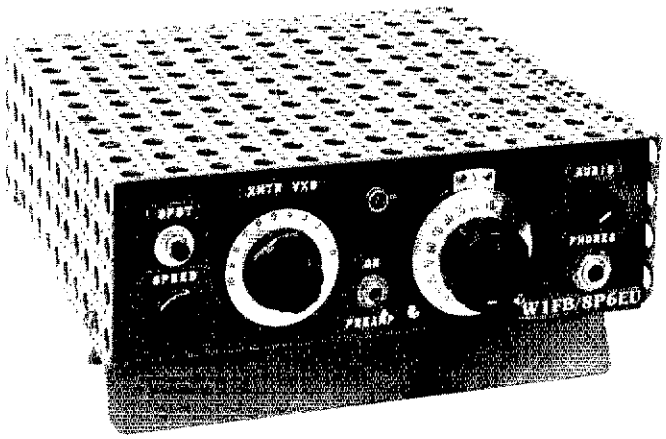
ANSI C95.1-(1982), *Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields (300 kHz to 100 GHz)*. (New York: American National Standards Institute, 1982).

"ARRL Comments on the Biological Effects of RF Energy," Oct. 1982 *QST*, p. 53.

"How Dangerous is RF Radiation?" Technical Correspondence, Sept. 1978, p. 31.

Proceedings of the IEEE, Special issue on Biological Effects and Medical Applications of Electromagnetic Energy, Jan. 1980 (New York: IEEE, 1980).

The 8P6 Special — "Hamcation" Backup Rig



Campers, travelers, vacationers and DXpeditioners require compact, lightweight gear. This trans-receiver for 20 meters fits the description and is not difficult to build.

By Doug DeMaw,* W1FB

Worried about a breakdown with your primary station on a "hamcation" (ham radio vacation)? Need a small rig for a business trip or a weekend holiday? Or how about that camping trip you've been planning? No doubt a trans-receiver that can be operated from a 12- to 14-V dc power source, and which can deliver 6 to 8 W of properly shaped cw into a 50-ohm load, would appeal to you. By way of added features, how about including a single-signal superheterodyne receiver with a 250-Hz i-f filter and rock-stable frequency control of the transmitter and receiver sections?

Some Features

I've carried all manner of QRP transceivers and "separates" on junkets to various West Indies islands over the years, mainly as a backup to the primary equipment. Most of them have worked well in a pinch — when the commercially made transceiver failed. But, most of the homemade units contained direct-conversion (D-C) receivers, which did not provide the cw selectivity I desired. Futhermore, single-signal reception was not possible, which compounded the QRM problem — especially in pileups! Since a bare-bones superheterodyne receiver is scarcely more expensive or complicated to build than is a high-performance D-C receiver, the former was my choice for this project. The receiver section of the trans-receiver was described earlier in *QST*[1]; therefore, I will key this article to the remainder of the circuit in the portable unit.

Long-term frequency stability is of the utmost importance to dependable dial calibration and effective operating. Large changes in temperature are prevalent from day to night in the tropics and when camping. Some simple L-C VFOs fail to "measure up" in the presence of radical shifts in ambient temperature, sometimes drifting more than 5 kHz over a 20° F temperature change. I chose VXO (variable crystal oscillator) control for the receiver and transmitter sections of this QRP station and could detect no discernible drift in either circuit during two weeks on Barbados as 8P6EU. Chirp-free cw was obtained from the transmitter, and one operator I contacted remarked, "Boy, it sounds like you're keying a frequency standard." A tape recording of my 8P6EU signal (courtesy of N1FB) verified the "sanitary" sound of the signal.

The portable package contains a Curtis Lil' Bugger keyer ($29.95, from Curtis, minus case and speed control); a twin-T sidetone oscillator, break-in delay module for T-R switching; and a switchable 15-dB preamplifier for use ahead of the receiver, as desired. A block diagram of the composite circuit is given in Fig. 1.

Transmitter Circuit

An excellent 20-meter transmitter was designed by former Hq. staff member W1VD for use in the Project Goodwill program.[2] It was chosen for use in my trans-receiver, and some modifications were made to (1) increase the VXO frequency swing; (2) shape the cw waveform; (3) provide diode switching for T-R control; and (4) add decoupling networks to ensure unconditional stability of the low-level stages. A bipolar dc switch was also added for keying control, as were heat sinks on Q3, Q4 and Q5.

All of the modifications are included with the original circuit on a new pc board that is the same size as the original one.[3] The circuit performance is otherwise unchanged from that of the original W1VD design. Circuit details are given in Fig. 2.

The Curtis keyer has a sidetone circuit, which can be used in place of the twin-T audio oscillator in this design. The duplication of sidetone availability resulted from the Curtis unit being added as a last minute convenience before the Barbados trip.

A spotting switch has been included to permit zero beating the receiver to the transmitter frequency, or vice versa. When spotting is done, the operator should tune for a pitch of approximately

*Senior *QST* Technical Editor

[1]Notes appear on page 21.

700 Hz to ensure that the transmitter frequency closely approximates that of the station being worked. Because of the twin VXO feature of this trans-receiver, no RIT is required, and wide transmitter-receiver frequency splits are possible.

The VXO Circuits

Greater frequency coverage is available per single crystal as the crystal frequency is increased. Hence, the receiver provides roughly 30 kHz of coverage at 14 MHz, owing to the 17.6-MHz crystal frequency. The transmitter covers approximately 19 kHz with the 14-MHz crystal. I set my frequencies to cover the lower portion of the Extra Class cw segment, but crystals can be chosen to yield coverage in any part of the band. I have a second crystal pair that provides operation in the General class part of the 20-meter cw band. The four crystals enable me to receive from 13.999 to 14.060 MHz. I can transmit from 14.000 to approximately 14.038 MHz.

The crystals are cut for a load capacitance of 30 pF and should be of the fundamental-mode type. Although overtone crystals can be used on the fundamental mode, they do not provide as great a frequency swing as fundamental-cut crystals do. An AT-cut crystal in an HC-6/U style of holder is recommended for VXO use. FT-243 crystals are not suggested for these circuits.

The innovator may wish to experiment with the VXOs to extend the tuning range. This can be done by increasing the inductance placed in series with the crystals. But, a point will be reached where the oscillator becomes a VFO rather than a VXO (with swings in excess of 100 kHz). The rock-stable quality will be lost, however.

The upper range of crystal oscillation with these circuits will always be higher than the marked frequency of the crystal — approximately 15 kHz higher for the receiver and about 8 kHz for the transmitter. This should be considered when ordering crystals. Furthermore, no two crystals ground for a given frequency will yield exactly the same operating characteristics in terms of frequency limits and range.

The VXO tuning response is nonlinear. The low-frequency end of the range is spread out, but the high-frequency part of the range is bunched up, so to speak. A vernier drive is recommended for the receiver VXO, but direct drive is adequate for adjusting the transmitter VXO.

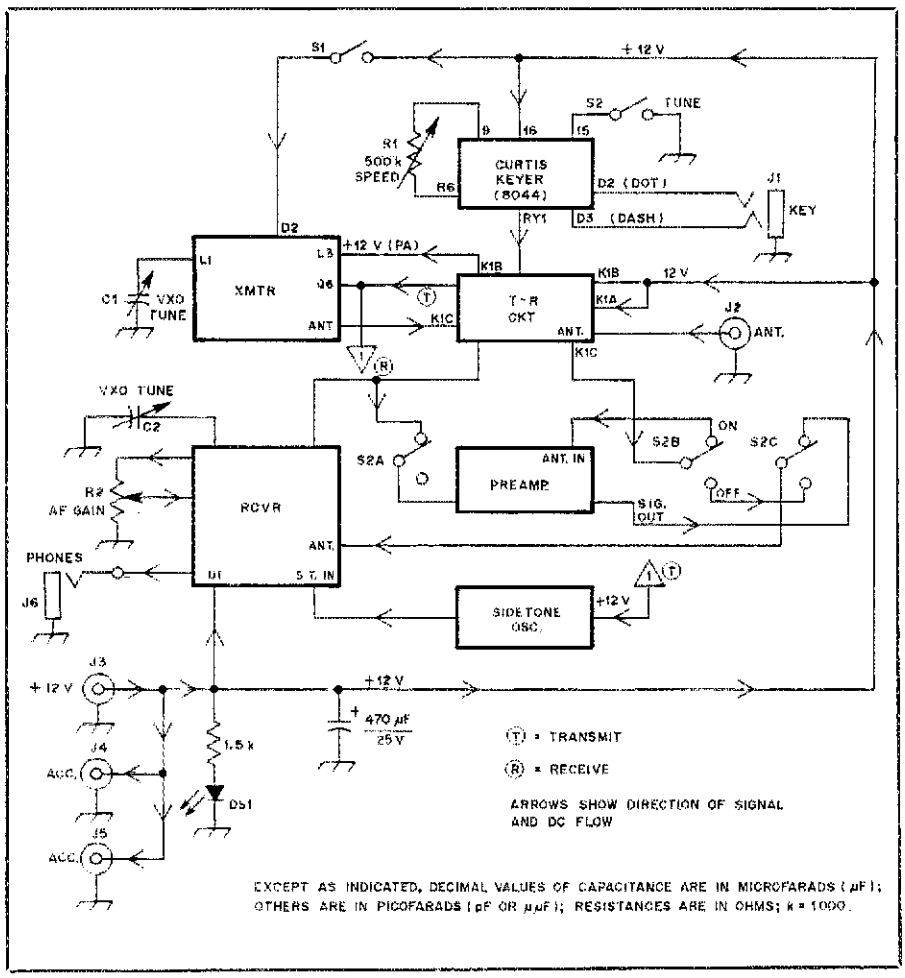


Fig. 1 — Block diagram of the trans-receiver showing how the modules are associated with one another. DS1 is a green panel-mount LED from Radio Shack. It serves as an on-off indicator. R1 and R2 are located on the front panel of the unit. The VXO tuning controls (C1 and C2) are available from the front panel.

Receiver Preamplifier

Although the basic receiver is not a monument to sensitivity and dynamic range, it is satisfactory for most 20-meter operation. I added a MOSFET preamplifier for use during weak-signal reception (Fig. 3). The primary advantage is an increase in overall receiver gain, with a noticeable improvement in noise figure. The preamplifier can be switched out of the antenna line for routine operation. I used a circuit kit that is available from Circuit Board Specialists (see note 3).

T-R Break-In Circuit

Break-in delay is provided by means of the circuit in Fig. 4. The module was developed by WAØUZO for use as a COR (carrier-operated relay) in repeaters. It has the advantage of not "hot switching" the PA stage of the transmitter. Hence, the antenna is connected to the PA before drive reaches the MRF476s. Hot switching can destroy the PA transistors over a period of time, and it can send out a momentary transient or "blurp" that may cause interference to other amateurs who are sharing the band.

Variable time delay has been provided by virtue of a pc-board control. The drop-out period can be lengthened by changing the 22-µF capacitor at pins 7 and 8 of the IC to a larger value. The components specified in Fig. 4 will permit a maximum delay of roughly 2 seconds. Minimum delay is 0.2 second.

A CD4093 quad, two-input Schmitt-trigger IC is the heart of the T-R circuit. As configured, the circuit permits the relay to close (transmit initiate) and the receiver to turn off instantly. Roughly 5 ms later, the transmitter is actuated, preventing unwanted hot switching. When the cw key is left up beyond the delay period, the relay opens and the receiver is actuated 5 ms later.

A 2N2222 serves as a relay driver, and two bipolar pnp switches are used for additional T-R control. The foregoing transistors are driven by the Schmitt trigger.

K1A in Fig. 4 is a surplus 12-V dc relay (135-ohm coil) from my junk box. Any similar dpdt relay can be used with the T-R circuit. For full QSK, the timing capacitor (22-µF) can be deleted and a reed relay (dpdt) or pair of reed relays (spdt each) substituted for K1. The reed relays will follow high-speed keying; standard relays won't. Various methods for full QSK are discussed in *Solid State Design for the Radio Amateur*.[4] The T-R circuit also keys the sidetone oscillator.

Sidetone Oscillator

Fig. 5 shows the circuit of the sidetone oscillator. The values given provide a frequency of 700 Hz with a clean wave. Out-

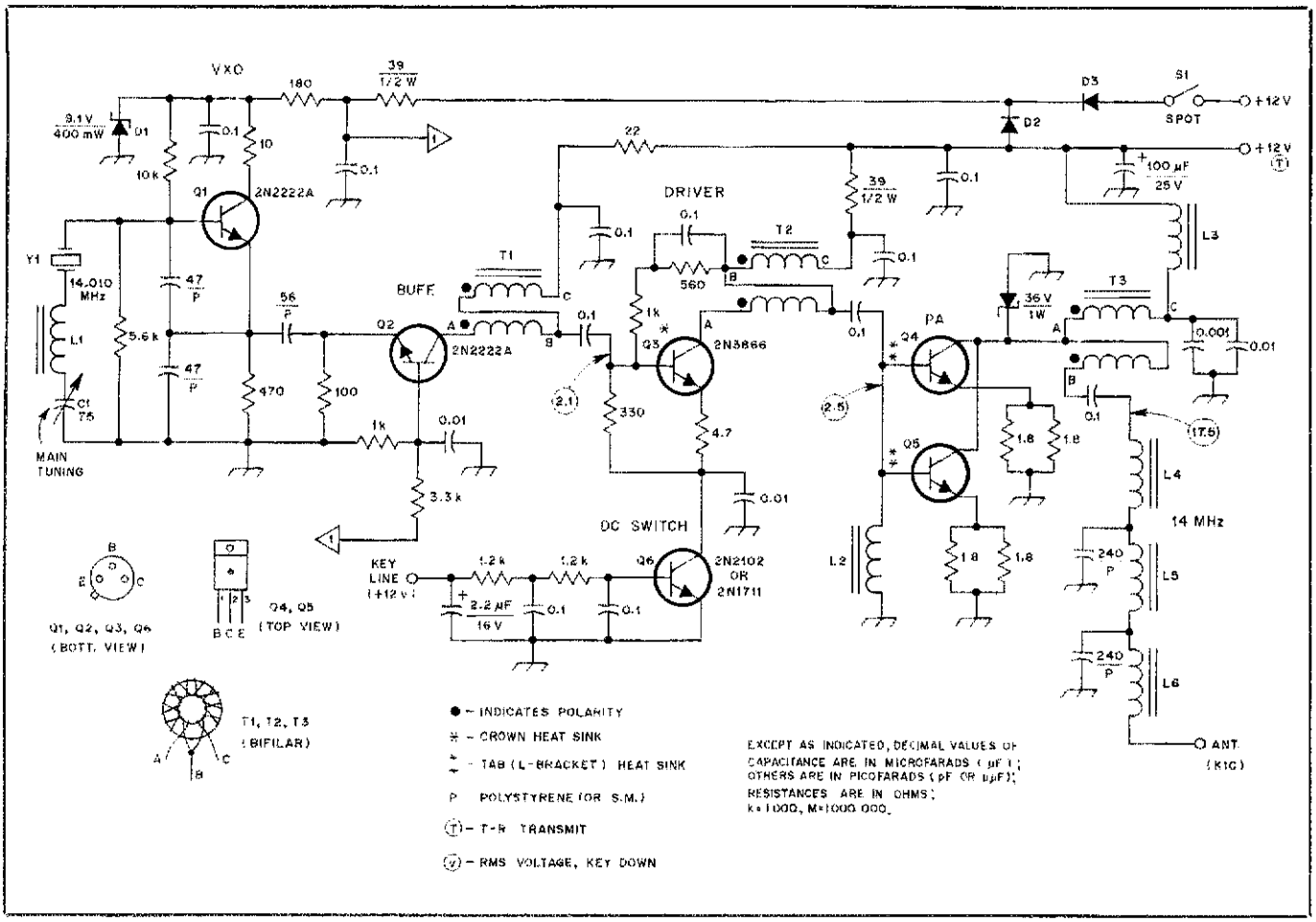


Fig. 2 — Schematic diagram of the modified W1VD 20-meter transmitter. Fixed-value capacitors are disc ceramic, unless otherwise noted. Polarized capacitors are tantalum or electrolytic. Fixed-value resistors are 1/4- or 1/2-W carbon-composition types, unless indicated differently.

C1 — Miniature 75-pF air variable.
D1, D4 — Zener diode regulator.
D2, D3 — 50-PRV, 1-A rectifier diode.
L1 — 43 turns no. 26 enam. wire on T50-6 toroid core (Amidon or Palomar Engineers), 7.5 µH.
L2 — Ferrite choke, 8 turns no. 26 enam. wire on an Amidon FB-73-801 jumbo bead.
L3 — Ferrite choke, 10 turns no. 24 enam. wire on an Amidon FT50-43 toroid.
L4, L6 — Toroidal inductor, 16 turns no. 24 enam wire on a T50-6 core.
L5 — Toroidal inductor, 19 turns no. 24 enam. wire on a T50-6 core.
Q4, Q5 — Motorola citizens band MRF476 transistor. Replaces discontinued MRF472 used in original W1VD circuit. Use home-made aluminum heat sink (small L bracket).
S1 — Push-button, momentary-on, panel-mount switch.
T1, T2 — Toroidal 4:1 broadband transformer. Use 11 bifilar turns no. 26 enam. wire on Amidon FT37-61 core.
T3 — Toroidal 4:1 broadband transformer. Use 11 bifilar turns no. 26 enam. wire on Amidon FT50-61 core.
Y1 — Fundamental 14-MHz range crystal, 30-pF load capacitance (see text). International Crystal Mfg. Co. type 434110, 10 N. Lee St., Oklahoma City, OK 73102.

put from the oscillator is routed to the op-amp audio-output stage of the receiver through a level control on the sidetone module. The audio-output amplifier is operational at all times, thereby permitting the sidetone to be heard during transmit periods.

Construction

There is plenty of latitude for packaging the trans-receiver. I chose a homemade cabinet that measures (HWD) 2-1/2 × 8 × 7 inches.[5,6] The cabinet bottom is a U-shaped piece of 16-gauge aluminum stock. The top cover is fashioned from a piece of aluminum cane metal that I bought at a hardware store. L brackets (two) are affixed to the inner edges (left and right) of the bottom half of the case. They provide anchor points for

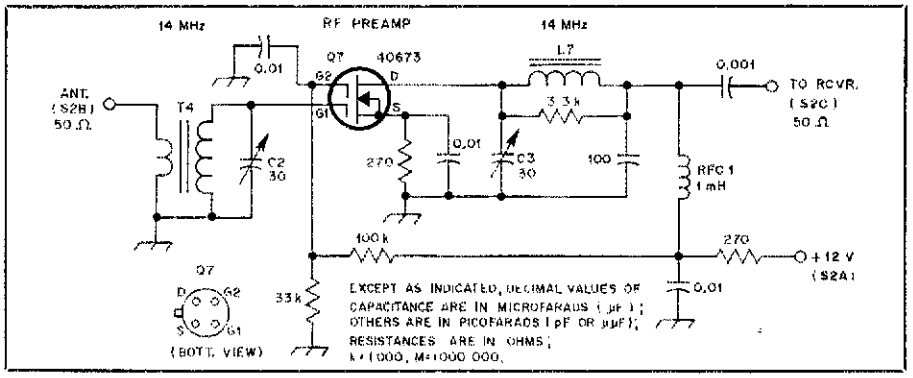


Fig. 3 — Schematic diagram of the 20-meter receiver preamplifier. Fixed-value capacitors are disc ceramic. Resistors are 1/4- or 1/2-W carbon composition.

C2, C3 — Miniature 30-pF Mylar or mica trimmer, pc-board mount.
L7 — Toroidal inductor, 30 turns no. 28 enam. wire on a T37-2 core.
RFC1 — Miniature rf choke, 1 mH.
T4 — Toroidal rf transformer. Primary, 2 turns no. 28 enam. wire over ground end of secondary winding. Secondary contains 28 turns no. 28 enam. wire on a T37-2 core.

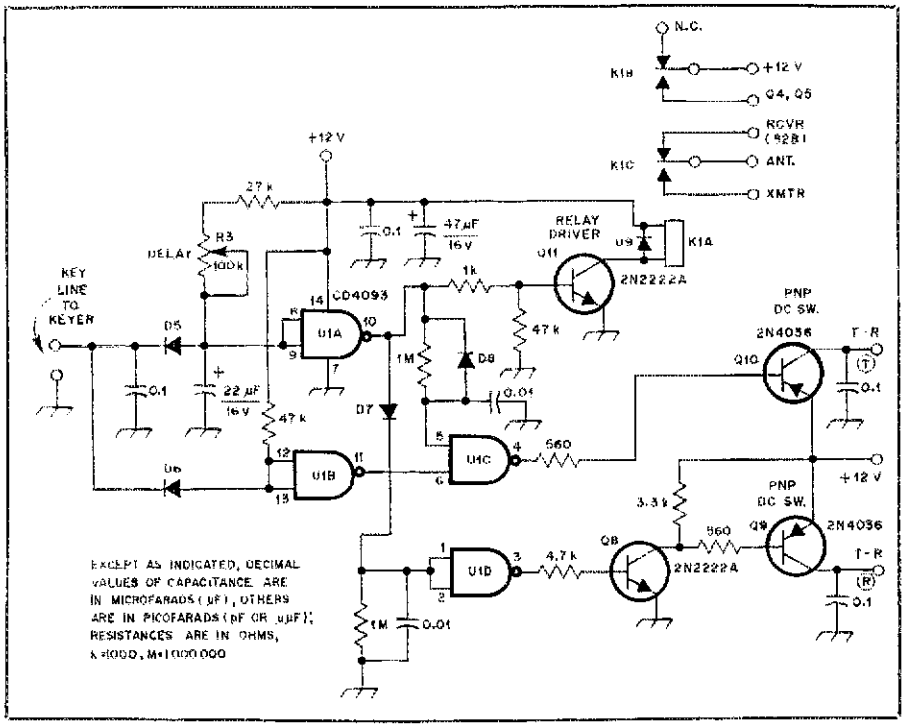


Fig. 4 — Schematic diagram of the break-in delay T-R circuit. Fixed-value capacitors are disc ceramic. The polarized capacitor can be tantalum or electrolytic. All diodes are small-signal silicon types, such as 1N914. K1 is a Magnecraft W67-RPC-X2 with a coil resistance of 135 ohms (see text). R3 is a pc-board mount trimmer control.

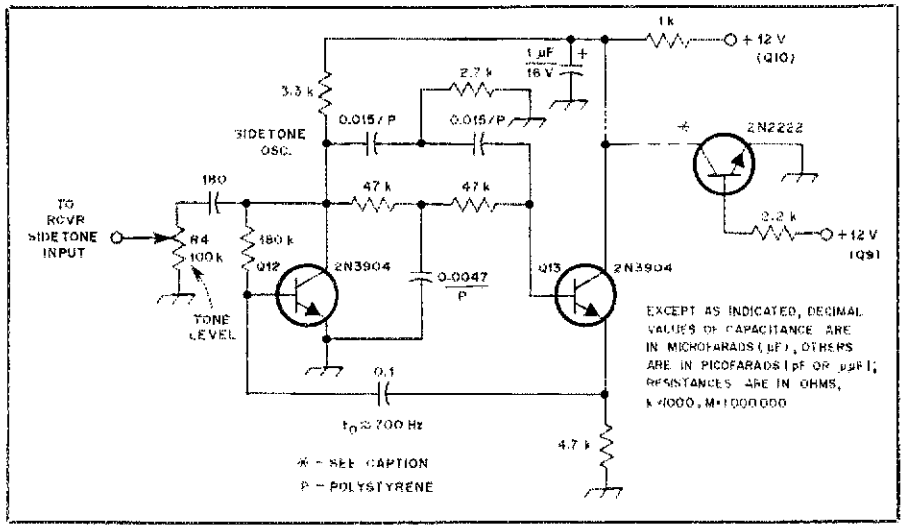


Fig. 5 — Schematic diagram of the twin-T sidetone oscillator for 700 Hz. Mylar or polystyrene style capacitors are suggested for best stability and Q. The polarized capacitor is tantalum or electrolytic. R4 is a pc-board mount trimmer control. The 2N2222 switch (optional) may be required to ensure fast turn off of the oscillator.

the lid, which is attached by means of two no. 6 sheet-metal screws per side.

The transmitter and receiver pc boards are supported above the chassis on 3/8-inch metal standoff spacers. All of the smaller boards are mounted on no. 4-40 screws, with two no. 4-40 nuts between the boards and the chassis to serve as standoff posts. A lock washer should be used at each mounting point to ensure good ground contact between the boards and the chassis. A view of the transreceiver innards is provided in Fig. 6. The revised transmitter is shown in Fig. 7.

RG-174/U miniature coaxial cable is used for all rf and audio wiring between the pc boards and the related panel jacks and controls. The shield braid of each cable should be grounded at each end. The dc connections are made with hookup wire that has been routed under the pc boards in bundles after being bound with lacing cord. A 470-µF, 25-V capacitor (see Fig. 1) is connected from the 12-V input jack to ground at the rear apron of the case. This helps to ensure a low-impedance 12-V bus and aids stability.

I painted the front and rear panels dark green. The top cover is painted gray. Both painted sections were given two coats of polyurethane clear spray after the paint had dried for 48 hours. This was done to provide a tough outer coating, which is practically impervious to damage from bumps and scratches. Green 1/4-inch Dymo® tape labels were added to identify the jacks and controls.

Adhesive-backed plastic feet (four) are attached to the bottom of the unit. I bent a length of aluminum sheeting to a 30° angle and placed it under the front of the box to elevate the panel during operation (see title-page photograph).

A set of pc-board templates and parts-layout data can be obtained from ARRL by sending $2 and a large s.a.s.e. Pc-board details for the receiver section were published in June 1982 *QST*.

Setup and Operation

It is best to assemble and test each module before mounting the circuits in the cabinet and wiring them together. "Murphy," should he be lurking in the background, can be unmasked early by this means. A scope or earphones will suffice when testing the sidetone oscillator. The T-R module can be checked by grounding the key line and observing the action of K1A.

Transmitter evaluation is accomplished by placing an output indicator (VSWR meter or wattmeter) between the PA and a 50-ohm dummy load. VXO range can be monitored on a station receiver, as can the quality of the keying. The approximate power output is determined by attaching a 2-W, 51-ohm resistor at the transmitter output terminal, closing the key (momentarily!) and measuring the rms voltage across the resistor by means of a scope or rf probe and VTVM. Power output should be between 6 and 8 W, depending on the supply voltage used. The power can be determined from

$$W = \frac{E^2}{R} \qquad \text{(Eq. 1)}$$

where E is in rms volts, and R is in ohms. Hence, if the load was 51 ohms and the developed voltage across the load was 19, the output power would be 7 W. Key-down current drain should be under 1.5 A. My unit draws roughly 1.3A.

The rf preamplifier can be tested and tuned by connecting it temporarily to the main station receiver. The gain, as noted on the S meter (relative) should be between 10 and 15 dB if all is as it should be. There must be no popping or blank carriers heard in the receiver as the amplifier is peaked. If there are some spurious responses, the preamplifier is unstable. If so, make sure the bypass capacitors are not defective and that all wiring is correct.

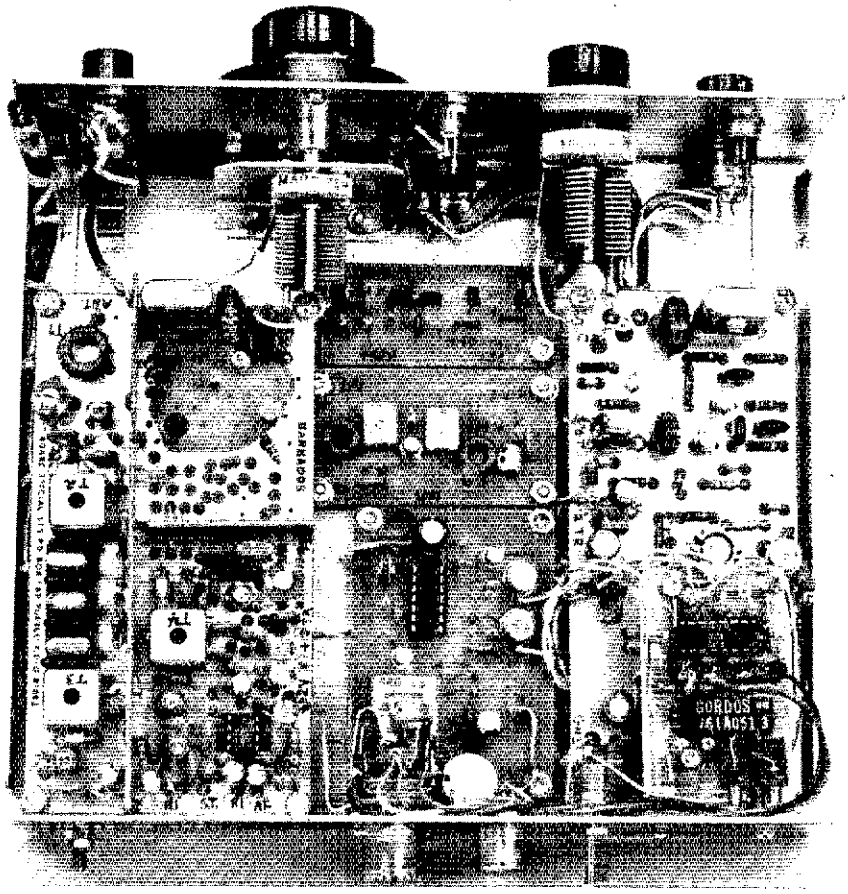


Fig. 6 — Interior view of the assembled trans-receiver. The receiver is at the far left. In descending order from the top center are the sidetone oscillator, the rf preamplifier and the break-in delay modules. At the lower right is the Curtis keyer, mounted on an L bracket above the transmitter pc board. The transmitter shown in this view is an original W1VD unit to which the modifications described in the text have been added. Fig. 7 shows the new transmitter board with a revised pattern and layout. The carrier-lock (tune) switch is located on the rear panel of the rig.

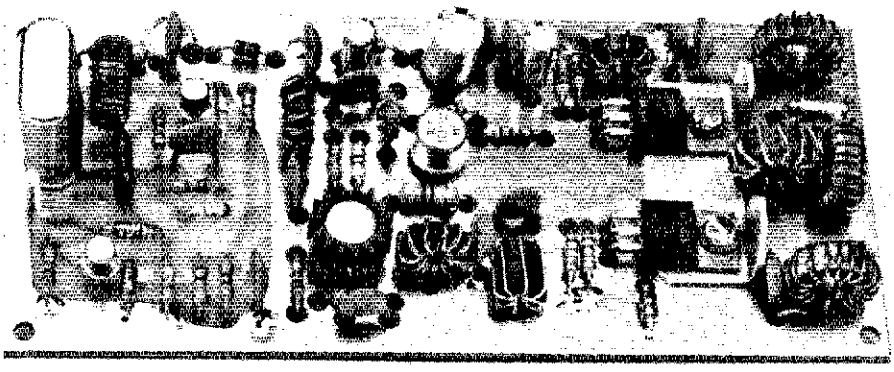


Fig. 7 — Photograph of the revised transmitter. Homemade heat sinking is provided for the PA transistors (far right). A crown heat sink should be placed on the driver transistor (board center). The ground foil has been etched away from the immediate area of the VXO to minimize stray capacitance and increase the crystal range.

Spurious responses will indicate self-oscillation. Only a smooth peak in received signal should be noted.

Results

Early-on testing was carried out at W1FB while using a Cushcraft A4 triband Yagi antenna at 50 feet. Countless stations answered my CQs and gave reports ranging from RST 569 to 599. Frankly, I could discern no difference in my success from that obtained with the FT-101ZD station transceiver (100-W output). I worked numerous European stations, and the JAs were easy to work too, when band conditions provided a good path. I was pleased when some operators asked what brand of gear I was using; they were interested because the cw note sounded so good! Many were amazed to learn the unit was homemade and that it put out only 7 W! This points out the value of proper cw waveform shaping, a trick that has not been learned by all of the commercial manufacturers. A 5-ms rise-and-fall time is the target value to shoot for.

On April 2, 1982, the little rig was packed and taken to St. James, Barbados, W.I., for a two-week holiday. The primary rig was a Ten-Tec Argosy, which operated at approximately 50 W during the 8P6EU, 8P6FJ, WB1FSB/8P6 operation. The 20-meter antenna was a sloping dipole over the seashore, the top end of which was some 35 feet above the beach. Excellent results, worldwide, were obtained with both rigs, and no operator could detect a signal difference in transmitters when I made unannounced switches during QSOs. Fortunately, we did not have to rely on the QRP trans-receiver as a backup, for the Argosy percolated nicely from 80 through 10 meters. But, I had a lot of fun with the small rig while testing its effectiveness from a DX location.

Tag Ends

It is entirely possible that the trans-receiver could be modified easily for use on 15 meters and, probably, for 40 meters. The shortfall on 7 MHz would be limited frequency shift with the VXO, but on 15 meters it should match that for 20 meters. I have not explored these possibilities and have no practical data to offer. A skilled experimenter should have no trouble with such a project.

The packaged unit could be made much smaller than the example in this paper. If the pc boards were mounted on end (vertically), that would be a step in the right direction. Or, some of the boards could be stacked atop one another. One might even include an SWR indicator and Transmatch in the cabinet.

If you're a traveling ham, this may be the rig you need. It will accompany me on many business trips, vacations and camping trips in the future. The unit may be little — but it's *loud!* QST

Notes

[1]D. DeMaw, "Build a Bare-Bones CW 'Superhet,'" *QST*, June 1982.

[2]J. Rusgrove, "A 20-Meter, VXO-Controlled, 6-Watt Transmitter," *QST*, Dec. 1978.

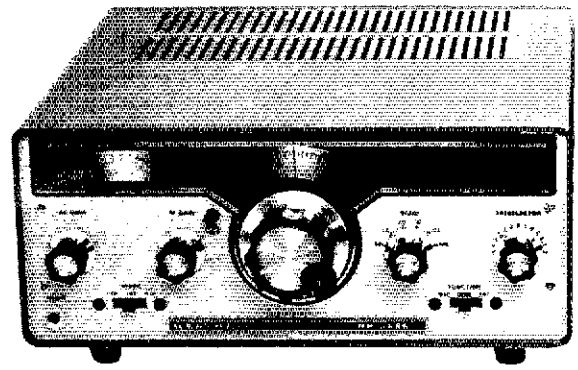
[3]Negatives, circuit boards and complete parts kits for this trans-receiver are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002, tel. 303-542-5083.

[4]W. Hayward and D. DeMaw, Published by ARRL, Inc., Newington, CT 06111.

[5]See title-page photograph. A case made from double-sided pc-board material would serve nicely in place of the aluminum one shown.

[6]mm = in. × 25.4.

HR-1680 Receiver Modifications — Try Them!



Is your '1680 as "sharp" as you would like it to be? These "fixes" will let you enjoy all-around improved performance.

By H. L. "Herb" Ley, Jr.,* N3CDR

I needed a good 12-V portable receiver for operation in emergencies. A used Heath HR-1680 was located, then put through its paces. It proved to be an excellent unit, but the selectivity and signal-to-noise ratio were not up to par with my other station equipment, and the vernier-dial mechanism was erratic in operation. So, recognizing that the HR-1680 improvement project involved circuit and mechanical changes, I set to work.

Improving the Crystal Filter

The i-f amplifier section of the receiver is straightforward. The second mixer on the front-end circuit board feeds the first i-f amplifier on the audio/regulator (A/R) board. That stage is connected to the second i-f amplifier through a cascaded half-lattice crystal filter, made up of four crystals. Unfortunately, the part of the A/R board containing the crystal filter is packed tightly with components, offering little room for modifications. A better location for additions is near the output of the second i-f amplifier, in the area containing capacitor C235 and the 13.9 μH toroid (L201) (see Fig. 1). Thus, the problem of improving the i-f amplifier selectivity and noise characteristics became one of choosing a suitable addition for the space available.

An ARRL publication, *Solid State Design for the Radio Amateur*,[1] provided some excellent leads. The authors point out a useful approach to improving the signal-to-noise ratio of a receiver: the addition of a "tail-end" crystal filter at the i-f output. My approach to improve the input filter selectivity was to measure the frequencies of several sets of matched filter crystals and to pair the crystals as closely as possible in frequency so that the filter response would be as sharp as possible.[2] This permits the extra crystals with the outlying frequencies to be used in a half-lattice tail-end i-f filter, which replaces the original A/R board i-f output circuit. This circuit concept worked out better than expected, so read on!

How to "Do It"

First remove the four filter crystals and the two BFO crystals from the A/R circuit board. Use as little soldering iron heat as possible. Flow excess solder from the crystal pins so they are smooth. Remove excess solder from the circuit board. Next, build the test oscillator in Fig. 2, so that the exact crystal frequencies can be measured. I built the oscillator on a 12-squared, hacksawed circuit board that is patterned after the method described by Leslie,[3] but any other method may be used. The circuit must be an exact electronic duplicate of the BFO oscillators in the HR-1680, even to the point of matching the load capacitance.

Measure the frequency of each crystal removed from the receiver, as well as the new crystals, and mark them. I use 1/2 × 1-inch self-adhesive labels.[4] The measurements should be made to the highest resolution possible, preferably hertz. You will find that the BFO crystals will be reasonably close to the frequencies marked on the holders, but don't be disturbed if the filter crystal frquencies are different from the holder markings. This is because they are used as filter elements, not oscillators. It is important to do all measurements at one sitting, with the frequency counter warmed up. Next, tabulate each of the crystal frequencies on a worksheet in descending frequency order. A sample of my tabulation involving four sets of four filter crystals and two BFO cyrstal sets is given in Table 1. The more crystals you have to work with the better the final results will be.

The next step is to separate the crystals into sets. The objective is to come up with two filter crystal pairs, with each pair being as closely matched in frequency as possible. The average frequency for each of the pairs should differ by about 1.25 to 1.5 kHz to give a resulting passband that will accommodate both cw and ssb signals. Depending on how closely each pair of crystals is matched, and the filter termination, the passband of a cascade lattice filter is about 1 to 1.5 times the frequency separation. In three HR-1680s (in which there was no change in the termination resistor originally used), a frequency separation of 1.25 to 1.325 kHz gave completely satisfactory results. In addition, it will be necessary to select two crystals for the tail-end filter. This filter may, and usually does, have a greater bandwidth that the input filter. It is definitely *not* necessary that the average frequency of the four input filter crystals equal the nominal 3395.000-kHz HR-1680 i-f; a small deviation from that figure will not be noticeable.

The final step is picking the most suitable BFO crystal for each input-filter set. Tabulate the average frequency of the four crystals in each of the input-filter sets in descending order. Against these figures set the corresponding frequencies of the usb/cw crystals (nominally 3396.4 kHz) and the lsb crystals (nominally 3393.6 kHz), also in descending order. The BFO crystals with the highest frequencies

*Herbert L. Ley Associates, Inc., P.O. Box 2047, Rockville, MD 20852

[1]Notes appear on page 25.

should be used with the input filter of the highest average frequency, and so on. An example is provided in Table 2. Once this step is completed, immediately bag the crystals for replacement on the A/R circuit board. Once you've put this amount of effort into the project, you don't want to get the crystals mixed up! When you replace the filter and the BFO crystals on the A/R board (using the construction manual and the frequencies marked on the holders as a placement guide), place the crystal-frequency labels on a sheet of paper and file them in the HR-1680 manual.

Once the crystals are on the board, the receiver should be checked to make certain it is operational before adding the tail-end i-f filter. A noticeable improvement in signal-to-noise ratio should be apparent. Through the courtesy of the staff of the local Heathkit® store a comparison was made with my modified set and their shelf demonstrator, with the same antenna switched between receivers. A worthwhile improvement, as a result of crystal selection, was observed. But don't rest yet! The improvement resulting from the addition of the tail-end filter will be truly remarkable.

The Tail-End Filter

The tail-end filter is contructed on an etched single-sided circuit board that is 1-1/4 × 3/4 inches in size. The etching pattern and component placement for the board are given in Fig. 3, and the circuit diagram is shown in Fig. 4. The tuned circuit in the drain lead of Q205 is a direct copy of the crystal-filter components in the "Mini-Miser's Dream Receiver,"[5] designed by W1FB, for the same i-f. Components are placed on the unclad side of the board. Of particular importance are the holes in the circuit board, labeled A through D, which are used to connect the filter board to the main A/R board by using short lengths of No. 22 bare wire, so that the filter board just clears the components on the A/R board.

Before the tail-end filter can be installed in the HR-1680, several components must be removed from that board (L201 [13.9-μH toroid — yellow dot], C235 [150-pF mica] and C231 [10-pF disc]). The wire from hole A on the tail-end filter goes to the hole for C235 (originally attached to the drain of Q205), and the wire from hole B goes to the mounting hole for C235 (originally connected to the 13-V supply at the junction of C234 and R235). Also, the wire from hole C goes over the top edge of the A/R board to the ground foil at the edge of the board (scrape the protective coating from the foil before

Table 1
Crystal Frequency List

Filter Type	
Measured Freq. (kHz)	
Higher	*Lower*
3395.665	3394.331
3395.645	3394.328
3395.610	3394.313
3395.564	3394.285
3395.554	3394.283
3395.549	3394.277
3395.538	3394.260
3395.520	3394.234
BFO Type	
Measured Freq. (kHz)†	
usb/cw	*lsb*
6.589	3.768
6.554	3.752
6.493	3.637

†See text and Table 3 for method of selection.

Table 2
BFO Crystal Selection List

Rcvr No.	*Av. Filter Freq. (kHz)*	*BFO Xtal Frequency usb/cw*	*lsb*
3	3394.993	3396.589	3393.768
2	3394.923	3396.554	3393.752
1	3394.905	3396.493	3393.637

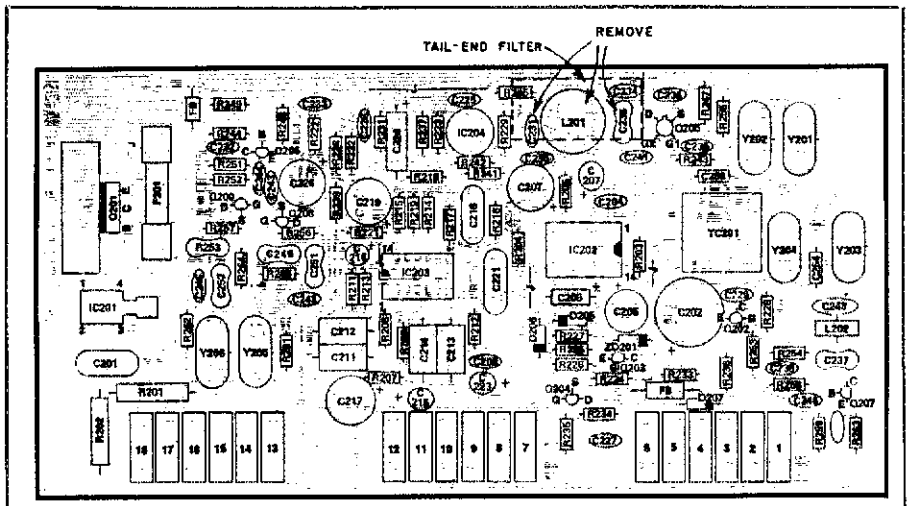


Fig. 1 — Component-side view of the HR-1680 audio/regulator board. The tail-end filter sits on top of this board.

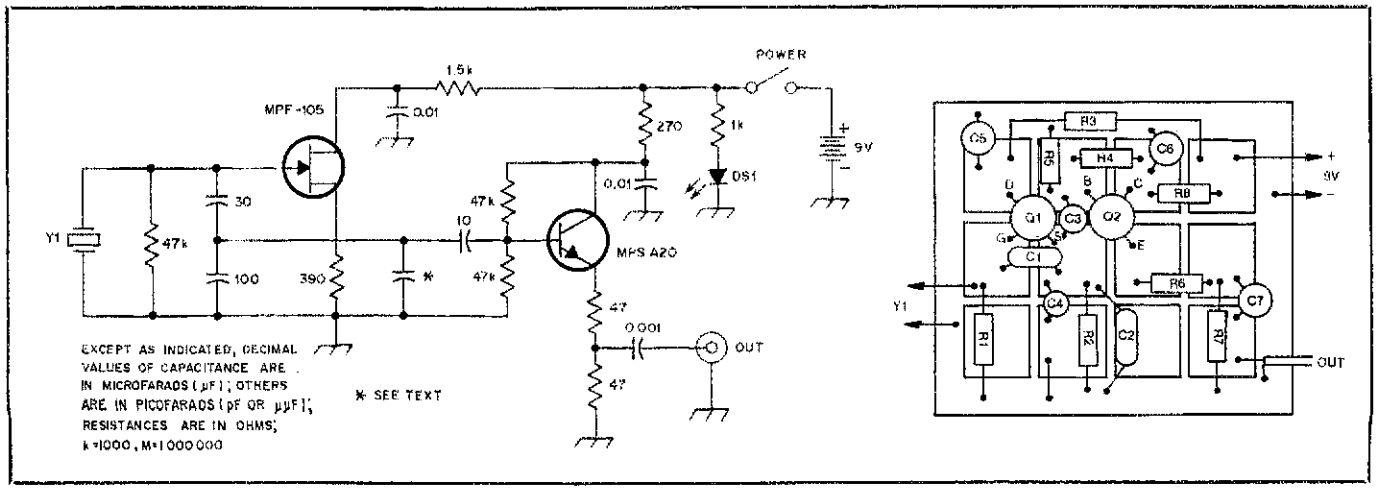


Fig. 2 — Test oscillator schematic diagram and parts-placement diagram. Y1 is the crystal under test. Black areas represent copper.

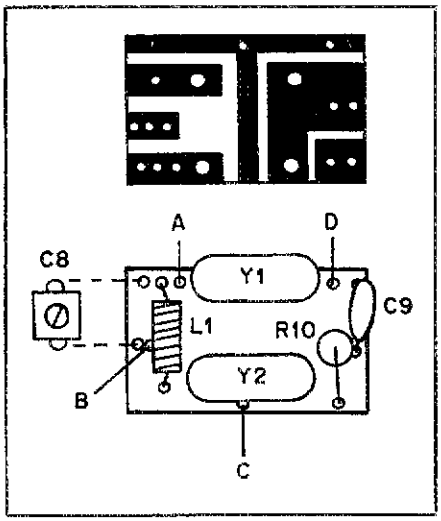


Fig. 3 — Tail-end filter circuit-board etching pattern and parts-placement diagram. The etching pattern is shown full size with black areas representing copper.

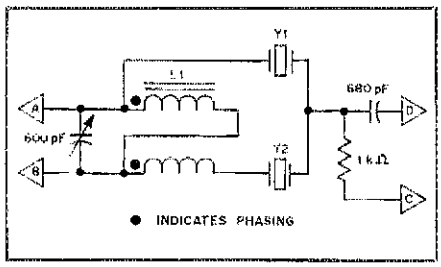


Fig. 4 — Tail-end filter schematic diagram. Y1 and Y2 are 3.3938 and 3.39505 MHz, respectively. L1 is 8 bifilar turns on an FT37-61 core.

soldering) and the wire from hole D goes to the counting hole for C231 (10-pF disc), originally connected to the junction of R242 and pin 4 of IC204.

The tail-end filter addition will reduce the receiver gain significantly because of insertion loss, causing a reduction in signal volume and a lower S meter reading. These anomalies can be returned to their original state by making two circuit board changes. The first is the replacement of R235 (4.7 kΩ) with a new resistor of 2.2 kΩ. This resistor is located in the bottom center of the circuit board and controls the S meter action. The second change is the addition of a 330-pF disc-ceramic capacitor as the emitter bypass element on Q207. Heath apparently considered adding such a capacitor, because holes and foil pads are present but not used. The position for the capacitor is adjacent to the 270-Ω emitter resistor (R263) at the bottom right-hand corner of the board. Its location is identified in construction manual pictorial 4-6 with the comment, "Do not install a capacitor at this location." It is important that a capacitor no larger than the one specified be used. Larger values will give greater gain, but they also cause intermittent stage oscillation.

Another addition is recommended for cw buffs — the installation of a 7-25 pF ceramic trimmer directly across Y206, the usb/cw BFO crystal. It can be added to the rear side of the board, positioned so that it can be adjusted from the top of the receiver. This trimmer permits adjusting the BFO beat note on cw so that maximum S meter response falls in the center of the active audio filter passband. This addition results in one disadvantage: It makes the BFO difficult to start if the set is exposed to cold temperatures. For the ssb operator there is no need to make this modification.

Once these changes have been completed, the usb/cw BFO crystal frequency can be adjusted for cw reception and the tail-end filter aligned. The A/R board is inserted in the receiver by means of three circuit-board extenders. With the calibration oscillator turned on and the BFO set to usb, tune the receiver to the calibrator signal at a convenient 100-kHz dial marker. The 600-pF trimmer on the tail-end filter board is tuned for maximum signal (if it has been added for cw operation), and the new usb/cw padding capacitor is adjusted for the lowest calibrator signal beat note. Now the receiver is tuned to produce a beat note that is approximately 750 Hz (the af filter center frequency). The 600-pF trimmer is adjusted carefully to peak the calibrator signal. If the receiver is tuned from one side of the signal to the other, the receiver should demonstrate excellent single-signal cw response. Some readjustment of the 600-pF trimmer may be necessary. If a sweep generator is available, it can be used to set the trimmer to the proper value. Its use is not necessary because excellent performance can be obtained using the alignment procedure described above.

Tail-end filter alignment of ssb operation is considerably simpler because of the broader passband required in that mode. Tune in an ssb signal with the BFO set to the proper sideband and the 600-pF trimmer set to produce the clearest received signal.

Table 3
Crystal and Filter Data for Three Modified Receivers

Receiver No./ Crystal Type	*Input I-F Filter Frequency (kHz)*		*Tail-End Filter Frequency (kHz)*
	Each Unit	*Mean*	*Single Crystal Only*
1) Hi Pair	3395.538		3395.564
		3395.529	
	3395.520		
Lo Pair	3394.283		3394.234
		3394.280	
	3394.277		
Filter Avg. Freq.	—	3394.905	3394.899
Spacing	—	3391.249	3391.330
2) Hi Pair	3395.554		3395.610
		3395.552	
	3395.549		
Lo Pair	3394.313		3394.260
		3394.299	
	3394.285		
Filter Avg. Freq.	—	3394.923	3394.935
Spacing	—	3391.253	3391.350
3) Hi Pair	3395.665		N/A†
		3395.655	
	3395.645		
Lo Pair	3394.331		N/A
		3394.330	
	3394.328		
Filter Avg. Freq.	—	3394.993	N/A
Spacing	—	3391.326	N/A

†There was no tail-end filter added to receiver no. 3.

Curing Dial-Drive Problems

Some HR-1680s exhibit unnecessary problems with the vernier-dial drives. My receivers have been no exception, so I'd like to offer some suggestions for making the system work the way it was designed to.

If you are correcting drive alignment in an already constructed set, it is necessary to remove the VFO tuning capacitor for proper realignment. Removal is a simple process. First, unsolder the heavy wire from the VFO capacitor terminal. Remove the nuts holding the dial lamps and push the lamps to one side so the dial pointer plate may be taken out, thereby permitting tilting of dial and capacitor. Loosen the front vernier drive screws and remove the four VFO capacitor mounting-bracket screws. Carefully push the capacitor toward the rear to disengage the front vernier drive; then tilt and lift out the dial and capacitor. Loosen the bracket, vernier and capacitor screws so you can begin the realignment process from scratch.

In addition to following the manual instructions *exactly*, I recommend the use of all four mounting screws in the step shown in the manual pictorial, 5-8. These four screws must be turned down *tightly* before securing the other screws of the capacitor mounting brackets and vernier drives; care in this procedure pays big dividends. In the final mounting of the VFO capacitor to the chassis, tighten one set of screws in diagonally opposite positions before securing the last two. If the drive is still not smooth when you finish, repeat the vernier alignment until it is.

If you prefer a lighter touch to the drive, additional work is required. Only the front vernier drive requires attention in such situations, so you may complete the task by removing the tuning knob and the front drive (on its mounting plate) without removing the VFO capacitor and dial. Once the front vernier drive is free, a portion of the lubricant from the ball-bearing drive is removed by flowing a small amount of lighter fluid through the mechanism. When this is done, the lubricant must be replaced by adding petroleum jelly to the ball bearing races on the front, the back and the inside of the hollow shaft. Use a small screwdriver and work the drive until the lubricant is taken up. Replace the mounting plate and front drive, then tighten the shaft setscrews and mounting-plate screws. Treated this way, the drive can be spun easily with a single finger, and it still retains the smooth action.

If the dial has too much backlash, the grease in the front vernier drive can be replaced with automotive cup grease. Fill the hollow rear shaft of the drive about half-full with cup grease, insert a spare piece of 1/4-inch shafting in the rear of the drive, then press it into the drive. The cup grease will be forced into the drive races, expelling the old grease, which must be carefully wiped away before the vernier drive and mounting plate are replaced.

This project has produced a modified HR-1680 receiver having much better single-signal and signal-to-noise characteristics than the original kit receiver. In this sense, the project was highly productive. In addition, it has been an educational exercise in receiver modification and design that has been most informative. I highly recommend the project to current or future Heath HR-1680 owners. QST

Notes

[1]W. Hayward and D. DeMaw, *Solid State Design for the Radio Amateur* (Newington: ARRL, 1977), pp. 85-88 and 217.

[2]Heath sells a matched set of four HR-1680 filter crystals for $36.20. The part number is 404-331. At least one set of crystals is required to complete the project.

[3]S. B. Leshe, "Breadboards Revisited," *QST*, Feb. 1974, p. 30.

[4]mm = in. × 25.4.

[5]D. DeMaw, "The Mini-Miser's Dream Receiver," *QST*, Sept. 1976, p. 20.

Strays

UoSAT-OSCAR 9 LIVES!

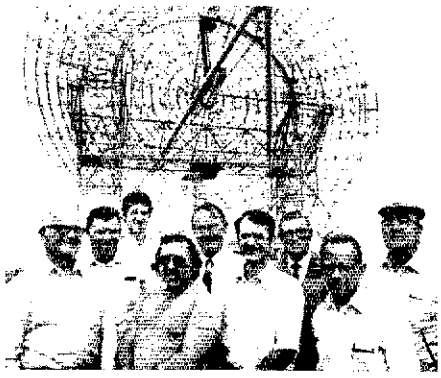
☐ When UoSAT-OSCAR 9 was launched in October 1981, satellite enthusiasts around the world had high expectations that it would serve as a valuable educational and experimental tool. (See related article beginning on page 53.) Those hopes suffered a serious setback in April 1982, however, when a command system glitch sidetracked final in-orbit checkout and stabilization. The glitch caused both telemetry beacons to be gated on — a major disaster, since at least one beacon had to be off for the satellite to "hear" ground commands on the band of the inactive beacon. With the 2-meter beacon desensing the 2-meter command receiver, and the 70-cm beacon desensing the 70-cm command receiver, UO-9 had, in effect, QRMed itself to "deaf"!

The UoSAT team at Surrey tried in vain to execute further commands; UO-9 simply would not respond. If nothing were done, UO-9 would be useless thereafter. The only hope lay in finding a ground station sufficiently powerful to overcome the local beacon and capture the command receiver. This would not be easy, since the satellite would be no closer than 330 miles (530 km) — its orbital altitude — from the ground station.

G3YJO contacted Dave Olean, K1WHS. Dave made a valiant effort with his powerful 2-meter EME array (*QST* cover, Sept. 1981). With 26-dBd gain, Dave zapped UO-9 with about 250-kW effective radiated power (erp), but could not break through.

Later in July, a team of amateurs at SRI International, Menlo Park, California, took up the challenge. Under the leadership of Dr. Robert Leonard, KD6DG, director of the Radio Physics Laboratory of SRI, an ad hoc UoSAT Salvage Team set to work rehabilitating the 150-foot (46-meter) SRI dish antenna. Occasionally used for EME work, the big dish had been out of service for years and had fallen into disrepair. Overcoming failed azimuth drive motors, leaky hydraulics and obsolete or missing computers, the team put the big dish on the air in August.

After several disappointments, the breakthrough occurred on September 20, when, according to KD6DG, "All the right pieces fell into place." With its 42-dBd gain pointed skyward, the big "rig" was keyed at 2235 UTC. About 10 MW of 70-cm erp blasted toward the "deaf" bird. UO-9 would either respond by turning its beacons off or by incandescing in the 70-cm flux! The beacons fell silent, and the jubilant Salvage Team knew at that instant that UO-9 had been saved. Awakened from his bed at midnight, G3YJO, at Surrey, soon was to confirm that, indeed, UoSAT was now responding to commands and that telemetry indicated the spacecraft's health as "nominal" (read FB). Operations will resume soon.



The team at SRI International that zapped UoSAT-OSCAR 9 back to life, from the left: W6YBL, KD6DG, KB6LZ, W6MXI, K6TDR, W6IRA, KE6D, W6WMC and W6GXN. *(photo courtesy SRI International)*

The dramatic salvage mission at SRI caps a singular episode in amateur satellite annals. However, the beneficial effects will be shared by all of Amateur Radio. The perseverance and professionalism of K1WHS, and the teams of G3YJO and KD6DG reflect enormous credit on all. While Amateur Radio history is replete with splendid examples of self-policing in regulatory issues, here we may have seen the best example of the flipside: The Amateur Service is also self-healing in cases of complex *technical* maladies!

It is a very proud day indeed! — *Vern "Rip" Riportella, WA2LQQ, Executive Vice President, AMSAT*

Next Month in QST

December *QST* will put you in a holiday mood with a host of enjoyable reading. Highlights are

- the first of a two-part article on the first kW, 2-30 MHz, linear broadband amplifier using power MOSFETs — an outstanding achievement.
- a Beginner's Bench workshop project (using readily available parts) that yields a versatile station accessory.
- articles on two timely subjects of general interest: cable-TV interference and the new League programs that can bring your affiliated club the recognition it has so richly earned.

The JF Array

You don't have a "green thumb" for antennas? This multiband "antenna farm" is easy to grow!

By Richard R. Schellenbach,* W1JF

It is purely accidental that the name of this antenna and my call sign are identical. However, it is no accident that the JF Array is a relatively simple but highly effective antenna system. It covers the 80-, 40- and 15-meter bands from a single transmission line. This antenna provides significant gain on the 40- and 15-meter bands, while acting as a standard λ/2 dipole on 80 meters. In fact, the array may be used on all hf amateur bands, without the gain and directional characteristics found on 40 and 15 meters.

The initials "JF" describe the physical configuration of this array. On 15 meters, the antenna consists of two back-to-back "J" type radiators; hence the name "J Flat-Top," which is shortened to JF.

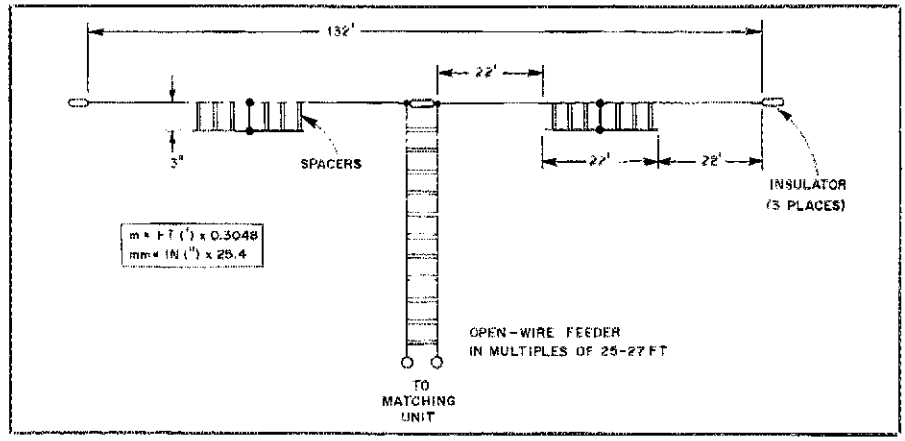


Fig. 1 — A dimensional drawing of the JF Array.

Theory of Operation

In essence, the JF Array operates as four 1/2-λ elements in phase on 15 meters, and two 1/2-λ elements in phase on the 40-meter band. On both bands, the feed impedance is extremely high. Therefore, an open-wire feed line (300 to 600 ohms) is recommended between this antenna and your Transmatch. Remember that this is a balanced antenna system, so it is desirable to maintain current balance from the antenna all the way back to your matching network.

Under some circumstances you may find it necessary to experiment with the length of your open-wire feeder. This is because some operating frequencies and line-length combinations present a load impedance beyond the capability of your matching network. The use of a nonharmonic-length feeder is the usual prevention or cure for this condition. Feeder lengths in multiples of 25 to 27 feet should allow all-band operation without any problems.[1]

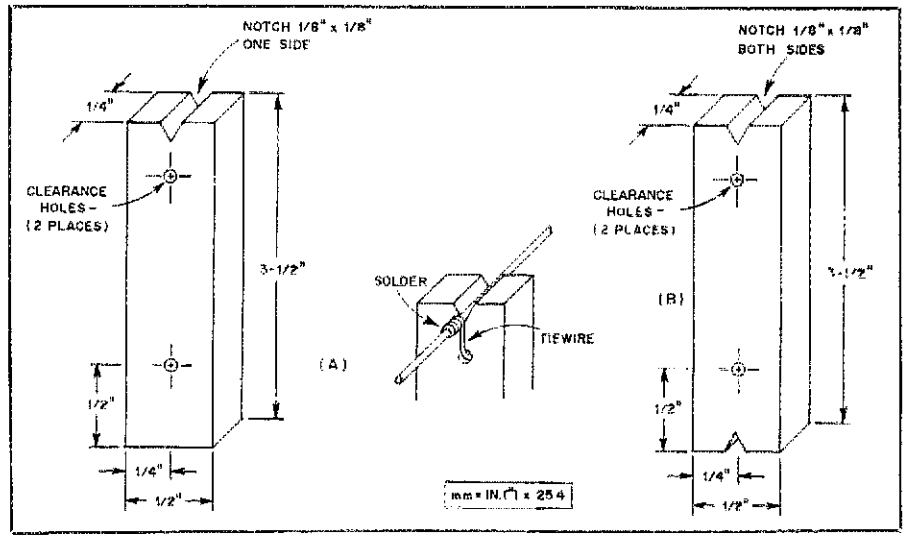


Fig. 2 — Spacer construction details for antenna sections are shown at A. Details of a spacer used for constructing the open-wire line are shown at B.

Construction

The flat-top section of the antenna is made from no. 14 copperweld, or no. 12 hard-drawn copper wire (Fig. 1). Heavy-gauge wire is necessary to support the considerable weight of the array. The two stub sections should be made from no. 14 or 16 hard-drawn copper wire, and are held apart from the flat top by means of homemade spreaders. These are fabricated from 1/4-inch-thick plastic or Plexiglas sheet (Fig. 2A). The length of individual spreaders is not critical, but it should not be longer than 4 inches to prevent the wires from becoming unwieldly during installation. A spreader should be placed every foot, or less, along the stub to provide support and to prevent undue movement during windy periods. The spreaders are held to the main antenna wire by small lengths (4 inches) of no. 14 or 16 copper wire. This tie wire should be passed through the clearance hole at the "V" groove end and wrapped tightly on both sides (Fig. 2). The stub wires then are passed through the opposite clearance hole, and *not* tied, allowing freedom of

[1]m = ft × 0.3048.

*12 Whitehall La., Reading, MA 01867

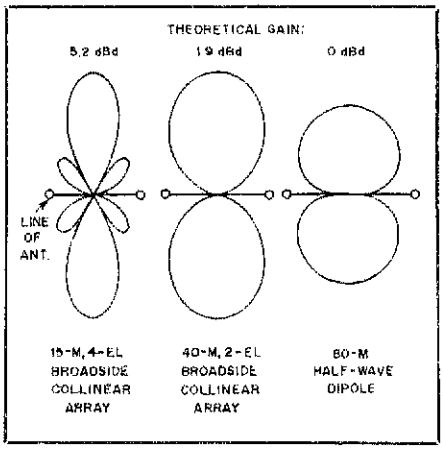


Fig. 3 — Radiation patterns and theoretical gain figures for the JF Array on different bands (for comparison only).

movement for stress-free support. After attaching the stubs, solder a jumper wire between the center-tap of each stub and the main antenna wire (Fig. 1). Ensure good electrical connections by first scraping off any enamel insulation or oxidation, and by wrapping the wires tightly before soldering.

Balanced feeders may be purchased, or constructed from no. 14 or 16 copper wire spaced apart by the spreaders shown in Fig. 2B. Various types of commercial open-wire transmission line offer the builder a lightweight, already-built option. Any of the popular 300- to 600-ohm lines will do.

Performance

It is worth noting that the JF Array radiates the main power lobe *broadside* to the wire and not off the ends as a conventional, harmonically operated antenna does (Fig. 3). With a properly balanced feed line, you will observe that the array has an extremely clean radiation pattern. Installed at the 30- to 45-foot level, the antenna provides good DX performance. There is yet another desirable advantage to be found: the JF Array provides an inherent diversity effect on the higher frequencies because of the large capture area. This effect greatly reduces fading that may occur during certain propagation conditions. Give this simple antenna a try. You shall be pleasantly surprised!

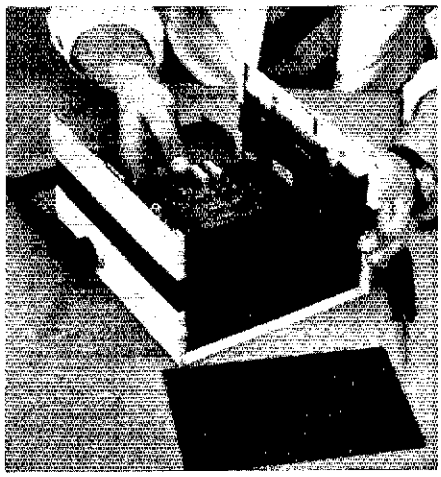
Dick, W1JF, a native of Southern California, was first licensed as W6TKX in the late 1930s. He is a 9-year veteran of both the U.S. Army and Navy, and has served as a communications specialist for nearly 40 years. Currently, Dick is a consulting scientist with Support Systems Associates, Inc., of Burlington, Massachusetts. In addition to his extensive communications experience, Dick holds a BSEE degree, and has completed post-graduate work in Business Management and Industrial Engineering.

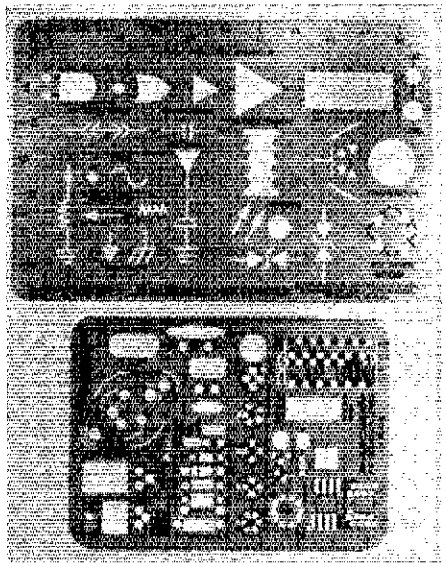
New Products

ARCHER CIRCUIT SYMBOLS AND PC-BOARD-LAYOUT TEMPLATES

☐ Radio Shack offers two new tools geared to help students and amateur or professional circuit designers and builders achieve accurate, high-quality schematics and designs. A circuit-symbols template (276-180) and a pc-board-layout template (276-179) are available for $3.95 each.

The circuit-symbols template offers a large selection of component and logic symbols. There are also two ruled edges with 0.1-inch graduations. A pc-board-layout template eliminates guesswork in pc-board design. It supplies exact-size (× 1) stencils for most commonly used active and passive components, including ICs and discrete devices. Look for these offerings at your nearest Radio Shack store. — *Paul K. Pagel, N1FB*





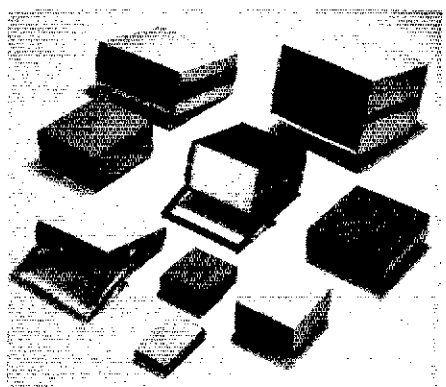
PAC-TEC ENCLOSURE KITS

☐ PAC-TEC Corporation offers 28 different plastic enclosure kits to aid in the construction of attractive and durable custom enclosures for a variety of items including power supplies, digital clocks, specialized test equipment, junction boxes and equipment interfaces. By using either the fixed-size units or the expandable units that allow the user to construct cases with several heights from a single kit, the designer can build the enclosure right on the workbench.

The kits, which come in four standard colors, include top and bottom covers, filler panels, front and rear panels (adjustable in expandable height models) and an assortment of necessary spacers and hardware. Available options include handles and tilt stands. Interior mounting bosses for securing components are standard, and detailed assembly and modification instructions are included with each kit. Front and rear panels can be drilled, cut, punched and silk-screened for displays and controls.

Available sizes range from the hand-held Series HP, which measures 3.6 × 5.75 × 1.12 inches, to the substantial Series CL, which measures as large as 12.5 × 11.63 × 8.76 inches.[1] For more information, contact PAC-TEC Corporation, a subsidiary of LaFrance Corp., Enterprise & Executive Ave., Philadelphia, PA 19153, tel. 215-365-8400. — *Paul K. Pagel, N1FB*

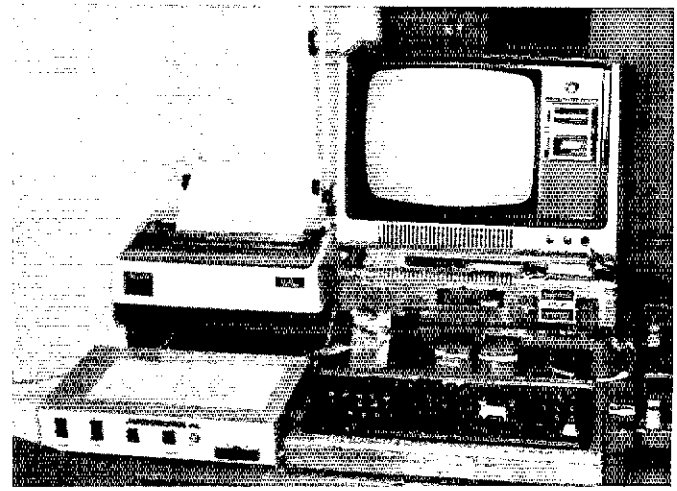
[1]mm = in. × 25.4



The Copper "80" Kettle

Are you "steaming" mad because of computer RFI? Try this unique fix for your TRS-80® microcomputer and enjoy QRM-free contacts.

By Hubert H. Wheeler,* W4IBU



It was in March of 1980, immediately after my retirement, that I became interested in RTTY and began investigating several of the methods to get on the air using this mode. At the time, I thought a computer and an interface would be the most appropriate setup, since it would give me two alternatives: the ability to interface with my Collins S-Line for RTTY and cw, and to have a personal computer as well. After looking at several computers, I elected to go with the TRS-80® Model I Level II and the Macrotronics RTTY/cw interface, even though I had been told of an RFI problem.

The problem with RFI was serious enough to make me wonder if I had made a big mistake. I read what I could on the subject, including an article from *QST*.[1] Following some of the suggestions from the article, I installed a new grounding system, shielded cables between the Macrotronics interface and the ham gear, and used Tube-koat on the inside surfaces of both the computer and the expansion interface.[2] The application of the Tube-Koat was not noticeably effective.

During a trip to Atlanta, I visited a craft shop that specializes in products for the fabrication of stained-glass windows and Tiffany-style lighting fixtures. It was there I discovered an adhesive copper foil. If this type of foil were available in sheets rather than narrow tapes, it could possibly be the answer to the RFI problems. Correspondence proved that it is available in rolls, 24 inches in width and 36 yards long.[3] If there were a sufficient demand, shorter lengths could probably be purchased.[4] The amount required is approximately 5 yards.

Installation

The adhesive copper foil comes in three sizes: 0.001, 0.00125 and 0.0015 inch. I suggest the 0.0015-inch size, since it seems to be best suited for the wear and tear of continuous use. Also, it is the best size to solder to. About 15 feet of the 24-inch foil is required to cover the keyboard and the expansion interface, to install the ground planes, and to shield the flat cables.

Fortunately, the foil acts as its own jumper between individual sections when there is an overlap of about 2 inches. The foil can be soldered once it is applied to the TRS-80® microcomputer, but be careful because the foil is thin. If you plan to solder the joints, practice on a spare cover first. The use of a small iron, applied quickly, will do the job nicely, with no damage to the plastic beneath.

My machine is no longer in warranty, so I began by opening the keyboard and installing a 20-gauge copper sheet between the keys and the printed-circuit board in the keyboard. The ALPS keyboard, installed in my computer, is the successor to the keyboard with keybounce. I can't be sure that this installation will work with the earlier keyboard. I drilled 1/4-inch and 3/8-inch holes in the copper sheet to match the stand-off supports, and installed the copper sheet between the keys and stand-offs. Be sure to clean the sheet thoroughly before final installation, for it takes only a minute particle of copper in the wrong place to cause havoc. Also, cover the printed-circuit board with a towel or other soft cloth to protect it from scratches. This copper sheet should not be grounded; rather, let it act as an electrostatic shield. To eliminate contact with the flat cable that connects the printed-circuit board with the keyboard, the copper sheet was cut to the size of the keyboard, measuring front to back, and was cut diagonally from back to front on the left side.

The foil will be applied to all surfaces of the keyboard and the interface, except the keyboard proper and the ventilation holes. At the ventilation holes, let the foil come up to, but not cover, the slots. Trim the foil that covers the screw holes and the interface switch, and test with an ohmmeter for continuity from the cables to the keyboard and the interface. If there is no continuity, use solder to bridge the foil junctions.

Copper screen wire is used for covering the ventilation openings. It is 16 × 16 mesh, wire diameter of 18 mills. I had considerable trouble in finding a vendor for copper screen wire. It seems that it is not available at the corner hardware store anymore.[5]

The screen is applied after the foil is in place, by being cut to size, tinned around the outside edges to prevent raveling, shaped to fit and soldered in place. I would recommend using a *hot* iron. Be quick!

Install a ground lug on the Macro-

[1]Notes appear on page 29.
*2100 Buckingham Dr., Huntsville, AL 35803

tronics cabinet. This will serve the following purposes: (a) a connecting point for the shields of the interconnecting cables; (b) a connection from the earth ground to the Macrotronics and the printed-circuit boards (through the interconnecting cables); and (c) a point to which a connection may be made from the copper foil to the earth ground.

I removed the power supplies from the expansion interface, covered them with foil, and shielded the cables. A brute-force filter that serves just these two power supplies was installed. This brute-force filter is connected in series with the Radio Shack line filter.

Testing

All testing during and after the installation was done in the following manner: The tests were made by first connecting to a dummy load, and then to an antenna for each of the hf bands.

I learned that the printed-circuit boards in both the computer/keyboard and the expansion interface are grounded from one to another through the interconnecting cable. This same ground is also through the connecting cable to the Macrotronics cabinet. There is, therefore, no need to worry about bringing a ground out of the TRS-80 unit, for it is already there. The following items had no effect on the amount of RFI when these were disconnected: (1) the cassettes and their cables; (2) the printer and its cabled connection; and (3) the video display and its cabling.

With the Macrotronics interface connected directly to the computer, the RFI was reduced considerably. This did not permit the use of my printer, so I elected to leave the interface connected during the installation and during all tests.

Results

Is it all worth the effort, you ask? Well, I'm going to tell you how it is! Before I started on this modification, I could not use the 80-, 40-, 15- or 10-meter bands because of RFI, and 20 meters was barely usable. Since the modification, the video is very clean during transmission, even when the kW amplifier is activated. During receive, I can barely hear the RFI on 40 meters, but it is not enough to deflect the S meter — except at one spot near 7092 kHz.

Covering the exterior in the manner described above should not void the warranty if it is still in effect, unless, of course, you did install the copper sheet in the keyboard. Since my warranty had expired, this did not present a problem. Further, I suspect that the fact that the units have been opened will not deter the company from repairing them, though a charge may be involved. [Please check with Radio Shack before modifying machines that are still under warranty. — Ed.]

Observations

I found the solution to be extremely effective. If only the manufacturer would provide a kit! I am told that the Model II machines have been modified in compliance with FCC regulations, but I am not aware of the effectiveness of this modification. (See FCC Part 15.25 for details.)

In working on this project other ideas have occurred to me concerning the use of the copper foil. It would be possible to enclose any plastic case used for making electronic equipment. It might even be possible to use this foil for the construction of copper-coated printed-circuit boards, though I will leave this for others to investigate.

I believe that clock modifications are available for the TRS-80 microcomputer. This might have some effect on reducing the RFI by changing the clock frequency. It might be possible to install a small capacitor in parallel with the crystal to reduce the 10.6-MHz frequency to about 10.48 MHz and thereby eliminate the second harmonic now present at 21.289 MHz. This would move it out of the band rather than eliminate it!

I will be happy to respond to any and all inquiries. Please send an s.a.s.e with your questions. If you are active on RTTY, I hope we can have a QSO one day. Good luck! QST

Notes

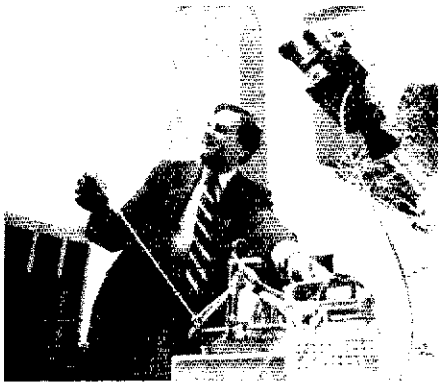
[1]P. E. Cooper, "Microcomputers and Radio Interference," *QST*, March 1980, pp. 17-20.
[2]Tube-Koat is a conductive aerosol spray sold by G. C. Electronics, 400 South Wyman St., Rockford, IL 61101.
[3]mm = in. × 25.4.
[4]Rolls of copper foil may be obtained from Edco Supply Corp., 323 36th St., Brooklyn, NY 11232, tel. 800-221-0918, ext. 19.
[5]Copper screen is available in strips, 36 inches wide × 1 foot long, from McMaster-Carr Supply Co., 600 Country Line Rd., Elmhurst, IL 60726.

Strays

E.T. "PHONES HOME" WITH HELP FROM A HAM

☐ What do a Hollywood producer/director and a radio amateur have in common? The answer is the summer 1982 smash-hit motion picture *E.T. The Extra-Terrestrial*. Steven Spielberg may have produced and directed the movie to instant success, but it was the ingenuity of Henry Feinberg, K2SSQ, of New York City, that provided the movie's main character, an alien from a distant galaxy, with the means to communicate with its home planet.

The project started about a year and a half ago when one of Spielberg's aides called K2SSQ, then an exhibits and science demonstrations coordinator for Bell Labs in Murray Hill, New Jersey, and asked him if he would devise a "communicator" that could be used in the film. Since designing items along these lines is something Feinberg has done much of his life, he agreed to take on the E.T. communicator as a part-time project.



Henry Feinberg, K2SSQ, displays the "communicator" he created using a clothes hanger, a child's phonograph, an umbrella lined with aluminum foil and other household items that enabled E.T. to call long-distance — at intergalactic rates, of course. *(Roger Tully photo)*

Using articles commonly found around the average American home — such as a child's toy, a knife and a fork, a circular saw blade, a coffee can, a TV tuner and an umbrella — K2SSQ designed a "plausible" beacon transmitter that could operate unattended, yet be capable of directing a pinpoint signal (microwave) into space. While in real life the communicator really does not transmit any rf, moviegoers will be delighted to know that the device does have a "special effect" on E.T., who is able to "phone home" with it. — *Bill Pasternak, WA6ITF, Panorama City, California*

HQ. LAB RECEIVES EQUIPMENT DONATION

☐ The Yaesu Electronics Corp. recently donated an FT-680R 6-meter multimode transceiver and companion FP-80 power supply to the ARRL lab. This unit will serve to complement the lab's test equipment. ARRL expresses its gratitude for this gift.

Amateur Use of Solar Electric Power†

Part 2: For emergency use, collected solar energy must be stored. This is the description of the method and mechanics used with the PV modules discussed last month.

By C. Philip Chapman,* W6HCS, Paul D. Chapman and Alvin H. Lewison

Simply connecting a photovoltaic (PV) array to the equipment to be powered is not the most efficient means of using solar energy, especially for emergency use. Power would then be available only during periods of sunlight, and emergencies can occur at any time of day — or night. To provide the power required during no-sun periods, the collected solar energy must be stored. This may be accomplished by means of batteries.

A battery box (see Fig. 6), constructed on a concrete pad, is used to house the batteries and a shunt regulator. A floorboard provides an air gap and lifts the six batteries off the concrete. Water entering the battery box will not collect around the base of the battery pack, but will run out of the enclosure. The front, sides and sloping roof of the box are constructed from marine-grade plywood that is waterproofed and painted before assembly. To prevent water from entering into ventilation areas, the roof has an overhang along the front edge and a tight seal around the mating edges.

During battery charge, considerable amounts of hydrogen and oxygen can be produced. It is important not to allow an accumulation of these gases, particularly if electromechanical devices are used for inverter actuation and power distribution and management. Vents are placed in the front section of the box and on the one exposed side to provide ventilation. In the roof assembly, holes are added around the front and sides to allow any gases that may collect against the inside top of the roof to escape. Holes are located also in the back side in an area immediately above the heat-sink area. Finally, all the rectangular vents are covered with aluminum vent mesh to prevent animals from entering the box.

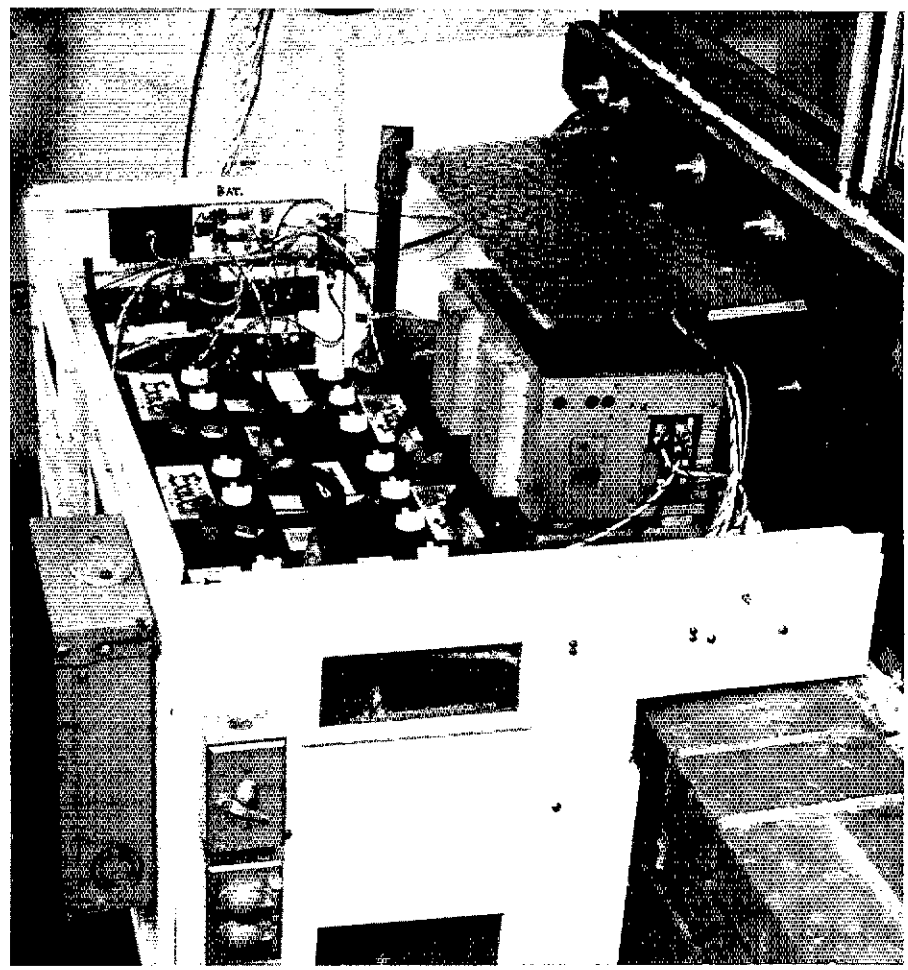


Fig. 6 — A view of the battery box showing the batteries, inverter and the breaker panel.

System Highlights

Fig. 7 is a conceptual diagram of this system. Extensive metering and the use of circuit breakers and isolation diodes are shown. The first isolation diode after the array protective diodes is used to isolate the PV panel-voltage meter from the rest of the system. This diode and the second isolation diode are Shottky devices.

Shunt Regulator: As shown in Fig. 8, a μA723 IC is used as the active device for the shunt regulator; it drives a pair of Darlington power transistors. These tran-

†Adapted from Jet Propulsion Laboratory publication 82-2, "A Low-Power Photovoltaic System With Energy Storage for Radio Communications," Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., Pasadena, CA 91103.

*2922 Alta Ter., La Crescenta, CA 91214

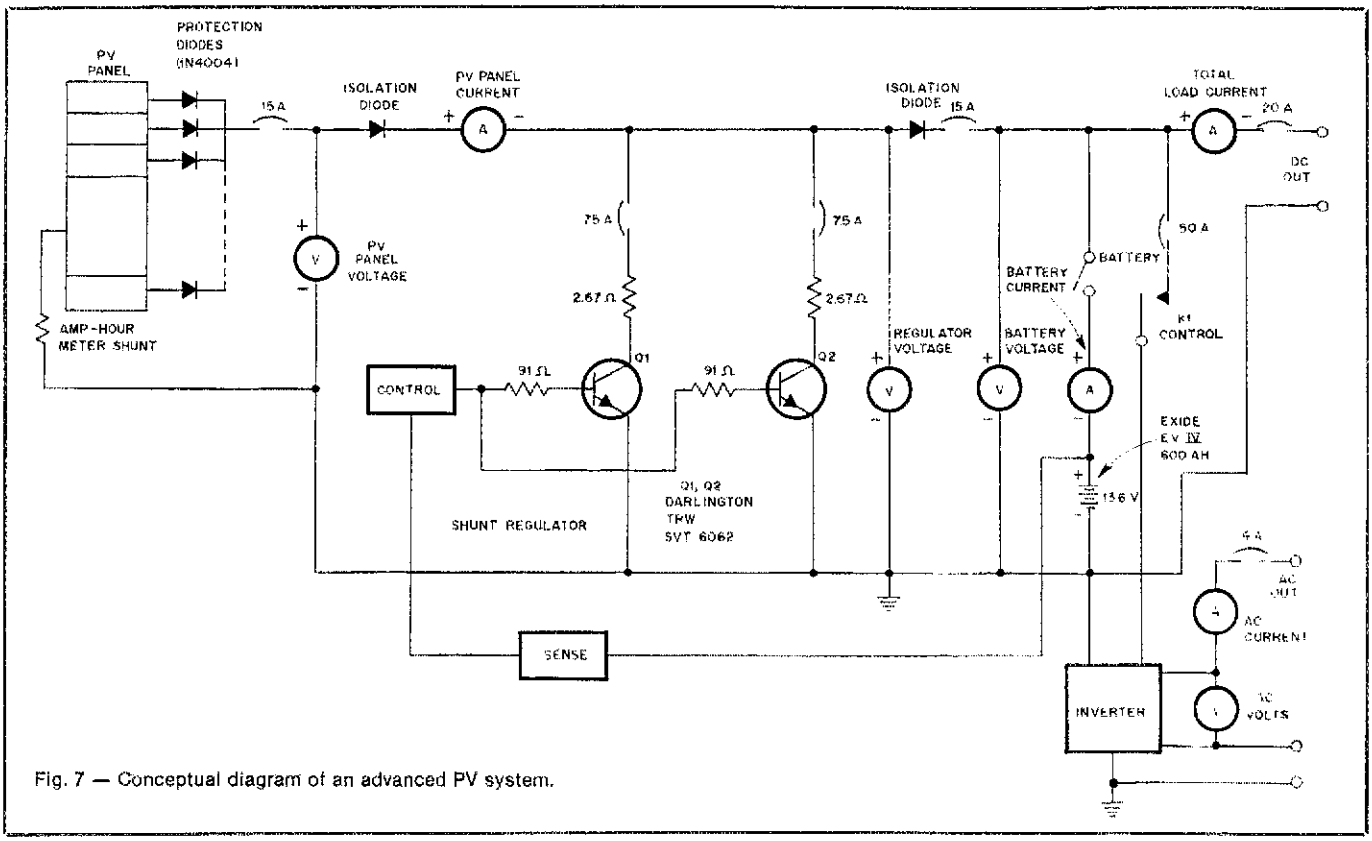


Fig. 7 — Conceptual diagram of an advanced PV system.

sistors are in series with the shunt resistors and regulate the current being diverted from the battery pack and load. It is because of their particular dc current gain versus collector-current characteristics that these transistors were selected. The current gain of these devices peaks when the collector current is between 4 and 6 A and is about 175 at 77°F. About 23 mA of base current is required to conduct 4 A through each device; the IC is capable of supplying at least 60 mA of drive current. At no time are the transistors driven into saturation, and the drive current is limited by the 130-ohm resistor and the 91-ohm resistors in each base lead.

As more array current is required to operate the equipment or charge the battery pack, drive current is reduced accordingly. If all of the array current is required by the load and battery pack, the shunt regulator turns off completely. Regulator control is accomplished by a feedback loop that senses battery voltage. The battery pack is maintained at a potential of 14.1 V during sun periods.

The 2.2-μF capacitor between the output and the inverting input of the 723 IC, and the 33-μF capacitor from the noninverting input to ground, stabilize the IC. These steps are necessary because of the high gain and wide bandwidth of the IC, which makes them highly sensitive when used in PV systems. The voltage regulator circuit board is heavily bypassed with 0.1-μF capacitors to bleed off any rf that might ride into the regulator box on the cable harness. Three parallel-

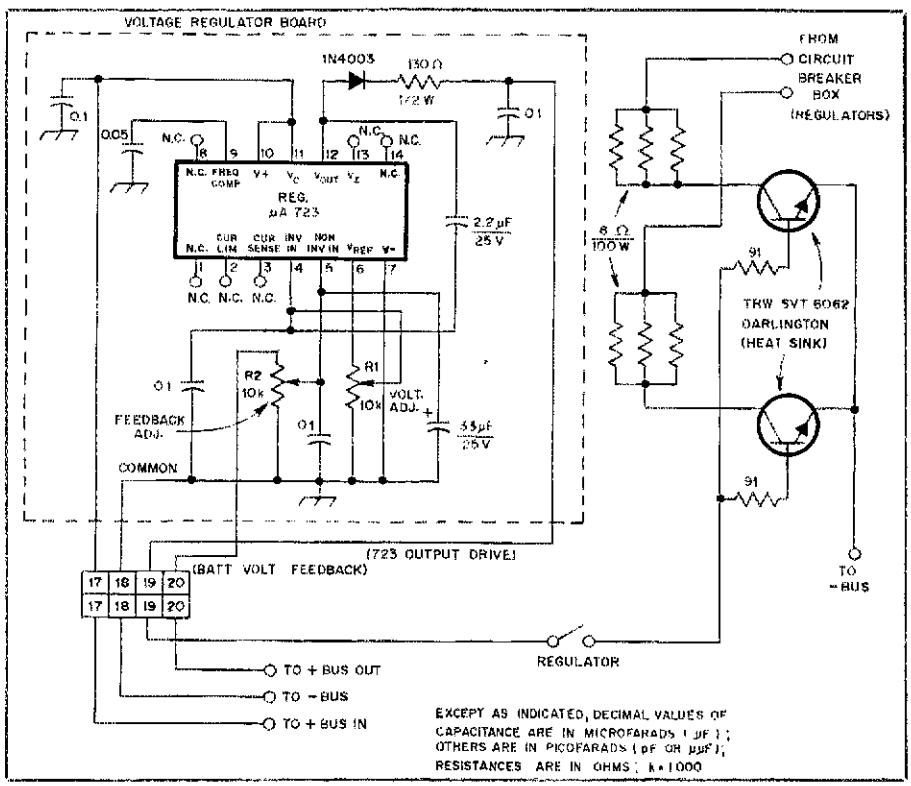


Fig. 8 — Schematic diagram of the shunt regulator. Refer to the text for more details.

connected, 8-ohm, 100-W, wire-wound resistors act as collector (shunt) resistors for each power transistor. These values were selected to allow at least 4 A of collector current for each device. About two-thirds of the shunt power is dissipated in the resistors, allowing the transistors to be operated conservatively. The resistors are mounted by means of stand-off brackets on the outside of the metal box containing the regulator. The transistors are mounted on heat sinks at the bottom of the battery

box, where air is available for convective cooling.

Battery Pack and Power Conversion: The six batteries are connected in series-parallel to give a nominal 12.7-V open-circuit potential. This battery pack has a rating of about 400 Ah at a 225-A rate.

Power dissipated in the battery pack is not simply the charge current times the float (charge) voltage. It can be determined by the following:

$$q_W = (E_H - E_I)I \qquad \text{(Eq. 1)}$$

where

q_W = dissipated power in watts
E_H = thermal-neutral voltage (2.07 V per cell for any lead-acid battery)
E_I = battery potential with I amperes flowing
I = charge current in amperes

The aging factor for deep-discharge lead-acid batteries is a function of the number of deep discharges experienced by the battery pack and the depth of the discharges. It is electrolyte-temperature dependent.[4]

In general, it is advisable not to allow the battery pack to drop below 50% of full charge. This will extend the pack life by perhaps 40% in normal temperature environments when compared with discharges down to 80% of full charge. For lead-acid batteries, Ah out of the battery is nearly equal to Ah into the battery. A conservative rule of thumb is

$$Ah_{charge} = Ah_{discharge} \times 1.1 \qquad \text{(Eq. 2)}$$

Power-conversion equipment is used to convert the 12-V dc to 117-V ac, and 12-V dc to 700-V dc. While the communications equipment will work on 117-V ac as well as on 12-V dc, the 117-V ac is required to rotate the antenna arrays. Also, the low-band equipment can run higher power output using 117-V ac rather than 12- and 700-V dc.

A Nova 5060-12 fixed-frequency, sine-wave, single-phase inverter is used to produce 117-V ac from the system dc voltage. It has a maximum continuous output rating of 500 VA and is voltage and frequency regulated. Inverter efficiency is about 60%. The inverter can be actuated from the battery box or the radio room by means of a relay mounted in the battery box.

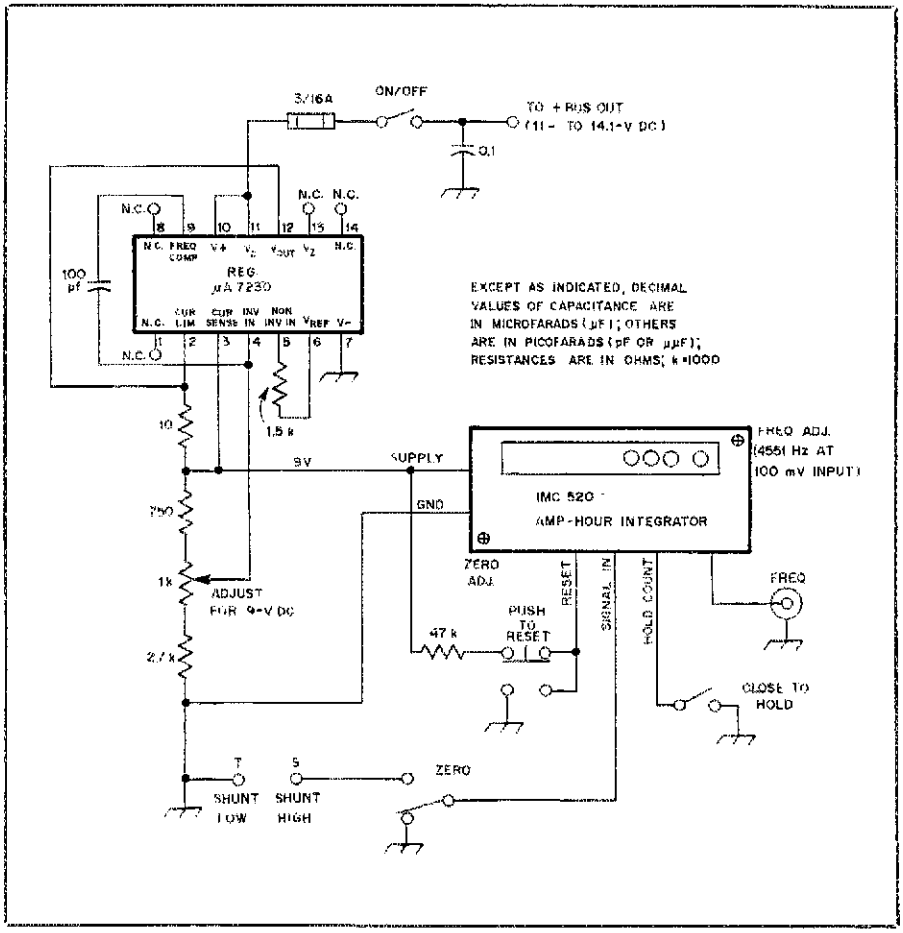
A dc-to-dc converter supplies high voltage to the final-amplifier tubes in the low-band gear when this equipment is used on dc. This converter will produce between 600 and 700 V and is not voltage regulated. Therefore, the input power of the low-band equipment is a function of the battery-pack status. This converter is located in the radio room and is actuated by a switch on the low-band transceiver.

Metering: During the time the station is not being used, engineering and scientific data are acquired. This is accomplished by a complement of meters (see Fig. 10) measuring various currents and voltages throughout the system. The Simpson dc voltmeters used incorporate self-shielding annular, 1-mA movements and provide 24-hour-per-day monitoring with minimal power consumption by the meters themselves. Diodes are used where needed to provide the necessary isolation and to ensure each meter display is restricted to a specified measurement task.

A dc voltmeter is located at the station operating position, where the operator can monitor the dc voltage level at the equipment location at all times and under varying loads. The reading can be compared with the battery voltage level meter to determine exact losses on the supply line to the station.

An Ah meter (Fig. 9) using the IMC model 520 digital ampere-hour integrator monitors the PV array output.[5] The IMC module consists of a voltage-to-frequency

[4]Notes appear on page 34.



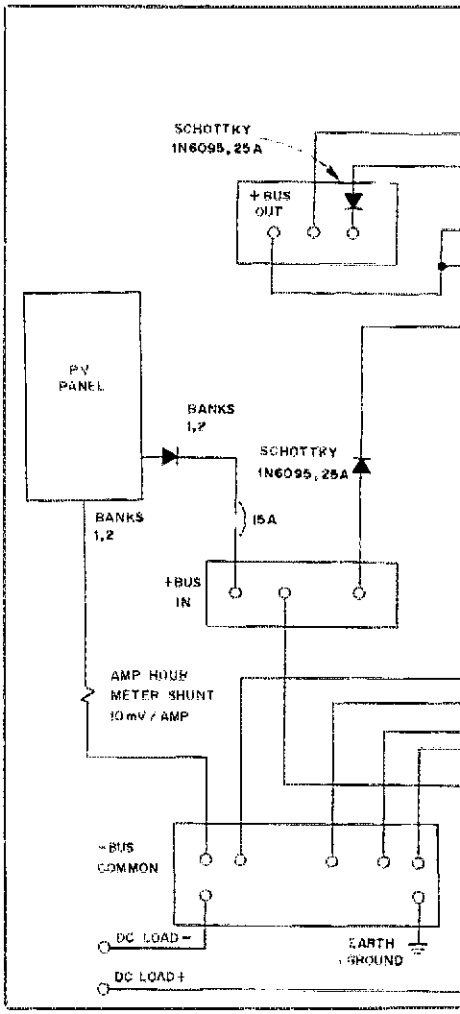


Fig. 9 — Partial schematic diagram of the Ah meter. The IMC module requires a 9-V supply, which is derived from the battery-pack voltage by means of a 723 voltage regulator IC. The meter requires less than 12 mA at 9 V.

converter (VFC), a 4-1/2 digit event counter and an LCD. A highly stable op-amp amplifies the input signal and sends it to the VFC. The VFC output is a train of pulses that is frequency proportional to the current present. A 10-mV-per-ampere, 0.25% precision current shunt located in the return lead to the PV array acts as the input signal source.

Some Considerations

The number of Ah per day of charge capacity available from an array on a cloudless day is a function of in-system PV module current characteristics, ambient temperature and atmospheric haze, site elevation and latitude, array wall and tilt angles, and time of year (sun declination angle).

Use of the PV module manufacturer's I-V characteristics may mislead the user. For example, on a warm (75° F), mildly hazy day at high sun, this system generates about 9.5 A with 22 modules in parallel, which would indicate perhaps about 0.43 A per module. Allowing 2 V more above the float voltage of 14.1, the curves in Fig. 3 (see Oct. 1982 *QST*, p. 14) indicate that the module current should be about 0.57 A, or 12.5 A total for 100 mW/cm² of sun radiation, at the normal operating cell temperature. This may occur under special or ideal conditions; however, 80 mW/cm² probably would be more realistic. In most instances where the SOC of the PV module is specified at 100 mW/cm² only, the actual performance most likely will be less than the I-V curves indicate. In addition, the shunt regulator constrains the array to 1 or 2 V above the float voltage, depending on the voltage drops between the array and the regulator. Therefore, the curves at 100 mW/cm² may not reflect the expectations of the actual system performance.[6]

Temperature and atmospheric haze affect the daily Ah totals, but not significantly over several days. Overcast or cloudy days swamp out the minor changes of temperature and haze. As the ambient temperature increases so does the cell temperature. The short-circuit cell current increases less than 0.1% per degree Celsius with increasing cell temperature, but the open-circuit cell voltage decreases more significantly (2.2 to 2.3 mV/C°). The net result is a reduction in cell power between 0.3 and 0.5%/C°.

Haze affects the array output more than temperature (at least in temperate climates). Comparisons of actual direct-beam-radiation measurements at the station site with three atmospheric haze models produced measurements of 82 mW/cm² for direct radiation and variations of between 65 and 96 mW/cm² for the haze models.

This system has a fixed tilt angle of about 36° and a wall angle close to 0°. The wall azimuth angle is the angle between true south and the array surface normal as projected down to the horizontal plane. Wall angles east of south are positive, west of south negative. The tilt angle is positive for surfaces tilted generally upward and facing generally south, and is zero for horizontal surfaces. Neither angle appears to be critical at nominal latitudes, particularly where a significant amount of the total irradiance falling on the array comes from reflections and diffuse reflections. If only direct-beam radiation were available, the tilt angle would be more important. A tilt angle about equal to the site latitude appears reasonable for fixed tilt-angle installations, such as this system.

The sun declination angle or time of year is important to the extent of establishing the number of hours the sun is available to irradiate the array. This is implicit in what is called the solar hour

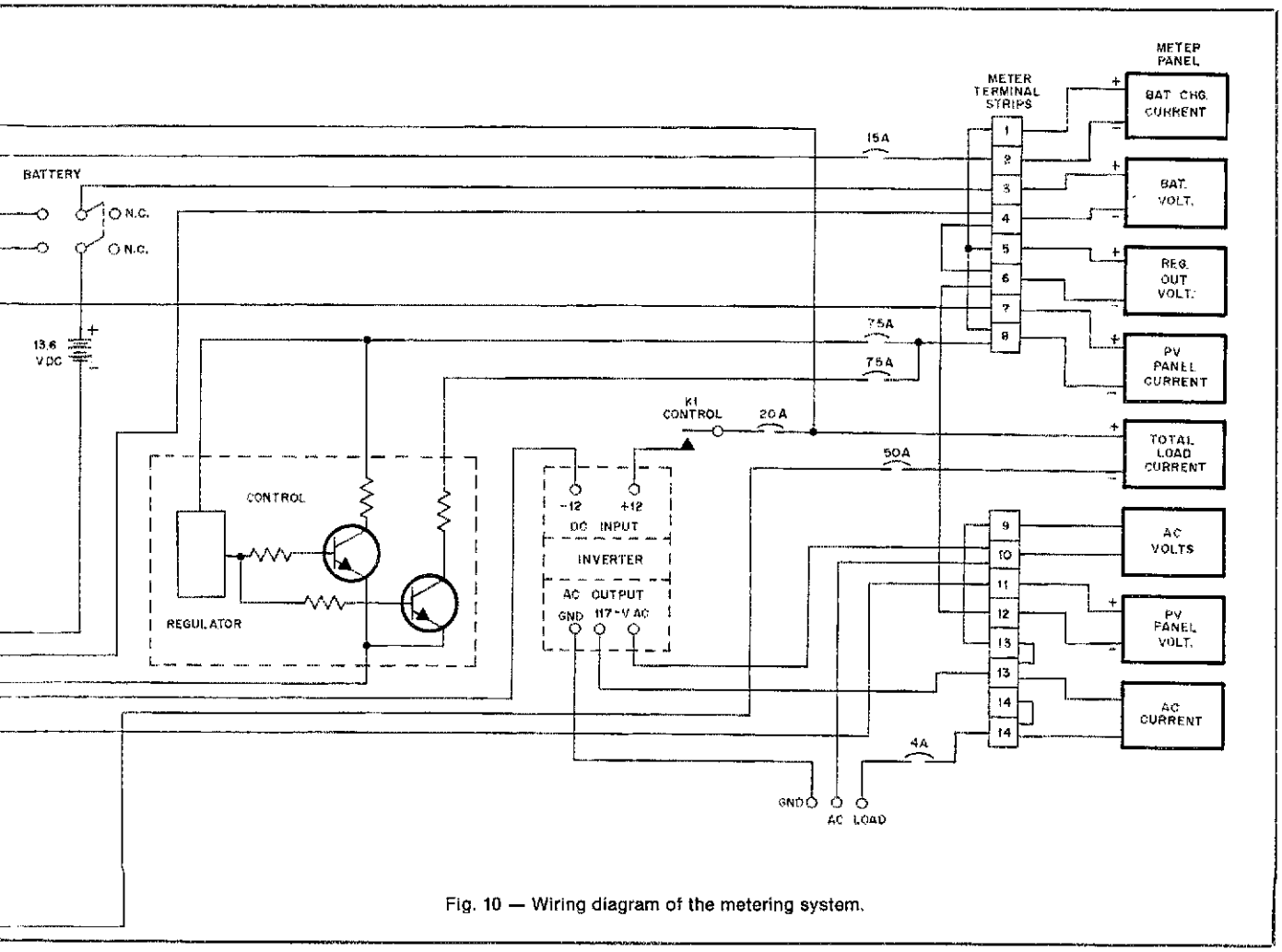


Fig. 10 — Wiring diagram of the metering system.

angle, which is equal to 15° times the number of hours from local solar noon. In the summer, the array will produce more daily Ah simply because the days are longer, and fewer Ah in the winter. This must be considered in specifying the array required to recharge the battery pack in a given number of hours or days.

Fig. 11 indicates the nominal voltages and currents from the PV array and within the battery box at high sun. The battery pack is assumed to be fully charged with no current being drawn by the radio equipment. The radio room is connected electrically to the system illustrated by two no. 4 stranded-copper cables for the dc loads, two no. 12 stranded-copper cables for the ac loads, and no. 14 wire for the inverter control.

System ground is established at the battery box where the negative side of the battery pack is connected directly to the utility company ground. However, this is not a single-point ground since the radio tower and antenna systems are grounded by means of the tower base, which is 5 feet in the ground. The outer coaxial cable shields connecting the radios to the antennas are at ground potential because of a radio room ground system used when operating the equipment from utility company power. This ground is the same one used at the battery box, but not the same ground point. This three-point ground configuration was initially of some concern. However, with all the equipment operating from solar power, less than 2 mA of ground-loop current has been measured. It is important to keep the dc-current meters in the current-source side of the equipment, rather than what is believed to be the current-return side when single-point grounding cannot be used. Otherwise, the meters may not read correctly. The station has been operated with some equipment simultaneously on utility power, dc solar power and inverter solar power with no ill effects.

The 50-foot run of cable between the radio room and the battery box exhibits a measured round trip dc resistance of 0.11 ohm. This impedance creates a problem when the dc-to-dc converter is used. This unit, located in the radio room, produces the heater current for the final-amplifier tubes and the plate voltage for the low-band transceiver when operating from dc (inverter off). It produces a 100-Hz square wave, which appears on the 12-V line. Any other equipment connected to this line will see this pulse train. This problem was partially eliminated by placing 86,000 μF of capacitance across the 12-V line. The capacitors are removed automatically from the line when the equipment is operated with the inverter or from utility power.

Control and Safety

Inverter control, emergency lighting control and radio room systems-voltage monitoring are performed in the radio room. The inverter is actuated by closing a 200-A, hermetically-sealed control relay. Because the input current to the inverter could be as much as 50 A, it is necessary to have a heavy-duty contactor. Also, the contactor is in a potentially hydrogen-rich environment; therefore, it is important to have a hermetically sealed device. All electromechanical switching devices are kept below the upper surface of the battery pack.

The inverter input and output are floating. In this system the inverter chassis, the −12 V return and the 117-V ac low side are made common so mixed modes of utility, inverter and battery-powered operation can be used safely.

A breaker box using seven aircraft-type breakers is provided for safety. Although 12-V systems appear to be relatively safe from shock hazard, the results of getting a watchband, ring or wrench caught between +12 V and −12 V can be dangerous and quite painful. All equipment is fused, and all inverter ac distribution is wired according to the National Electrical Code with a third-wire ground carried through to all ac outlets. Finally, the array framework is grounded, and all antennas can be disconnected during electrical storms.

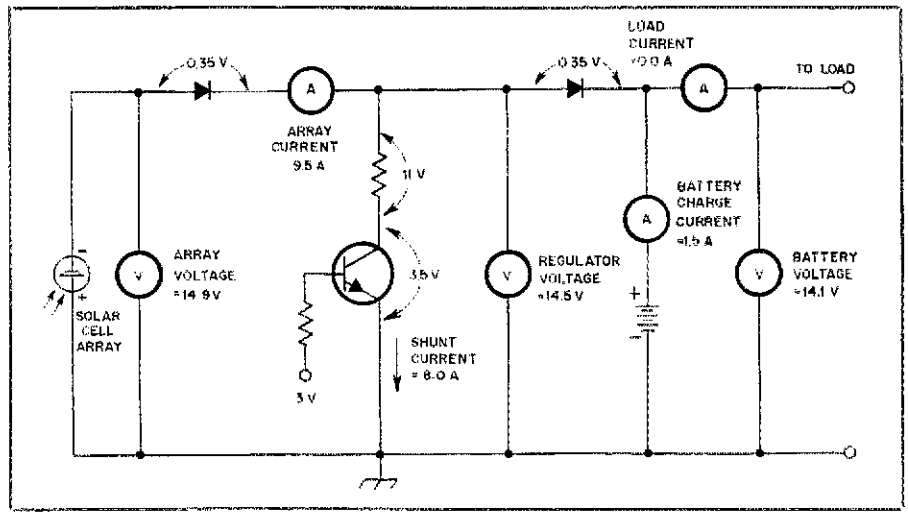


Fig. 11 — Nominal high-sun system voltages and currents.

Summary

It is amazing how inefficient low-voltage (12-V) inverters are. Techniques and new semiconductor devices are available to improve this performance. Much of the available commercial communications equipment is designed for 12-V dc and 117-V ac, so 12-V sine-wave or pseudo sine-wave inverters are desirable for these systems.

Emphasis has been placed on increasing the efficiency of solar cells. Perhaps equally important areas of improvement are in battery development and complete characterization of these batteries for PV energy-storage use. Battery temperature coefficients, Peukert constants and constant power-discharge coefficients are required to design cost-effective energy storage PV systems.[7]

PV manufacturers should present their I-V curves in decrements of 10 mW/cm², from 80 or 100 mW/cm² and indicate that the curves translate linearly along the ordinate axis with irradiance. A few days of using a radiometer will convince most people that a 100-mW/cm² day happens only occasionally — at least in and near metropolitan areas. An 80-mW/cm² day is perhaps more realistic.

Since there is an abundance of 12-V communications equipment being manufactured, it would be helpful if the PV-module manufacturers would provide units specifically designed for 12-V energy-storage systems. This would assume 14.1-V float voltages, shunt-type regulators and two diode drops. A system then could be operated at an optimum point on the I-V curves.

It is definitely impressive to sit at the radio room console and talk to someone across town or halfway around the planet using a no-noise, nonpolluting energy source. We think small systems patterned after the one described here will appear in greater numbers as the cost of photovoltaics and inverters becomes more attractive.

Notes

[4] *Handbook for Battery Energy in Photovoltaic Power Systems*, SAND 89-702Z, Bechtel National, Inc., Final Report, Nov. 1979, pp. 2-5, 2-6, 3-23, 3-24, 3-25. Available from National Technical Information Service, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

[5] International Microtronics Corporation, 4016 East Tennessee St., Tucson, AZ 85714.

[6] R. G. Ross and C. C. Gonzales, "Reference Conditions for Reporting Terrestrial Photovoltaic Performance," *Proceedings of the AS/ISES 1980 Annual Meeting*, Phoenix, Arizona, June 1980.

[7] W. Peukert, "On the Dependence of the Capacity of Lead-Accumulators on the Discharge Current," *Elektro-Technische Z.* (ETZ), 18, 1897, pp. 287-288.

Antenna Gain Measurements

Part 1: Technique — the fine points of making accurate gain measurements without access to a professional antenna range.

By Fred Brown,* W6HPH

The field of antennas is one in which the amateur can make significant technical contributions to the state of the art; this has been well demonstrated in the past. In probably no other area of electronics does pure empiricism yield greater results.

Unfortunately, the myth has become widespread that gain measurements are beyond the acumen or ability of the intelligent amateur. This dilemma is further clouded by many antenna articles that have appeared in the amateur (and sometimes even in the professional) literature with exaggerated gain figures. Unfortunately, some antenna manufacturers have been dishonest about gain, so much so that *QST* has refused (rightfully) to accept advertising in which gain figures are mentioned.[1]

Transmission-line SWR measurements and even antenna impedance measurements are well covered in the amateur literature, but the parameter of most interest to amateurs — antenna gain — is largely neglected. There is no question that gain measurements are not as easy to make as impedance measurements, but this is not to say that gain cannot be determined accurately with fairly simple equipment and straightforward procedures. The techniques outlined here will permit the experimenter to determine the true gain of a manufactured or homemade antenna to an accuracy of within 1/2 dB or better.

This article deals with gain measurements at uhf, where antenna dimensions are small enough for convenient handling. Lower-frequency antennas can be measured by the use of scale models. In antenna work, scaling is based on the principle that when *all* dimensions are scaled by the same factor as the wavelength the scale model will perform exactly the same as its full-scale counterpart.[2] For instance, if we wanted a 432-MHz scale model of a 7.2-MHz antenna, all dimensions, including element and boom diameters, insulator size and so forth, would be scaled by a factor of exactly 60. The free-space performance of the scale model then would be precisely the same as the 40-meter version.

Comparison and Reciprocity

The straightforward way to measure gain is to compare the performance of the antenna under test directly with that of a reference antenna of known gain.[3,4,5] Other techniques have been used to determine gain but, in terms of simplicity, practicality and accuracy, the comparison method is best for amateur purposes.

The reciprocity principle is that the gain, impedance and radiation patterns of any antenna are the same whether the antenna is used for transmitting or receiving. Comparison could be carried out at either end of the antenna range, but usually it is easier and more practical to compare antennas at the receiving end.

The Distance Requirement

At the very close range of only a few wavelengths, an antenna will perform differently than it will at large distances. The performance on an antenna range will be the same as the long-distance performance, provided that a certain minimum-distance requirement is met. Of course there is no *maximum* distance requirement; however, very long-distance antenna ranges give rise to fading signals, ground reflections and weak signal levels.

Primarily because of the ground reflection problem, the most practical antenna test-range distance is usually from 1 to 5 times the minimum distance requirement. This minimum range depends on the largest antenna dimension and the wavelength; the generally accepted value is

$$S_{min} = \frac{2D^2}{\lambda} \qquad \text{(Eq. 1)}$$

where the minimum distance (S_{min}) is measured in the same units as the largest antenna dimension (D) and the wavelength (λ).

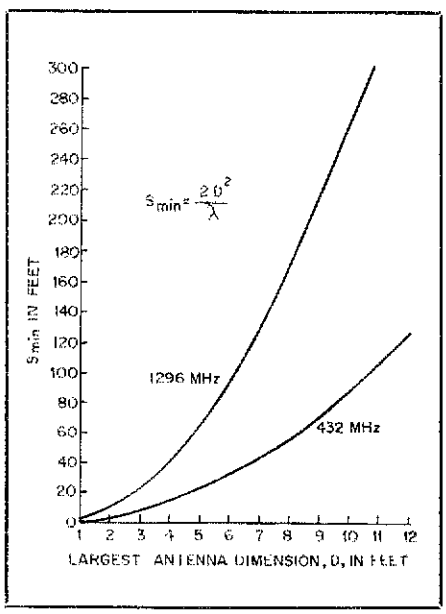


Fig. 1 — The minimum distance at which antenna gain can be measured accurately depends on the size of the antenna and the wavelength. Notice that for a given antenna size the minimum distance is three times as far for 1296 MHz as it is for 432 MHz.

A plot of S_{min} versus antenna size is given in Fig. 1 for 432 and 1296 MHz. Note that for a given antenna size, S_{min} is greater at the higher frequency.

The Reference Antenna

The simplest reference antenna is a dipole, and since gain is customarily expressed in decibels referred to a half-wave dipole (dBd), the dipole has the advantage of being a zero-dB reference. In some respects a dipole is the best, and in other respects it is the worst, of reference antennas. On the plus side is simplicity and reliability. You almost have to *try* in order to make a bad dipole. About the only

[1]Notes appear on page 37.

*1169 Los Corderos, Lake San Marcos, CA 92069

thing that can go wrong is the impedance match, and this will show up readily with a simple SWR check.

The main shortcoming of the dipole is its lack of directivity: It offers little or no rejection of unwanted reflected signals that come from wrong directions. Nevertheless, if a good deal of care is exercised, accurate gain measurements are possible with a half-wave dipole reference antenna.

A better reference antenna has been developed by the Electronic Industries Association (EIA); dimensions are given in *The ARRL Antenna Book*.[6] A number of these 7.7-dBd gain antennas have been built by various amateurs, and it is worth noting that, even though different construction and impedance-matching methods were used, the gains have always measured within 1/10 dB of each other.

Another reference antenna design, easier to construct than the EIA antenna, is shown in Fig. 2. This antenna has the further advantage of being a good match to 50-ohm coax without any external matching devices. Its gain is 6.8 dB over a half-wave dipole.

Impedance Match

To measure gain accurately by substituting one antenna for another, both antennas should have the same impedance. This condition will be met if the SWR on both is low. But the match is not nearly as critical as is generally believed. For instance, an SWR as high as 2.0 results in a mismatch loss of only 0.51 dB. Fig. 3 gives the mismatch loss for SWR values between 1.0 and 2.0.

For best results, the receiver used for comparison should have an input impedance that is a match to the transmission lines used on the antenna, which will usually be 50-ohm coax. Sometimes attenuator pads are used ahead of the receiver to ensure that the antenna "sees" a 50-ohm load. Uhf attenuator pads, however, are expensive and not always available. Furthermore, they are not really needed at uhf, where the high attenuation of small-diameter coaxial cable can be utilized to do the same job. For instance, at 432 MHz, 37 feet of RG-174/U provides 7 dB of loss, and at 1296 it takes only 26 feet of RG-58/U for the same attenuation. A cable loss of 7 dB means a return loss of 14 dB, and this is enough to ensure that the input SWR will be less than 1.5, no matter how bad a mismatch the receiver is.

Reflections

Reflections are the main bugaboo of antenna measurements. An accurate determination of gain requires that the antenna be illuminated by a uniform-plane wave front from just *one* source. Any reflecting object constitutes an additional source. Unless the reflected signal is weak compared to the direct signal, substantial error can result. Practically any object larger than a quarter wavelength, conducting or nonconducting, can cause a reflection. Generally, two types of countermeasures can be taken against reflections: directivity and distance.

The most obvious way to avoid reflections is to get away from all reflecting objects (distance) by carefully choosing a test site. Fig. 4 shows the geometry of the reflection problem. Obviously, the reflected signal will be weak compared with the direct signal if d is large compared with S. For instance, if d is 5 times S, the reflected signal will need to travel more than 10 times as far as the direct signal. Assuming the worst case of a perfect specular reflection from a large object, a reflected-path distance 10 times as great would make the reflected wave at least 20 dB weaker than the direct wave. That might seem like enough attenuation, but reflected signals even 20 dB down can cause worst-case measurement errors as large as 1.7 dB.

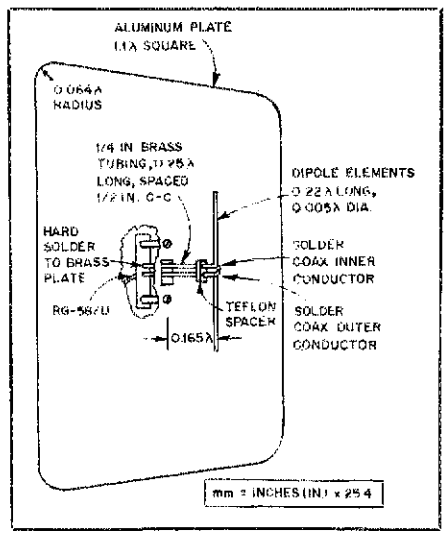


Fig. 2 — A half-wave dipole feed-point impedance can be reduced from 73 to 50 ohms by spacing it 0.165 wavelength above a conducting plane, as shown. The dipole-reflector combination makes a useful reference antenna with a forward gain of 6.8 dB.

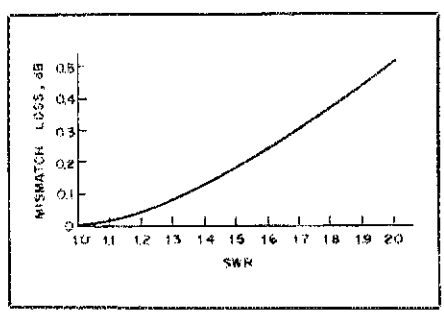


Fig. 3 — Decibel loss resulting from mismatch.

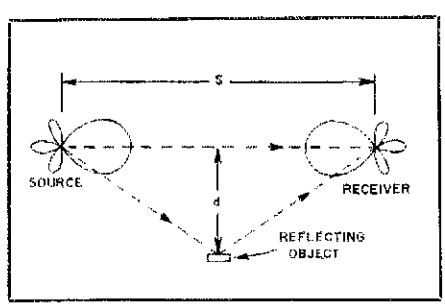


Fig. 4 — The signal can travel from the source antenna to the receiving antenna directly, or along a "bounce" path if a reflecting object is present. The magnitude of the reflected signal will depend on the ratio of d to S, the "scattering cross-section" of the object and on the radiation patterns of the two antennas.

Fig. 4 also illustrates how antenna directivity can be utilized to reduce errors arising from reflections. If the reflecting object lies in a direction that is near a null in the pattern of the source antenna, the reflected signal can be attenuated to an insignificant level.

It also can be understood from Fig. 4 why an antenna range intended for pattern measurements must be much more reflection-free than a gain-measurement range. When the antenna under test is rotated so that its main lobe is pointed at the reflecting object, the reflected signal is magnified by the gain of the antenna, whereas the direct signal may be greatly attenuated by a null of the receiving antenna.

Generally speaking, the ideal test site is an open field, far from houses, trees, cars, cows and all other objects. Such a site leaves us with only one large reflecting object to deal with: the planet Earth. This problem will be dealt with in detail later. The equipment and body of the experimenter can cause reflections, but usually these objects will be below or behind the source or receiving antenna where the directivity of these antennas will discriminate against reflected signals. In professional work, the personnel and equipment are sometimes placed in a hole below the antenna to "hide" them from the electromagnetic environment. The hole is covered with perforated sheet metal to simulate a smooth ground.

Open fields are plentiful and accessible in all parts of the country. (If the one you find is private property, be sure to get the owner's permission.) The field should be smooth to within a quarter wavelength, which is only 2-1/4 inches at 1296 MHz. Grass can be expected to absorb some of the ground-reflected wave, but heavy brush should be avoided. Where the field is furrowed, it is best to choose a signal path that is perpendicular to the furrows.

Any antenna range can easily be tested for reflections by means of a dipole or a similar probe held aloft on a stick. Observe the signal as the probe is moved a few wavelengths up and down, and sideways, across the wave front. A good test site will yield a constant signal

strength as this is done. With vertical polarization, the dipole should be held above the experimenter's head so that his body will be in the direction of the dipole null. See Fig. 5. For horizontal polarization, the probe should be something more directive than a dipole. Two horizontal half waves fed in phase and spaced a half wave apart vertically will also provide a null in the downward direction. Closer to the ground, the reference antenna of Fig. 2 makes a good probe, as the experimenter can stand behind the reflector and thereby shield himself or herself from the source.

The ground-reflection problem will be dealt with in two parts since the case for vertical polarization requires a somewhat different treatment than that for horizontal polarization.

Vertical Polarization

It is not generally appreciated that at a certain angle of incidence a vertically polarized wave will not be reflected appreciably from the earth. Instead, it is simply refracted into the soil and absorbed. the angle at which this occurs is called the Brewster angle.[7] Its exact value depends somewhat on the soil conductivity, the soil dielectric constant and the frequency, but for typical soil at uhf the Brewster angle is usually quite close to 15°.

If, then, our antenna range is set up so the transmitted signal strikes the earth at an angle of 15° at the point on the ground at which it would be reflected to the receiving antenna, it will be possible to avoid virtually all of the ground-reflected signal. The geometry is shown in Fig. 6. Where transmitting and receiving antennas are of equal heights, an incidence angle of 15° requires that the range distance (S) be 7.5 times the height above ground (h).[8] Of course, S will also have to meet the minimum distance requirement (S_{min}) discussed previously.

Horizontal Polarization

With horizontal polarization there is no Brewster angle to absorb the ground reflection; instead, the reflection coefficient is nearly 100% for all angles of incidence of concern at the test range. Accordingly, we must employ a different strategy to avoid earth reflections, and a number of techniques have been devised to deal with this problem. Probably the most practical for the amateur is to utilize vertical-plane directivity at the source. If the transmitting antenna has a directive-pattern null in the direction at which the ground-reflected signal is transmitted, the ground reflection can be diminished to a negligible level.

It's not hard to make an antenna with a null at a given angle with respect to the main lobe. Two identical antennas (they could be Yagis or simple dipoles), fed in phase, will produce nulls that are a function of the spacing between the two antennas. Fig. 7 gives the relationship between spacing in wavelengths and the angle of the first null measured from the main lobe. For instance, if we want a null at 15° below horizontal, we space the two antennas 1.932 wavelengths apart vertically. Then, if we make the range geometry such that the angle of incidence for the ground-reflected signal is 15°, we will be able to avoid practically all of the ground reflection. It is essential that the two antennas be identical and be fed in phase with equal amplitudes. The latter requirement will be met if the two identical antennas are fed through equal lengths of transmission line of identical impedance. The lower antenna should be at least a few wavelengths above ground so that its feed-point impedance will not be affected significantly by the earth's proximity.

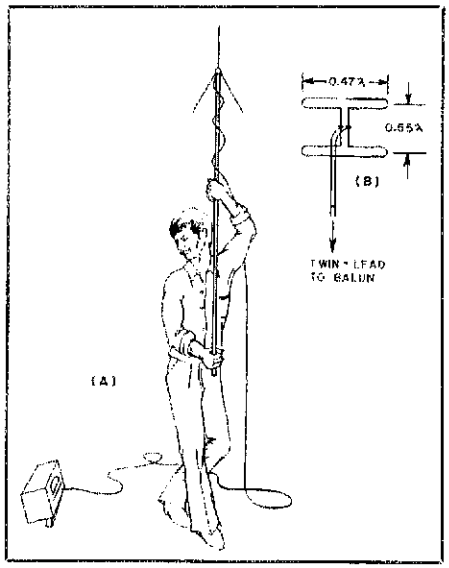


Fig. 5 — At A, if vertical polarization is used, a drooping ground plane makes a good test probe to check the antenna range for reflections. If the range is reflection-free, the received signal will remain constant as the probe is scanned across the wave front. A suitable probe for horizontal polarization is shown at B.

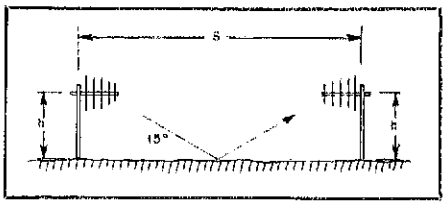


Fig. 6 — The ground-reflection problem can be avoided largely by using vertical polarization and making the range geometry such that the reflection signal will strike the ground at the Brewster angle of 15° (S = 7.5h). See text.

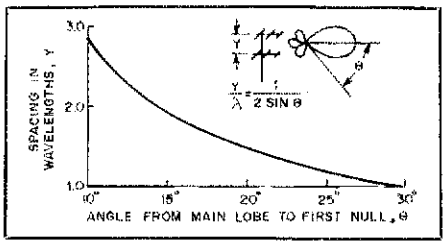


Fig. 7 — Two identical antennas spaced at distance y and fed in phase will produce a null at an angle θ, as shown. This null can be used to circumvent the ground-reflection problem.

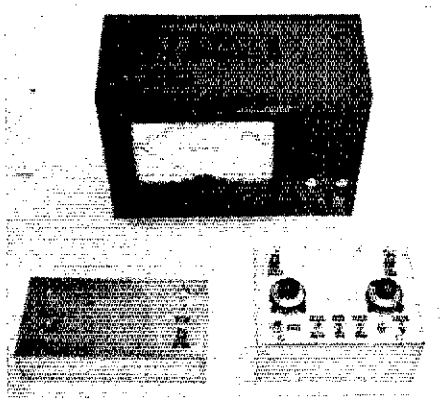


Fig. 8 — Shown here is complete instrumentation for battery-powered 432- and 1296-MHz antenna measurements. The equipment can be used also as a short-range mcw communications set. Details in Part 2 of this article.

Instrumentation

Fig. 8 shows home-constructed equipment suitable for making accurate gain comparisons in the field. This will be described in detail in Part 2, the conclusion of this article.

Fred Brown was licensed at age 16 as W6HPH. He has held this call continuously since 1949, upgrading to Extra Class in 1967.

Electronics has been Fred's career as well as hobby. He received a BS from California State Polytechnic University in 1955 and an MSEE from the University of Illinois in 1956. He has worked as an electronics engineer for the U.S. Navy and Raytheon Mfg. Co., and has taught electronics at Mt. San Jacinto College and Cal Poly. Fred has authored more than 50 technical articles in amateur and professional journals. During the summer he can sometimes be heard operating in England as G5AWI.

Notes

[1][Editor's Note: Different measuring techniques may produce different gain figures for the same antenna, yielding inconsistent and thereby misleading results. (The antenna environment, or "test-range" facilities, are of primary significance.) No industry standard for gain measurements of amateur antennas has been recognized by the ARRL.]

[2]There are a few factors that do not scale perfectly, such as antenna losses, dielectric constants and so on, but seldom are these of any practical consequence.

[3]W. Overbeck, "Measuring Antenna Gain With Amateur Methods," *QST*, Oct. 1977, p. 11.

[4]B. Clark, "Direct Methods for Measuring Antenna Gain," *Ham Radio*, July 1969, p. 26.

[5]F. W. Brown, "How to Measure Antenna Gain," *CQ*, Nov. 1962, p. 40.

[6]*The ARRL Antenna Book*, 14th edition (Newington: ARRL, 1982), p. 15-25 (p. 320 in the 13th edition).

[7]E. C. Jordan, *Electromagnetic Waves and Radiating Systems* (Englewood Cliffs, NJ: Prentice-Hall, 1950).

[8]In this article, "angle of incidence" is measured from the reflecting surface, rather than from the normal to that surface, as is customary in physics texts.

An Ohmmeter With a Linear Scale

Build this simple, useful device during a weekend and enjoy the convenience of a linear readout scale.

By Harry M. Neben,* W9QB

Amateurs who experiment usually have a VOM (volt-ohm-milliammeter), which can be used to measure resistance. However, the scale of most VOMs is nonlinear, being cramped at the high-resistance end, which makes measurement little more than a guess. This resistance-measuring device has a linear scale and a range of 100 ohms to 10 megohms, can be calibrated by a single measurement, and is easy to build. The circuit is very simple, consisting of an operational amplifier, a Zener diode, a meter and a series of switched reference resistors.

This ohmmeter operates by comparing the voltages at the inputs of an operational amplifier, then translating this voltage differential into a meter reading (Fig. 1). For explanation purposes, we will make the reference and unknown resistors equal in value. In that case, the voltage at the inverting input will be equal to half the output voltage. Feedback through the unknown resistor will cause the output voltage to swing until there is no input-voltage differential. This 2:1 divider will cause the output voltage to swing to 2 V_Z, which causes the meter to read full scale.[1] An unknown resistance of less than the reference resistance will unbalance the operational amplifier input and cause the meter to indicate less than full scale. The user must select a reference resistance (or scale) of higher value to keep within the meter range. Note that the meter circuit includes a clamping diode. This diode is desirable to protect the meter against overload when the unknown resistor value approaches infinity (open circuit).

*1151 Fairway Dr., Dunedin, FL 33528

[1]For a theoretical analysis of op-amp operation see G. Woodward, "A Beginner's Look at Op-Amps," *QST*, April 1980, pp. 15-18, and June 1980, pp. 25-31.

Construction

All components were purchased as stock items from a local parts store. There are no specialty components to frustrate the builder. The meter is built into a 6-1/4 × 3-3/4 × 2 inch experimenter box. The local store had a 6.2-V Zener diode, so this was used. Any Zener diode of less than 9 V can be used. Other parts were right from the rack. A 1-mA meter was selected as the most practical one to use, because the scale is easily multiplied by factors of 10.

Front-panel layout is conventional, with the meter, the selector switch and the measuring terminals in line from top to

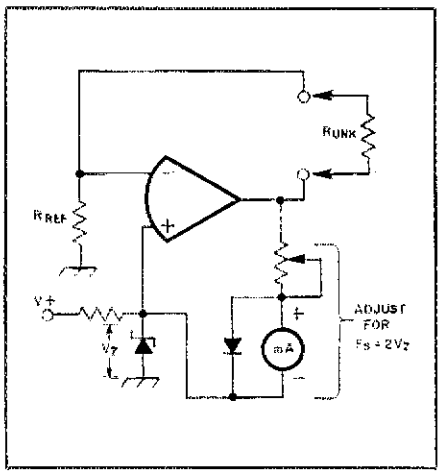


Fig. 1 — Basic circuit for the linear-scale ohmmeter. See text for details.

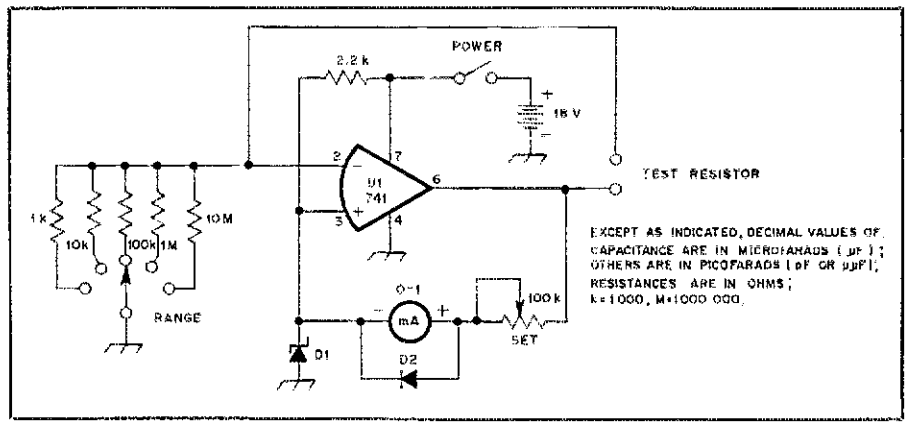


Fig. 2 — Linear-scale ohmmeter schematic diagram. Fixed-value resistors are carbon composition, 1/4 or 1/2 W.
D1 — 9 V or less, 200-mW Zener diode.
D2 — 1N914 silicon diode.
U1 — 741 operational amplifier.

bottom. The reference resistors are mounted on the selector switch. A small piece of perf board is used to mount the operational-amplifier socket and to provide space to mount the Zener diode, the limiting resistor and the meter-calibration potentiometer. The meter-clamping diode is mounted on the back of the meter. Two 9-V batteries are mounted within the case.

Calibration

After the Zener diode and meter are selected, the first step should be to calibrate the meter against the Zener diode voltage. This is done by using the auxiliary circuit (Fig. 3). Connect the Zener diode in series with a suitable resistor to a 9-V battery. Connect the meter and the 100-kΩ series potentiometer (R_S) across the Zener diode. Adjust R_S until the meter reads full scale. The meter circuit is now calibrated and no further adjustment is necessary. However, the accuracy of the readings of the meter will depend on the tolerance of the reference resistors.

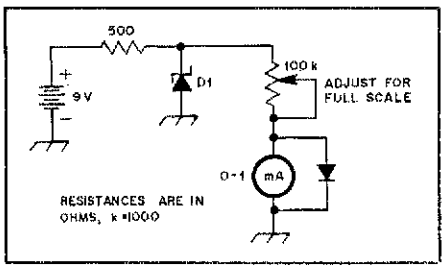


Fig. 3 — Calibration circuit for the ohmmeter. The meter series resistor is adjusted until the meter indicates full-scale.

Strays

WORKED ALL STATES, BICYCLE MOBILE

☐ There I was, a college professor who had been granted a nine-month sabbatical, with loads of spare time to improve myself. All that hamming was settling to my midsection. Some sort of exercise program to keep in shape was in order. Jogging was out because of a knee injury, so I decided on bicycling. This was fine for a while, but quickly became a little dull. What could be done to make exercise more enjoyable?

I remembered seeing an article about a fellow who put his rig on a bicycle and operated from it. That was it! I reconditioned my son's old Sears 10-speed by adding a luggage carrier and two metal saddle baskets on the back. Several power sources for my rig, an Atlas 210X, were investigated. My transceiver draws between 4 and 8 A at 12 V, so something hefty was needed. A car battery would be far too heavy, and $90 for a gel cell was too expensive. It was also a little large, although the one I saw had a shoulder strap. I decided to use a motorcycle battery (a Sears 12N9-4B-1) that had a 9-Ah rating. It weighed only 8 lb and measured 5-1/4 × 3 × 5-1/2 in. The best part was that it cost only $25 on sale.

Now for the antenna. It was a choice between my Swan M-34 mobile antenna with traps for 10, 15 and 40 meters or my single-band Hi-Gain Hamcat mobile. Here again size was the deciding factor. The Swan was heavier, but was only 66 in. tall without the extension for the 40-meter band. It would also provide multiband capability without having to switch traps. An old, flexible, metal-strap mobile mount from my junk box was secured to the back of the luggage carrier. The baskets, the luggage carrier and the bicycle frame were strapped together with antenna wire to create a ground plane.

The motorcycle battery was placed in one of the baskets. The rig, which consists of the Atlas 210X and a Ten-Tec 277 antenna tuner, was tied to the top of the luggage carrier. The tuner was needed to reduce the effects of the next-to-no ground plane that the antenna normally required.

I was ready to make my first radio-equipped ride. I was a little self-conscious, to say the least, knowing that the neighbors already had some reservations about me because of the antenna farm on my roof. What would they think when they saw me with my 66-in. antenna on the bike calling "CQ" as I rode down the street? Too late for that now; I was committed to the attempt. The first major problem encountered was getting on the bike. It is very hard to swing a leg over the rig and in front of the antenna. The next problem was learning to get control over the somewhat unstable vehicle. Then came getting off, which is also a tricky affair.

Having mastered the riding problems, it was time to operate the rig. I tuned it up on 15 meters, with an SWR of only 2.5 to 1. I called "CQ" and, after a short while, had my first QSO with Harry, W2ECP, of Rahway, New Jersey. After he stopped laughing when I announced myself as Bicycle Mobile 4, he gave me a 5 × 5 report. On the first ride, I also worked Colorado, New York, Wisconsin and Idaho (with a 5 × 2). The reaction of the people on the streets varied from interested to dumbfounded.

Even since he combined bicycling with Amateur Radio, Elliot Kleiman, WA4YDK, has found out how much fun exercising can be. In fact, he's already received WAS (with a bicycle-mobile endorsement) and WAC awards, and is well on the way to DXCC.

The best bands to work were 10 and 15 meters, although I also made some contacts on 20 and 40. The antenna seemed to work better with the 3-ft extension on the top, even though the 40-meter trap isn't supposed to pass much through it on 10 and 15 meters. The battery supplied enough power to operate up to an hour and a half. It would die in a manner similar to a NiCd — almost without warning. After a year of use in this manner, the battery still operates, but now it holds a charge for less than an hour. Because of the relatively weak transmitted signal, trying to break into a QSO in progress was more effective than calling CQ. A note of caution about motor-powered vehicles and curbs on streets: They have very little respect for an operating amateur. Care must be made in the selection of bike paths, in order to preserve both life and dignity.

After a year of operating, I applied for and received a Worked All States award, which has a very highly prized "bicycle-mobile" endorsement. Then there's the added thrill of working DX. Yes, I've worked ZS3, ZS4, 4X4, VK3, G3, JA and HC2. That's enough for WAC, but there are no special-category endorsements. DXCC must be the next goal. It turns out to be a very enjoyable way to ride a bike, and the QSOs that you have are a little bit more memorable than those from a fixed station. I even have a QSL with a picture of me and the bike.

I don't know if it's for everyone, but it is certainly a novel operating mode. I hope I can turn on the rig some day and hear someone else calling "CQ CQ" from a bicycle. A bike-to-bike QSO would really be something! — *Elliot B. Kleiman, WA4YDK, Hollywood, Florida*

Build the Timeless J Antenna

Need an inexpensive, simple antenna for use in hotels? Put this on your 2-meter rig — it's not a pipe dream.

By Lee Aurick,* W1SE

Some ideas never die: They seem to disappear, only to reemerge when we have a need for what they have to offer. The J, or J-Pole, antenna is one of these perennial concepts. I built one for 5 meters in the mid-'30s. Now I have revived it for use on 2-meter fm.

The antenna derives its name from its similarity to the letter J. A half-wave length antenna, it is fed at one end through a quarter-wavelength matching section. It may be fed by open-wire line or coaxial cable. (Some builders like to use a balun with the coaxial feed. I believe that a balun makes little difference in performance, and is only an unnecessary complication.)

My interest in reviving the J came from the inadequate performance of a quarter-wave antenna I used in a hotel room. I needed something that could easily be folded to carry within my luggage or the car. The J appeared to be a "natural" for this need. It operates independently of ground. You can match coaxial cable to it easily. Finally, the antenna may be constructed in sections that simply bolt together and mount on a plastic base.

Construction

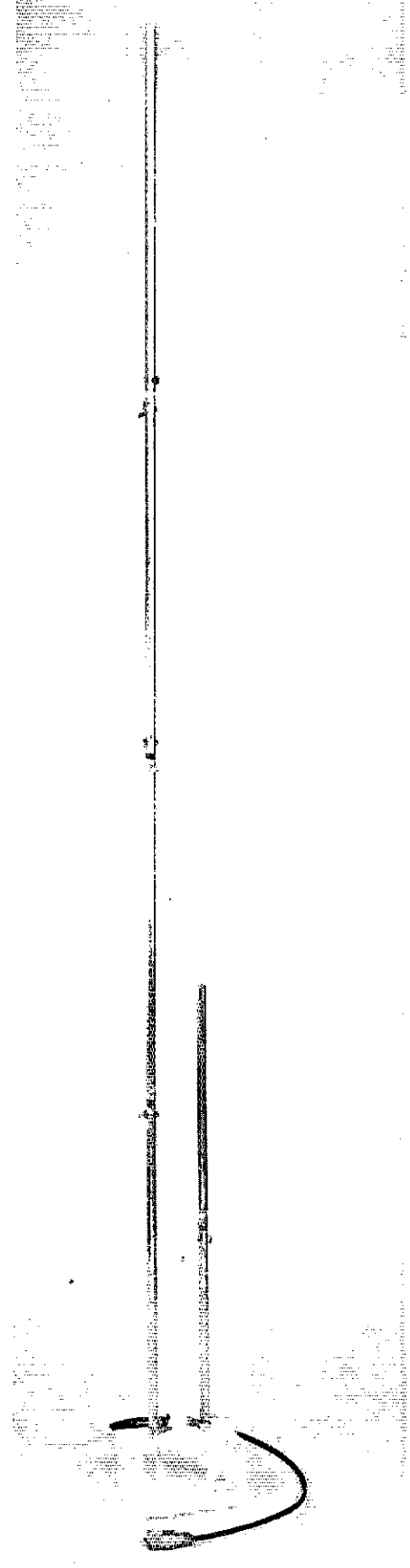
The radiating part of the antenna is 38 inches (mm = in. × 25.4) long and has a matching section that is 19 inches long (Fig. 1). Both are made from 3/8-inch diameter aluminum tubing. One side of the matching section must be added to the antenna section for a total of 57 inches. From this length is subtracted the length of one side of the "U" mounted within the plastic. In this instance, the length of the matching section within the plastic is 2-1/4 inches long. On the other side of the matching section this length is, similarly, subtracted from the 19-inch length. Therefore, each side is shortened by the length within the plastic and is, respectively, 54-3/4 inches and 16-3/4 inches long. The U-shaped base of the antenna within the plastic is made from 1/4-inch-diameter aluminum tubing and spaced 2-1/8 inches, center-to-center. The U projects 1-7/8 inches above the plastic (total length: 4-1/8 inches).

The lengths of the larger-size tubing mounted above the plastic base are divided into four pieces on the longer side, and into two pieces on the shorter side. This results in four pieces approximately 13-11/16 inches long and two pieces approximately 8-3/8 inches long.

Four lengths of 1/4-inch-diameter tubing are cut to 2 inches. These are inserted 1 inch into the larger tubing and are held with no. 6 screws, 1/2 inch long. One end is fastened in place with hex nuts, but the other end is secured with wing nuts for "no-tools" assembly and disassembly. A dab of different colored paint helps to identify mating parts — I have difficulty drilling holes in different pieces that will always match! With the paint identifier, you may always be certain of a correct match-up of sections, the first time, when assembling the antenna.

The base is made from a scrap piece of polystyrene. Just about any insulating material may be used. Care and patience must be exercised while drilling the plastic. The plastic must be worked slowly with frequent rests to permit the drill bit to cool. If not, a sloppy hole and charred or melted plastic, will meet your efforts.

The plastic base I used had a groove that ran the width of the block. I placed the bottom of the U in this groove. Rubber feet, attached to the bottom, should provide adequate clearance for blocks not having a built-in groove.



Matching

To make the connector clips, I cut two narrow strips of aluminum from scraps. I bent them to fit tightly around the aluminum sections and fastened them with no. 6 hardware. The center conductor is connected to one clip, and the shield

*Advertising Manager, *QST*

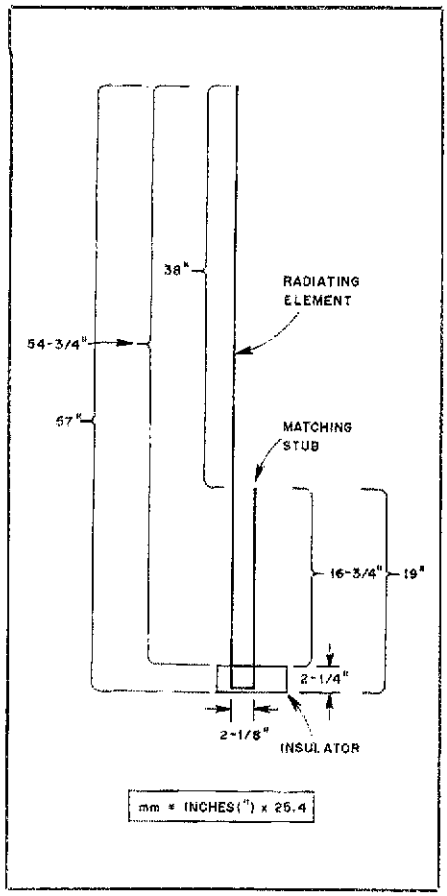


Fig. 1 — Construction details for the J. See text for discussion.

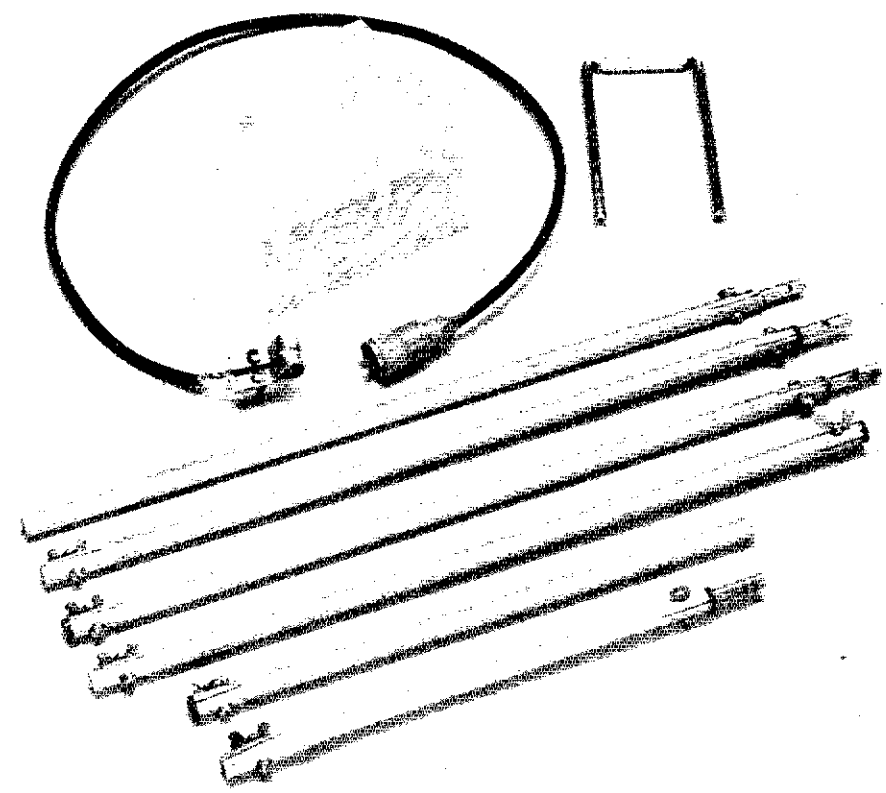
to the other. It doesn't seem to make much difference which is connected to which. I tried it both ways, and neither seemed superior.

Connect an SWR indicator in the line to indicate the point of match. Alternately, slide the connectors up and down and check the SWR until the match point is located. With the antenna matched to 1:1 at 146 MHz, the SWR remained below 1.2:1 throughout the band. Pivoting the connectors toward or away from each other has a slight effect on the SWR, and may be used for "fine tuning" the match. The antenna shown happened to achieve unity SWR at the point where the large tubing met the plastic base.

How Does it Perform?

Initial testing was done in the ARRL lab. The ARRL Hq. building is constructed with steel girders, which provide a degree of shielding. In addition, the lab is mostly underground. Despite these limitations, repeaters 15 miles away were "full quieting," and were raised easily with 10 watts of power.

The J is a simple antenna to build and adjust. It will provide a worthwhile improvement over most 1/4-wavelength antennas, and will beat a "rubber duckie" hands down. When you are a bit more fixed than mobile with your hand-held or other rig, you will find the J can add miles to your enjoyment.



The completed "J" antenna, ready for assembly.

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 request.

FIELD DAY IN THE REAL "BOONIES"

☐ Some of us dream of "getting away from it all" during Field Day, and the photograph illustrates the perfect spot to realize that fantasy. The setup was used by ARRL TA Dan Petersen (WA6OIL) and Roger Colbath (N6FMR) during their QRP Field Day operation in 1982. The spot is located 55 miles northeast of San Diego and is close to Garnet Peak.

The station was a Heath HW-8 (2-W output) and some homemade accessory gear. Dan says they didn't try to kill themselves setting any records, but they worked 61 stations in 26 states with their low-power station. They also copied the W1AW Field Day message, as topping for the cake.

WA6OIL also mentioned that when the photograph was taken they had a *mild* breeze (note the position of the flag!). Later in the day, "The wind came up"! Apart from that, the only difficulty was Murphy-related. Someone forgot to pack the roll of coaxial cable for the antenna, so several short lengths of line with connectors were joined, and the show was on the road. Well, why not? After all, Field Day is meant to simulate emergency conditions! — *Doug DeMaw, W1FB*

This site near Garnet Peak in southern California proved to be a gem of a place for WA6OIL and N6FMR during their 1982 ARP Field Day operation.

BEGINNER'S BENCH

Station Set Up — How to Make It Simple!

Buying equipment is only part of putting together an amateur station. Here are some hints that will make setting up your station and getting it on the air easy.

By George Collins,* KC1V

I remember watching a ham friend setting up his station. I was a newly licensed Novice at the time, and seeing this OT (old-timer) sort through the maze of wires, equipment and cables made me think that his middle name had to be Merlin! He never looked at a diagram, scratched his head, or made a false move. He *knew* where every wire belonged. How could anyone remember it all? I wondered if I would ever be able to do the same.

I'm sure many newcomers to Amateur Radio have similar experiences. Over the years, I have learned the old-timer's secret. He knew where everything belonged because he understood the purpose of each piece of equipment and how it had to be connected in order to function properly. If we use this approach when setting up our stations, what might seem to be a complicated puzzle will become a simple and logical arrangement.

There are two parts to setting up your station. First, the desired equipment is obtained and a suitable station location is chosen. This part of the process was covered by Doug DeMaw in an earlier article.[1] Along with tips on selecting equipment and accessories, he gave hints on how to lay out a comfortable and safe station. You would be wise to review that article before plugging in your transmitter and "throwing the switch."

After you have selected your equipment and have arranged the operating position, we come to the second part of station setup. We must connect the various pieces of equipment so they will function efficiently. Let's look at some station setups and see if we can understand how they are connected by first understanding what each piece of gear does. We'll also discuss how to use some of the accessory equipment to make our operating more enjoyable.

The simplest amateur station may consist of a transceiver and a single antenna. Many "first contact" QSOs have been made with such stations, but most amateurs soon want more versatility. A more typical station is shown in Fig. 1. Included in this arrangement is all the equipment a beginning amateur is likely to need. A transceiver is shown in the figure, but a transmitter and receiver combination could be used instead. Later, we'll discuss the transmit-receive (T-R) switching necessary when a separate transmitter and receiver are used.

SWR Indicator

Some type of standing-wave-ratio (SWR) indicator should be part of every amateur station. This piece of equipment serves many functions. It's useful as a relative power indicator during transmitter tune-up, and as an antenna-system "monitor" during operation. Should anything go wrong with the antenna or transmission line (such as a broken wire or a loose connector), the SWR indicator will reveal the problem by indicating a higher than normal SWR.

When a Transmatch is part of your station equipment, the SWR indicator really gets a workout! If it isn't a necessity for adjusting the Transmatch, it certainly makes the job much easier. You will also need an SWR indicator when trimming wire antennas to the correct length, or when making other antenna adjustments. Numerous commercially manufactured SWR meters and power meters are available, or you may choose to build one. Construction details for an SWR/power meter can be found in *The Radio Amateur's Handbook*.[2]

Although the SWR indicator has many uses, all the applications have one thing in common: We use the indicator to determine the SWR at the transmitter output. This tells us that the SWR indicator should be the first piece of equipment in the transmission line from the transmitter. We don't want it, for example, on the output side of the Transmatch. If it were located at the point, we could measure the antenna feed-line SWR, but we couldn't determine when the Transmatch was adjusted correctly. Remember, the purpose of the Transmatch is to provide a low SWR at the *transmitter output*. By placing the SWR meter between the antenna switch and the rig, we can use it to monitor the feed-line SWR of any of the antennas. It also allows us to use it as an output-power indicator when tuning the transmitter into the dummy load.

Low-pass Filter

Following the SWR meter is the low-pass filter. It helps attenuate transmitter harmonics that, if radiated, might cause television interference (TVI). We want it in the transmission line at all times, so it must be located between the transceiver and the antenna switch. It is recommended that the low-pass filter be placed directly at the transmitter output (between the rig and the SWR indicator in our

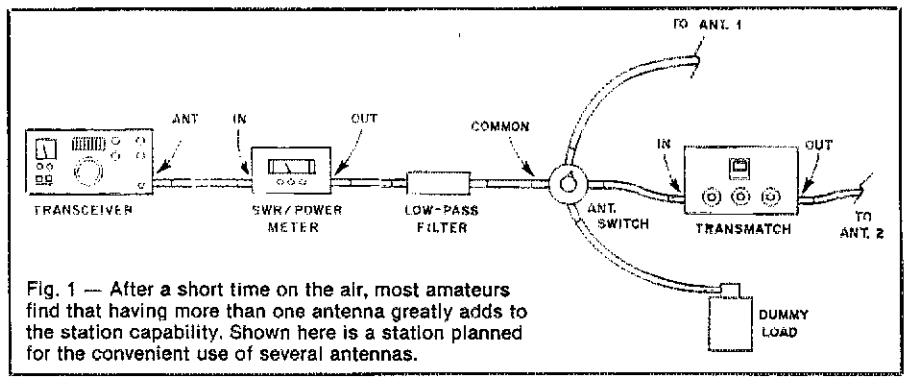


Fig. 1 — After a short time on the air, most amateurs find that having more than one antenna greatly adds to the station capability. Shown here is a station planned for the convenient use of several antennas.

[1]Notes appear on page 44.
*Basic Radio Editor

example). Generally this is a satisfactory location, but some SWR meters (because of rectifying diodes) have been found to generate harmonics of the transmitted signal. With such meters, we want the low-pass filter between them and the antenna! If you should experience a TVI problem, try both filter locations, and use the one that results in the least interference. It is important that the low-pass filter be used in a transmission line with a low SWR. For this reason, the filter should be located between the rig and your Transmatch.

Antenna Switch

Although it is a simple device, few accessories add more convenience to station operation than the antenna switch. Even in stations with only a single feed line (those that use a single multiband antenna), a switch is still convenient for selecting the dummy load during tune-up and while testing your transmitter. Five-position switches are commonly available, and most provide for grounding of all unused antennas. Building an antenna switch is also a great weekend project.[3]

Often, two antenna switches are useful. If you use your Transmatch with more than one antenna, a second switch can be placed at the Transmatch output to select the desired antenna.

Transmatch

A variety of Transmatch circuits are available, both in commercially manufactured units and for home construction. The operational details will vary depending on the circuit used, but generally the Transmatch can be connected to your station as shown in Fig. 1. Most commercial Transmatches are designed for use with antennas fed with coaxial cable. The most popular circuits used are the T-network and the modified T-network, or Ultimate Transmatch circuit. These circuits are also useful with end-fed wire antennas.

In addition to the basic function of providing a low SWR at the transmitter output, many Transmatches have other features. Some include antenna switching, and others contain an SWR or power meter. One feature that can be important is a bypass switch. It allows you to switch the Transmatch out of the transmission line when it is not needed. If your Transmatch contains antenna and bypass switches, you can eliminate the external switch. Be sure you have some means of connecting your transmitter output (after it passes through the SWR indicator) to the dummy load without it going through the matching circuit. You'll want to be able to do so during transmitter tune-up.

Amplifiers

When the General class ticket arrives, many hams begin thinking about adding an amplifier to their stations. Typically, it will be a linear amplifier designed for use with a transceiver in the 100-W-output class. These amplifiers normally have built-in T-R relays to handle the antenna switching. A control line between the amplifier and the transceiver allows the transceiver T-R switch to control the amplifier relay. During receive, the relay connects the amplifier input jack directly to the output connector. This connects the transceiver to the rest of the system just as if the amplifier were not present. While the transceiver is transmitting, the amplifier relay is closed, connecting the transceiver to the amplifier input circuit. It also connects the amplifier output to the feed line that goes to the antenna. When the amplifier is turned off (or is in standby), the transceiver is connected directly to the antenna feed line during transmit and receive.

Connecting this type of amplifier to the rest of your station equipment is easy. It simply goes between the transceiver and everything else! In effect, the amplifier is part of the station transmitter. All other station equipment is connected to it the same way it was connected to the transceiver. This is shown in Fig. 2.

Some older amplifiers found on the used-equipment market do not contain a T-R relay. Using these units with a transceiver requires the addition of a relay and some control wiring. You should not rule out these older amplifiers simply because they lack a T-R relay. Many of them are well-made, and can be obtained at bargain prices. The needed modification should not be difficult or expensive.

T-R Switching for "Separates"

Many new hams choose a separate transmitter and receiver combination for their first station. It's a good choice; some older units will provide excellent service at a minimum cost. Most of these transmitters require an external T-R relay (Fig. 3). The relay switches the antenna feed line from the receiver to the transmitter during transmit periods. A transmit/standby switch in the transmitter is used to control the relay. Some transmitters provide a switched voltage to operate the relay, while others allow you to connect directly to the control-switch contacts. In the latter case, you must provide a source of power for the relay coil. If the transmitter supplies the control voltage, be sure you choose a relay designed to operate at the *same* voltage. Many transmitters that contain only vacuum tubes supply only 117-V ac for relay operation. If your transmitter is of this type, be sure to exercise caution when wiring the relay. All 117-V lines must be well-insulated, and all "hot" terminals need to be covered. Check the schematic diagram in your transmitter owner's manual to determine how your equipment is wired.

In addition to transferring the antenna from the receiver to the transmitter, we must also "mute" the receiver by placing it in the standby mode while transmitting. In any well-planned amateur station we should be able to go from receive to transmit by operating a single switch. This means that the switch used to control the transmitter and the antenna relay must also control receiver muting. Often, the receiver mute line must be grounded in order to place the receiver in standby. If the transmitter has a second set of contacts available on the transmit switch, these can be used to ground the mute line. Normally, you can't use the same conacts to control the T-R relay and to mute the receiver. If only one contact set is provided in the transmitter, you can use a second or auxiliary contact set on the T-R relay for receiver muting. If this is done, the RCVR MUTE line in Fig. 3 would be connected to the antenna-relay auxiliary contacts.

Most recently manufactured transmitters were designed for use with a matching receiver. These units contain an antenna relay and receiver-control circuits, so you don't need an external relay. The receiver antenna input is connected to a receiver-output connector on the transmitter through a short length of coaxial cable. A control cable for connecting the units carries the receiver muting signal. Most receiver/transmitter pairs provide for transceiver-style operation with the variable-frequency oscillator (VFO) of one unit controlling the transmit and the receive frequency. While there is no reason a particular receiver or transmitter must be used only with "its twin," transceive operation may not be practical with other than matching units.

Fig. 1 is only one of a number of possible equipment arrangements. The exact equipment being used and the type of operating you prefer will determine the details of your particular setup. By keeping in mind the function of each piece

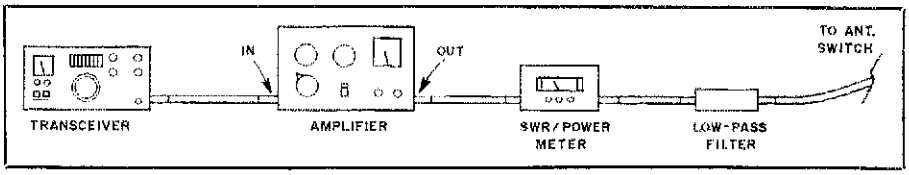


Fig. 2 — For medium-power operation (less than 300 W), RG-58/U coaxial cable is satisfactory. When a high-power amplifier is added to the station, as shown here, RG-8/U cable is recommended, especially if a high SWR may be encountered. RG-58/U cable can be used between the transceiver and the amplifier.

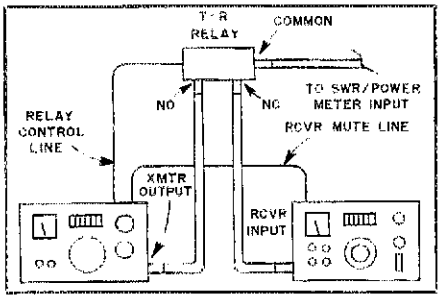


Fig. 3 — For convenient operation, a separate transmitter and receiver can be used with an external T-R relay. The common relay line is connected to the rest of the station in the manner used for the transceiver in Fig. 1.

of equipment you'll be able to plan your station to best fill your needs.

Tune Up

With your station setup completed, it's time to put it on the air and begin making contacts. Right? Almost, but before you begin filling the pages of that logbook let's look at some ways we can use our station equipment to best advantage.

The first step in putting your station on the air is transmitter "tune-up." One objective you should always have in mind is minimizing on-the-air tuning. This is when the antenna switch and dummy load shown in Fig. 1 really "shine." Always start your tune-up by selecting the dummy load by means of the antenna switch. Follow the instructions in your transmitter or transceiver owner's manual, and tune the rig for normal output into the dummy load.

Tuning procedures vary from one rig to another, but most modern ssb/cw transceivers are similar. If your rig has a vacuum-tube power amplifier (PA), you'll probably need to adjust the driver tuning, the amplifier tuning and loading, and the carrier- or drive-level controls. Most rigs are equipped with a TUNE position on the mode switch. It allows you to make the initial transmitter adjustments at reduced power (saving wear and tear on the output tubes!). Normally, the TUNE position is used while peaking the driver tuning control. With rigs that produce some output in the tune mode, you also can adjust the PA tuning control at reduced power. I use my SWR indicator as an output meter, and adjust the PA tuning for maximum output. This ensures that when the rig is placed in the cw mode the PA will be tuned approximately to resonance. Generally, the PA load control should be set at minimum loading for these initial adjustments.

Now you are ready to switch to the cw mode and complete the tuning procedure. Because you have preset the controls, closing the key should produce some output, and the plate current shouldn't be excessively high. The output power will be fairly low at this point because of the light amplifier loading. Increase the loading until the output reaches a peak, and then readjust the tuning control for maximum output. The two controls interact, so you will need to adjust one and then the other a few times to obtain maximum output. Keep in mind that your objective is to adjust the loading control for maximum output power. If you need to reduce the plate current (to keep it at the recommended level), do so by using the carrier- or drive-level control rather than by reducing the amplifier loading. Be sure to readjust the loading and tuning controls if large changes in drive level are made. After you have gone through this procedure a few times, you should find it easy to tune your rig in a matter of seconds.

If your antenna feed-line SWR is fairly low (less than about 2:1), you're ready to switch from the dummy load to the antenna and to start making contacts. At most, you may need to check the PA tuning adjustment. At higher SWR conditions, the loading control also will require some readjustment. If the SWR is higher than, say, 3 or 4, you probably will want to use the Transmatch.

Transmatch Adjustments

To minimize on-the-air Transmatch tuning, you need to be able to preset the Transmatch controls for the operating frequency and the antenna you are using. That means the controls must have dial scales of some kind. A T-network or an Ultimate Transmatch, for example, will have three controls: two capacitors and an inductor. The capacitor dials should have at least 20 scale divisions. If a rotary inductor is used, it should be equipped with a turns-counting dial. Pieces of paper or notecard taped behind the knobs can be used to make dial scales on units that don't have them. With the Transmatch controls preset, little (if any) on-the-air adjustment should be needed. The exception to this is when you are operating on the lower-frequency bands. Transmatch settings become more critical, or "sharper," as the frequency is lowered. On the 80- or the 160-m band, you'll need several sets of dial readings to cover the entire range.

"Presetting the Transmatch controls sounds like a good idea, but how do I know where to set the controls the first time?" That's a good question. To determine when the Transmatch is adjusted correctly you must have the antenna connected and the power applied. That means on-the-air tuning — something *we would rather not do.* In this case it may be unavoidable, but by doing it properly we can minimize interference to others.

First, become familiar with the operation of your Transmatch by using the dummy load as an antenna. Tune your rig directly into the dummy load. Then, connect the load to the Transmatch output. Using reduced power (no more than 10 watts or so), you now can get the "feel" of the controls without causing QRM. Also, the control settings you find in this manner will serve as good starting points when you adjust the unit with the antenna attached. When you are adjusting a T-network or an Ultimate Transmatch, a good method is to first set both capacitors to maximum capacitance and the inductance to minimum. Then, key the transmitter and adjust the inductor until the reflected power dips to a minimum. Next, adjust the *input* capacitor. Often, you will be able to obtain a match by using just these controls. If a match can't be obtained, decrease the output capacitance slightly and readjust the other controls. You want to use the largest value of output capacitance possible to obtain a match. This will yield the highest circuit efficiency. It also allows the greatest change in operating frequency without a need for Transmatch readjustment.

Once you can tune the Transmatch into the dummy load with ease, you're ready to attach the antenna. Place the controls in the positions you found to be correct for the dummy load, and then key the transmitter. If your feed-line SWR is not extremely high, you should need to make only small changes in the settings to obtain a match. When you're using an end-fed wire antenna, the impedance at the feed point can differ greatly from 50 ohms. In this case, the control setting may not be close to those found for the dummy load, and you will need to start from scratch.

When making on-the-air adjustments (on a clear frequency), never use more power than is necessary to obtain an adequate forward-power reading. A few watts should be more than enough. As you adjust the Transmatch for a dip in the reflected power, don't forget to check the forward-power reading from time to time. Transmatch mistuning can cause the transmitter output to drop. This, of course, makes the reflected power reading fall, even though the SWR is still high. Remember: The SWR is related to the *ratio* of the forward and reflected powers. Should the forward power decrease too much, you will need to readjust the PA tuning control.

There is (almost) always more than one way to do something, and operating an amateur station is no exception. Hopefully, some of the methods and equipment discussed here will help you develop your own techniques — techniques that will add to your operating pleasure and to the enjoyment of those who share the bands with you.

Notes

[1] D. DeMaw, "That First Ham Station — How to Choose It and Set It Up," *QST*, Nov. 1981, pp. 37-40.

[2] G. Woodward, ed., *The Radio Amateur's Handbook*, 59th ed. Newington: ARRL, 1981), pp. 16-31, 16-32.

[3] P. O'Dell, "Julie's Custom Antenna Switch," *QST*, June 1981, pp. 30-33.

Product Review

Conducted By Paul K. Pagel,* N1FB

Japan Radio Company Model NSD-515 HF Transmitter

I recently reviewed the JRC NRD-515 all-wave receiver.[1] So, I was also anxious to review the NSD-515 (matching transmitter in the "515" series). It covers all the amateur bands from 1.8 to 30 MHz, including the WARC bands at 10, 18 and 24 MHz. Featuring the latest technology, the '515 uses digital techniques to control the VFO system, to switch the internal filter networks and even to control an optional built-in antenna tuner!

Features

Ssb, cw and fsk are the operating modes of the transmitter. During ssb operation, an internal speech processor (which uses an rf compressor, a peak limiter and crystal filtering), can be activated to increase the effective "talk power." On fsk, the transmitter can be frequency-shifted directly by a teleprinter or by a set of dry contacts.

The front panel of the transmitter contains all the frequently used controls — VOX GAIN, ANTI TRIP and DELAY; the speech processor COMPRESSOR control, an F-CAL/PTT/XMIT switch (used to key the transmitter manually and to spot a receiver), a multifunction VSWR/REL, POWER/IC/VC meter and switch, and the MODE switch. Both the mike and key jacks are on the front panel. Several controls on the '515 are not too common — a VFO LOCK knob prevents the unit from changing frequency. There is also a power output control knob, which works in *all* modes.

If the NSD-515 transmitter is mated with the NRD-515 receiver, the VFO of either unit can be used to control the pair as a transceiver, or the units may be operated "split" with independent VFO control. One multiconductor cable carries all the VFO signals and T-R switching lines between the receiver and transmitter.

A unique option offered with the unit is a preset, digitally controlled antenna tuner, which fits *inside* the transmitter cabinet! The circuitry consists of a series of L networks, with the amount of inductance controlled by relays, and the capacitance preset by means of trimmer capacitors. The relays are controlled by digital information sent from the BAND switch.

Circuit Features

The MHZ control, in conjunction with the main tuning dial, drives a series of TTL encoders that generate BCD data for each significant portion of the operating frequency — 0.1, 1, 10, 100 kHz, 1 MHz and 10 MHz. The 1- and 10-MHz information is decoded to switch the band-pass and low-pass filter networks, and to latch the various relays in the optional antenna tuner.

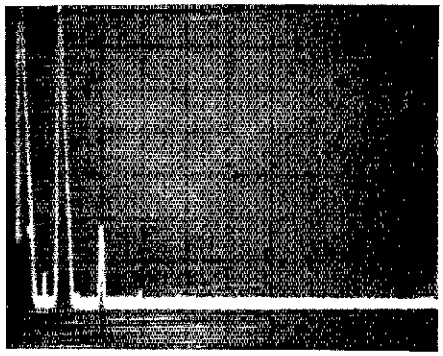


Fig. 1 — Spectral display of the NSD-515. Vertical divisions are 10 dB; horizontal divisions are each 2 MHz. Output power is approximately 100 W at 160 m. The worst-case spurious emission is approximately 52 dB down from the fundamental.

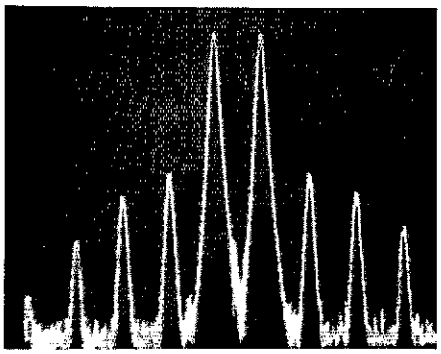


Fig. 2 — Spectral display of the NSD-515 during two-tone third-order IMD testing. The third-order products are 39 dB below PEP, and fifth-order products are about 43 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transmitter was being operated at rated input power in the 20-meter band.

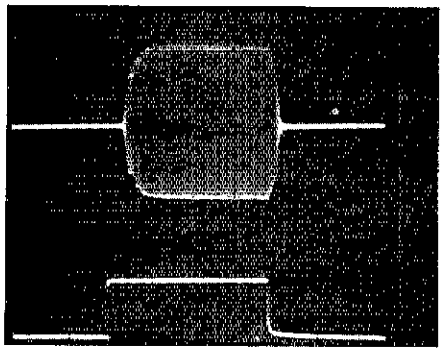


Fig. 3 — Cw keying waveform of the NSD-515. Upper trace is the rf envelope; lower trace is the actual key closure. Each horizontal division is 5 ms. Carrier level adjusted to rated input. Higher amounts of drive caused the wavefront to sharpen.

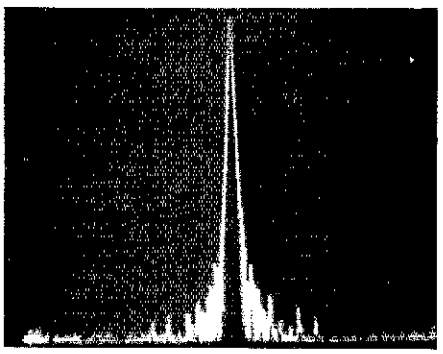


Fig. 4 — Narrow-band spectrum of the NSD-515. Vertical divisions are 10 dB; horizontal divisions are each 500 Hz. Power output is 100 W on 14 MHz. The noise at the base of the carrier is generated in the frequency synthesizer.

Signal generation in the '515 is by means of a combination of analog and digital technologies. The VFO system is entirely digital, using a shaft encoder to drive an up/down counter, which in turn determines the output frequency of the VCO. JRC engineers have done their homework in this synthesizer design: By using a high reference frequency and dividing the final output of the VCO in half, the noise sidebands of the synthesizer are reduced dramatically! The high-frequency oscillator (HFO) uses a bank of crystal oscillators. The frequency is varied by means of a Varicap® diode and the Δ-F (XIT) control. An SN76514 mixer IC is used to combine the VCO and HFO signals — a strange choice, since the '76514 is no longer available in the U.S. (something to think about when considering service).

A solid-state final amplifier is protected by control circuits that "watch" for over-temperature, excessive collector current and high VSWR. The final amplifier heat sink covers a major portion of the rear panel.

Options

Several options are available for the transmitter. These include the internal antenna tuner, an ac power supply, several types of microphones and a hand key. All of the optional items were included with the review unit.

The CFG-515 antenna coupler has a maximum tuning range of 12.5 to 150 ohms, or a 3:1 VSWR in a 50-ohm system. Maximum power rating is 150 W.

Dc power for the review unit came from the NBD-515 ac supply. This unit has a strapping bar that permits the use of 110, 117, 220 or 240-V ac. Dc output voltage is 13.8 at 15 A, *continuous duty*! A very large heat sink covers the entire rear panel of the supply.

Perhaps the most interesting option offered

[1] "Japan Radio Company Model NRD-515 All-Wave Receiver," *QST*, Nov. 1981, pp. 42-43.

*Assistant Technical Editor

Japan Radio Company Model NSD-515 HF Transmitter

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Amateur bands — 160-10 meters, including WARC assignments.	As specified.
XIT range: Not specified.	±600 Hz.
Modes of operation: Ssb, cw and RTTY.	As specified.
Frequency display: Six 1/2" red LEDS.	As specified.
kHz/turn of tuning knob: Not specified.	10 kHz.
Power output: 100 W.	Greater than 100 W.
Spurious suppression: 50 dB or more.	Worst case: 52 dB (160 m).
Third-order IMD: Less than −31 dB, relative to PEP.	−39 dB relative to PEP.
Frequency stability: Within ±500 Hz 5 to 60 min. from power on, ±50 Hz every hour after warmup.	150-Hz drift from a cold start to 1 hour later.
Power requirements: 13.8-V dc, 20 A.	As specified.
Size (HWD): 5.5 × 13.4 X 11.8 inches.†	
Color: Gray and black.	

†mm = in. × 25.4.

with the transmitter is the KY-3A cw hand key. The base of the key weighs almost 1 lb![4] A rubber base on the key prevents slippage on the desk top.

On-the-Air Operation

Through the good graces of the people at JRC, I was able to borrow an NRD-515 receiver to mate with the unit. The package is very neat; only two cables are required to interface the units. One carries T-R control and VFO signals, the other is the receive antenna line. Once the connections are completed, the operator has the pleasure of "twiddling" the 40 switches and knobs on the transceiver!

As with most of my product reviews, I tested the pair in several contests. Contests seem to present the most demanding amateur application for receivers or transmitters. Receivers are subjected to strong local and DX signals, and filtering systems are put through the paces because of very close channel spacing. Transmitters are operated for periods of 24 or 48 hours at a time, which tests their reliability; signal-processing systems for ssb are tested by the amount of "punch" they have in a pileup.

In every contest each piece of gear performed flawlessly. Comments about the transmit audio were nothing but "great," except when the compressor control was adjusted too high. On cw, the waveform is quite hard, but no comments about key clicks were heard (even at a multi-multi effort).

One problem arose on cw — zero beating. The delta-F control on the transmitter is for vernier adjustment of the transmit frequency. The digital display in the transmitter does not reflect the change in frequency for the delta-F control, which makes exact zero beating difficult.

Those of us looking for a new rig would probably pass right over the JRC twins; after all, the product is new, and JRC is new to the U.S. Well, after talking with a few JA stations, I found out that JRC is a very old and respected manufacturer of marine communications equipment. The quality of the equipment speaks for itself. It will be hard to return the review unit to the manufacturer! Equipment prices were not available. — *Gerry Hull, AK4L*

[4]kg = lb × 0.454.

WESTERN ELECTRONICS 998BUA TRAP DIPOLE

Most amateurs are willing to take a small trade-off in antenna efficiency for the convenience of multiband operation with a single antenna and feed line. Trap-style dipoles, verticals and hf-band Yagi beams are found worldwide, and many of them serve well as compromise antennas. The urban dweller or one-tower ham is a typical candidate for some form of multiband hf antenna. If a single feeder (coaxial line) is desired, then a trap (sometimes called a "trapped") type of radiator is of interest. Others prefer a center-fed or an end-fed Zepp antenna, which can be used with tuned feeders and a Transmatch. The inconvenience of a tuned feed line is the need to readjust the Transmatch each time the operator changes bands. Generally, this is not necessary when using a trap antenna.

I needed a multiband dipole for a two-week operation as 8P6EU at Barbados, W.I. Being mindful of the aesthetic quality of the beach area at Coconut Creek Club Hotel on the island, a clutter of antenna wires and feed lines was ruled out. An acceptable approach to the matter evolved from the use of a Western Electronics 998BUA trap dipole for use from 80 through 10 meters. The hotel manager had no objections to the use of the antenna when it was erected in the clear to protect the guests from accidental contact with the legs of the dipole and the feeder cable. It was erected as a sloping dipole over the seashore, with the high end approximately 40 feet above ground and the lower end about 10 feet above the sand.[3] The feed line was brought away from the antenna at a right angle, then routed to the station (a Ten-Tec Argosy).

The Antenna

Western Electronics was kind enough to ship a review unit of the 998 dipole in time for the West Indies trip. It arrived the day before our departure, which provided no time to check the system for performance. A cursory examination was carried out, however, and it became apparent that a serious problem would have to be resolved. Fig. 5 clearly illustrates the potential threat to proper operation: There is no firm electrical connection between the wire sections of the antenna and the traps. Rather, the no. 18 copper-clad steel wire terminates at each end of

[3]m = 0.3048 × ft.

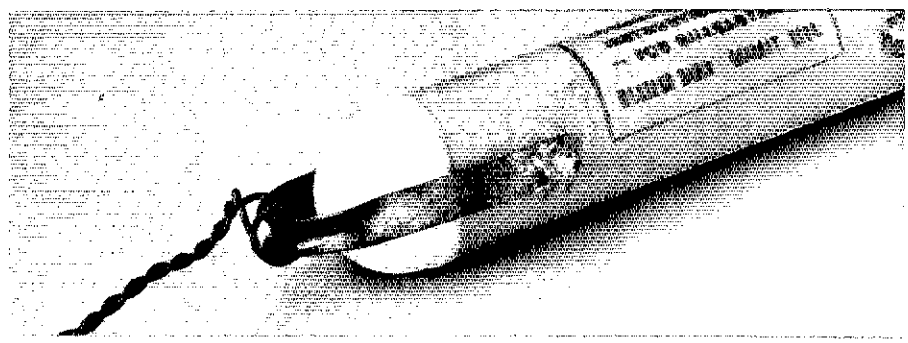


Fig. 5 — Close-up of the unmodified trap. Note the wire ring over the trap yoke, which serves as the electrical connection.

Western Electronics 998BUA Trap Dipole

Manufacturer's Claimed Specifications	*ARRL Test Results*
Antenna length: 104 feet.	Confirmed.
Feeder length: 90 feet.	Confirmed.
Power rating: 1000 W cw, 2000 W ssb.	Tested at 600 W only. No problems noted.
VSWR: 2:1 or less, all bands.	Does not conform on 80 meters (see Table 1).
Feed line: RG-58/U.	Confirmed.
Frequency range: 80 through 6 meters.	80-10 meters confirmed. Not tested on 50 MHz.
Electrical integrity: No claims.	Substandard (see text).
Physical characteristics: No claims.	Good.

Fig. 6 — Modification of the traps to ensure proper electrical connections between the traps and the wire sections of the dipole. Lock washers have been added to the trap bolts. A coating of clear sealant was added to prevent corrosion where the yokes are mounted to the traps.

the traps in a preformed loop, which encircles the metal yoke of the trap. The instructions specify a need to ensure tension of the dipole in order to maintain electrical contact. This is in sharp contrast to fundamental procedures for electrical connections, especially those used in an outdoor environment! I observed also that the no. 6 studs and nuts that held the yokes on the traps were loose and without lock washers — another potential problem in the presence of wind and corrosion. Something had to be done before the antenna was erected in a salt-air locale!

Fig. 6 illustrates the quick preventive measure taken at each of the two traps. A length of stranded hookup wire (no. 22) was used as a jumper connector soldered from the antenna wires to the yokes on the traps. I strongly recommend that the manufacturer adopt this change. It was deemed important also to install lock washers at each of the yoke attachment points, then coat the hardware with noncorrosive sealant (see Figs. 5 and 6). These changes were vital to reliable performance, as salt air (or acid in the smoke and smog of cities) will tarnish and corrode a copper surface in a few hours, causing poor electrical joints. The copper surfaces of the trap antenna turned green during the first 24 hours of use on Barbados!

The 988 has one trap in each leg of the dipole. The traps are resonant in the 40-meter band. The more elaborate Western Electronics dipoles contain traps for the discrete bands of operation, thereby permitting the antenna to function as a half-wavelength dipole on each band of interest. The 998 does not perform in this manner on 20, 15 and 10 meters. It does, however, seem to present a current node for those bands at the feed point.

A 90-ft length of RG-58/U coaxial cable is supplied with the dipole. No brand name could be found on the gray-colored cable, but it was quite flexible and soft, making it easy to route around corners and into the hotel room. I did not perform loss tests on the line (50-ohm load and wattmeter), so the quality of the line is unknown.

Dacron guy line (rated at 300 pounds test) is supplied in two 15-ft lengths — one for each end of the antenna. A built-in lightning arrestor and static-drain resistor is located at the center insulator of the dipole. I sealed the open end of the coaxial cable where it emerges from the center insulator and joins the legs of the antenna; this spot seemed vulnerable to weather effects also. The feed line is terminated at the station end in a PL-259 type of connector.

Western Electronics specifies band coverage from 80 through 6 meters with the 998BUA. I did not test the system on 6 meters. Also, it is rated (guaranteed) for 1000 W on cw and 2000 W on ssb. My strong preference for a feed line at those power levels would be RG-8/U, but I have "pumped" 600 W into RG-58/U and RG-59/U with no ill effects when my antennas had a VSWR below 2:1. But, I have also melted the smaller lines with a 600-W output-power level when a high VSWR existed. This happened during an ice storm in New England. Beware!

Table 1
Measured VSWR Bandwidths

Band (meters)	*Lowest VSWR (MHz)*	*Band Edge (MHz)*	*Band Edge (MHz)*
80	2.1:1 — 3.850	2.9:1 — 3.500	2.5:1 — 4.000
40	1:1 — 7.150	1.8:1 — 7.000	1.8:1 — 7.300
20	1.3:1 — 14.350	1.6:1 — 14.000	1.3:1 — 14.350
15	1.9:1 — 21.450	1.9:1 — 21.000	1.9:1 — 21.450
10	1.7:1 — 28.000	1.7:1 — 28.000	2:1 — 29.700

Measurements were made by means of a Bird Thruline wattmeter, courtesy of ARRL Laboratory Technician Mike Kaczynski, W1OD. Readings on 15 and 10 meters are "apparent VSWR" indications, owing to the effects of the 90-foot RG-58/U feed line. Tests were not performed on 6 meters, although the antenna is rated for use on that frequency.

Antenna Literature

A large collection of tutorial and supporting literature was shipped with the antenna. Some of it made very interesting reading, but other parts caused me concern because of technical misinformation. The misspelled words did not create any problems in comprehending the instruction sheets. Some of the statements are worth quoting:

1) "We have made hundreds of tests and found that when a coaxial feedline is long enough so that it is over one-quarter wave length long electrically at the lowest frequency, the antenna used on the feedline acts as a balun, and the RF currents equalize BEFORE they get to the antenna itself."

2) Concerning how much voltage is on each side of a dipole, the manufacturer recommends "... .or you may prove it yourself, by simply drawing an arc off of each end of the antenna and compairing [sic] both sides while the transmitter is operating and feeding the antenna power *(use a lead pencil)*." Emphasis has been added by the reviewer, for this type of practice can be very dangerous, and it is not recommended. Also, an arc of such magnitude can send a large transient down to the transmitter, thereby posing a serious threat to a solid-state final amplifier stage. It also can cause RFI and TVI.

3) "The traps have zero losses."

4) "Anything above 15 feet will work well." [*Concerning antenna height* — Ed.]

5) "The height above ground has nothing to do with matching the SWR to the feedline, or feedline to transmitter, and it will not increase radiation efficiency of the antenna."

There are a number of similarly "interesting" statements contained in the antenna literature provided by the manufacturer, but we'll save that reading for you when you purchase your dipole.

Performance

I was glad I took a Transmatch and VSWR indicator with me to 8P6 land, for the SWR-protected transceiver I used would not operate effectively into the dipole without my creating a 1:1 condition at the station end of the feed line. This is typical of any well-designed solid-state transmitter that contains a VSWR shutdown circuit for the protection of the PA transistors.

Excellent results were obtained on 80 and 40 meters while using the trap dipole. I was able to work the world on cw with approximately 40 W of output power. Performance on 20, 15 and 10 meters was not spectacular, owing in part to poor daytime band conditions. I solved the problem to some extent by building a 20-meter dipole with tuned feeders, which was also erected as a sloper. It worked quite well on 20, 15 and 10 meters. At times, both antennas

yielded similar signal reports on the three upper bands, but at other times the 20-meter dipole exceeded the performance of the 998 by two or three S units. I attributed the difference to the effective angles of radiation of the two antennas, respective to the time of day and propagation conditions.

Upon my return to the USA, the trap dipole was erected high and clear at ARRL Hq. Table 1 shows the measured VSWR on the bands from 80 through 10 meters. Western claims a 2:1 VSWR (or less) on all bands. I found this to be true on the specified frequencies other than 80 meters. The antenna was exceptionally handy and easy to erect, and was well suited to air travel in terms of weight and bulk. I strongly suggest that prospective buyers of this and similar Western Electronics models of antenna give consideration to performing the same type of "surgery" that I applied. The procedure will negate the occasion for intermittent operation, stray rectification, TVI and RFI.

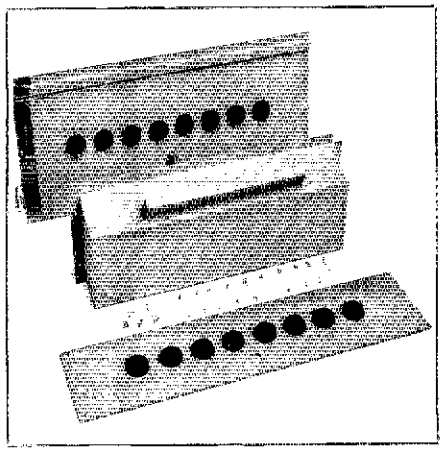
This antenna is distributed by Western Electronics, Kearney, NE 68847. Price class: $80. — *Doug DeMaw W1FB*

THE LAMBDA COAXIAL PORTAL UNIT

☐ Most amateurs have faced the problem of bringing their transmission lines through the outside wall of the house. With a single coaxial cable it's not difficult to do, but as the "antenna farm" grows, so does the problem. If you have five or six feed lines plus a rotator control cable or two, drilling holes through a window frame isn't likely to be a satisfactory solution.

The Lambda feedthrough panel is a *good* solution to the problem. With it you can bring up to eight cables through the wall without worrying about water leaks or drafts. Two 16-gauge aluminum panels, a protective cover and all the necessary hardware are supplied with the unit. The larger of the two panels, measuring 16-1/2 × 8 inches, mounts on the outside surface of the wall.[4] The smaller panel (16-1/2 × 4 inches) is attached to the inside wall surface. Both panels have eight holes, each fitted with a heavy rubber grommet that will accept cables up to 1/2 inch in diameter. The grommets prevent chafing of the feed-line insulation and also seal any unused holes. The protective cover attaches to the outside panel, shielding the holes from the elements. All the aluminum parts are painted with zinc-chromate primer. This produces a highly durable surface that readily accepts finish paints.

[4]mm = in. × 25.4



Installation

Installing the Lambda panel is easy. It is designed to mount between studs located 16 inches apart (center to center). After locating the studs, cut a rectangular hole in both wall surfaces, following the dimensions given in the instructions. Then fasten the outside panel over the hole with six woodscrews. A braided copper strap is supplied for connecting the panels together so that both can be effectively grounded. With the braid in place, pass the cables through both panels and attach the inside panel to the wall. Connecting a ground wire to the threaded stud provided on the outside panel and fastening the protective cover in place completes the installation.

If the cables do not have connectors attached to them, you will be able to pass them through the rubber grommets without removing the grommets from the panel. To install cables fitted with connectors, you must remove the grommets. They can then be carefully cut with a sharp knife and slipped over the cable. The holes in the panels are large enough (13/16-inch) to accept uhf (PL-259) or type-N (UG-21) connectors. With emphasis today on energy conservation, you will want to fill the space around the cables with fiberglass insulation to reduce heat loss.

When carefully installed and finished, the Lambda panel is an attractive, convenient solution to a sometimes difficult problem. The Lambda Coaxial Portal Unit is manufactured by Lambda Vector Corp., P.O. Box 35, Rte. 1, Monterey Rd., San Miguel, CA 93451. Price class: $50 — *George Collins, KC1V*

AVATAR MAGNETICS AV-357 POWER TRANSFORMER

☐ A popular construction project in *The Radio Amateur's Handbook* since the 1981 edition has been the 300- to 400-W 13.8-V power supply. The major stumbling block for would-be builders has been the lack of a commercially available transformer. Despite copious information in *QST* and the *Handbook* on rewinding transformers, many people are put off by the effort and uncertainty involved.

All that's changed with the introduction of the AV-357 by Avatar Magnetics. Ron Williams, W9IVF, designed the unit to the specifications given in the *Handbook* article. Taking special note of the critical requirement for precise rectifier voltage to maintain regulation and minimize dissipation, Ron tapped the primary winding in five places to provide optimum rectifier input. Another use for these taps is to compensate for line voltage variations.

Fig. 3 shows the AV-357, and the accompanying table lists the specifications. Anyone who's seen the photos in the *Handbook* will be impressed that the Avatar unit does the job of the *Handbook* transformers with less than half the volume. The obvious benefits of using a smaller, lighter transformer are enclosure compactness (easier to fit in the shack) and a lighter foundation (no need for expensive 1/8-in. aluminum plate!) The trade-off is that such a compact assembly must be designed to ventilate the transformer and prevent it from heating the already heavily taxed transistor heat sink. In the *Handbook* supply, the transformer ran practically cold at the rated load. The compact AV-357 unit naturally runs quite a bit warmer — not so hot as to take the skin off your fingers, but hot enough to affect any nearby sensitive regulator components. I tested the AV-357 in free air for eight hours using a 400-W load consisting of a parallel bank of five 5-Ω 225-W resistors (I knew they'd come in handy some day!). It's definitely a heavy-duty piece.

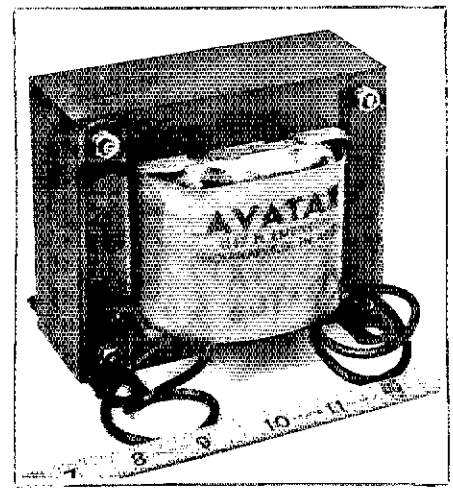


Fig. 3 — The Avatar Magnetics AV-357 transformer, designed for use in the *Handbook* 300- to 400-W power supply.

Avatar Magnetics AV-357 Power Transformer

Manufacturer's Claimed Specifications†

Input excitation: 117 V, 60 Hz
Output voltage vs. load current:

		(100% duty)	*(25% duty)*
Primary tap	*Open*	*20 A*	*30 A*
1	21 V	20 V	19.5 V
2	20	19	18.5
3	19	18	17.5
4	18	17	16.5
5	17	16	15.5

Dimensions: 5-1/4 × 4 × 4-1/2 in.
Weight: 13 lb.

†Verified in the ARRL laboratory.

At 400 W of secondary output, the measured primary current at 117 V was 4.4 A for an efficiency of 77%. The primary magnetizing current was 330 mA, using the tap yielding the highest secondary voltage. All of these tests were performed at 60 Hz. No information is published for 50-Hz operation, and no power generator for that frequency exists in the ARRL lab. (I approached several of the staff audiophiles, but none was willing to subject his amplifier to so severe a test!) However, the designer suggests 20% as a reasonable current derating factor for 50-Hz applications.

The AV-357 removes a significant impediment to the home construction of 13.8-V power supplies for transmitting service. If you don't know why you should build your own supply instead of buying an "accessory" unit for your transceiver, see the *Handbook* article. Avatar Magnetics can custom-wind transformers for any load from 200 to 2000 W. Price of the AV-357 is $35 plus shipping. Avatar's address is 1147 North Emerson, Indianapolis, IN 46219. — *George Woodward, W1RN*

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

LOW-FREQUENCY SQUARE-WAVE PULSES

☐ When you are testing digital circuits the need occasionally arises for a source of low-frequency square-wave pulses. I have found that an electronic keyer and a voltage source connected in series make a suitable source of low-frequency pulses for some applications. Fig. 1A shows the general arrangement.

The dot lever of the keyer is held closed for as long as the pulses are needed. If a wider pulse is desired, the dash lever may be used. The speed control is used to vary the frequency of the pulses. The output of the voltage source is not specified because this will depend on the requirements of the circuit under test. For the TTL family, the pulse height usually needed is 5 V, so a 5-V source would be used if there is no voltage drop across the keyer output terminals. You will need to pay attention to the polarity of the source and of the keyer (if any) and the polarity of the circuit under test. Be sure that the grounds of these devices do not cause problems.

An alternate circuit is shown in Fig. 1B. As shown, the output will be low with the key open. To produce a high logic level with the key open, simply omit the inverter.

If the circuit under test must be pulled to ground potential, this circuit will not work. I did not require this, and the circuit worked well. Keyers that use a relay-switched output may not be suitable for this application because of contact bounce. — *James Herb, W3SHP, Selinsgrove, Pennsylvania*

REMOVING DIRT IN METER MOVEMENTS

☐ I read the item about removing dirt in meter movements by Dean Elkins, K4ADJ, in the June 1982 Hints and Kinks column with much interest. Some years ago I worked in the test-equipment lab of a large electronics firm. We used a method that I think was much simpler to free the many meter movements that became stuck with dirt. It does not require the removal of the armature or pole pieces of the meter.

Obtain some self-sticking paper labels from an office-supply store. These come with the adhesive side on a waxed-paper base. Using a sharp knife or scissors, cut some strips of this material about 1/16 inch wide, and an inch or more long.[1] The labels are a little stiffer than ordinary tape.

Remove the meter case and look through the movement to locate the metal "hairs" that are causing it to stick. Peel the backing strip from a piece of the label and work it carefully through the pole piece. The metal bits will adhere to the paper strip, and can be removed easily. Repeat the process with more label strips until the movement is free. You can test this by blowing gently on the pointer. Reassemble the meter case, and it will be just like new. — *Warren Laufer, K2FG, Buffalo, New York*

FILAMENT INRUSH-CURRENT LIMITER FOR LINEAR AMPLIFIERS

☐ I wanted to protect the 3-500Z tubes and the diodes in my Heath SB-220 linear amplifier from excess current when turning it on. Another goal was to accomplish this without changing the amplifier circuit. I designed and built an external unit housed in a surplus box with a perforated aluminum cover for good ventilation.

My amplifier is wired for 117-V ac operation, but I built the current limiter with possible 234-V operation in mind. Fig. 2 shows the circuit I used. The changes required for 234-V ac use are shown in Fig. 2B.

To use the device, you merely plug the ac line cord from the amplifier into the unit and then connect the line cord of the limiter into a wall outlet. Turn on the amplifier, then switch on the limiter. The amber pilot light comes on and the 3-500Z tubes warm up gradually to a slight glow. In five seconds, the relays close, the green pilot lamp comes on and the tubes reach full operating temperature. — *David Brown, W6NBM, Wildomar, California*

KENWOOD TS-120S CW FILTER

☐ When I installed the cw filter (Kenwood YK-88C) in my TS-120S, I discovered that I could not operate in the cw mode without the filter. Switching to the usb position to receive and back to cw for transmit was an inconvenience I would not tolerate.

*Assistant Technical Editor

[1]mm = inches × 25.4

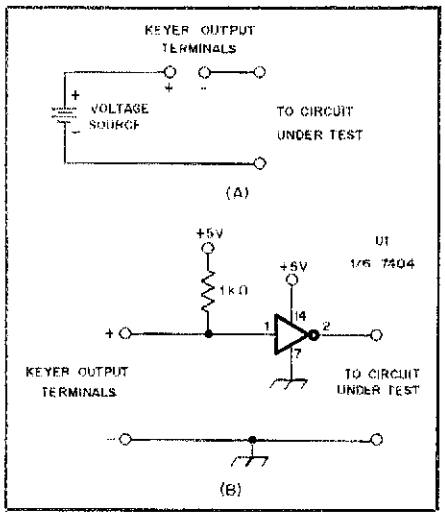


Fig. 1 — Shown at A is a simple method of obtaining low-frequency square-wave pulses. The voltage source should suit the circuit under test. An alternate circuit for use with TTL levels is shown at B. The inverter can be used or not, as appropriate.

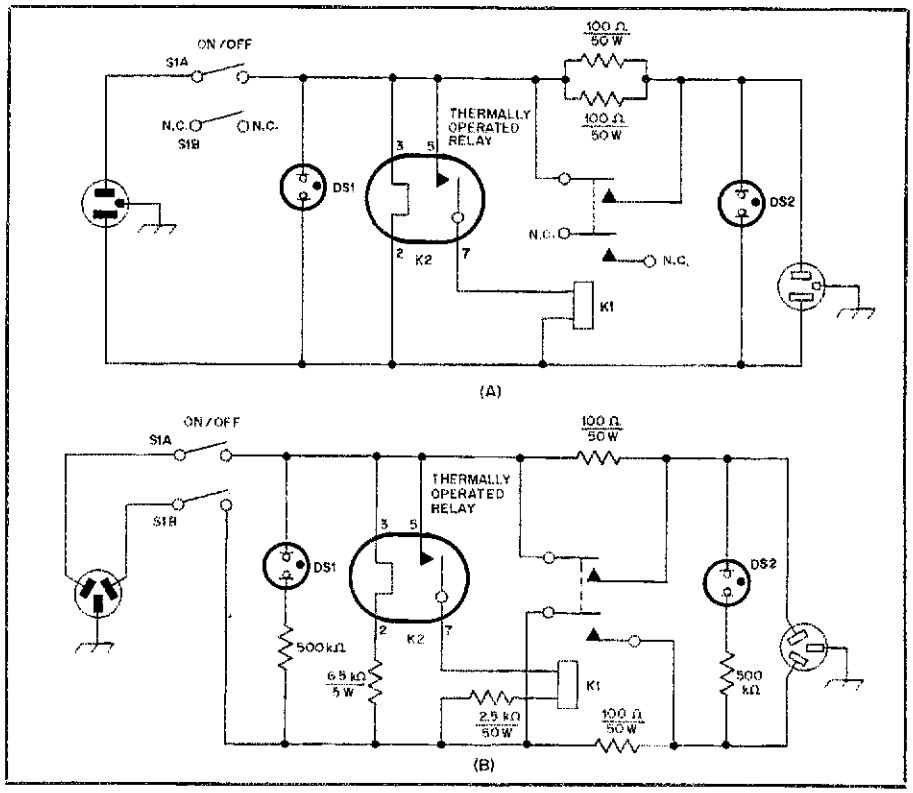


Fig. 2 — The schematic diagram of an inrush-current limiter used to protect the tubes of a linear amplifier is shown at A. A revised circuit for use with an amplifier wired for 234-V operation is shown at B.

DS1, DS2 — Neon pilot lamps: one amber, one green lens. Built-in resistor for 117-V ac operation, such as Radio Shack 272-707.
K1 — 117-ac relay, dpst, 25-A contacts, such as Potter & Brumfield type PR7 AY.
K2 — Amperite time-delay relay, no. 115NO5 (5-s delay); available from Allied Electronics, 401 E. 8th St., Fort Worth, TX 76102, or from the location nearest you.
S1 — Dpst switch; 25-A, 234-V contacts. Octal tube socket for K2.

The problem could be solved by installing a dpdt switch, but I did not want to drill holes in my new radio. The noise-blanker switch is a dpdt unit. I never found the noise blanker to be effective, so I decided to use that switch.

A small plug, labeled no. 29 on the i-f board, must be removed. A pair of leads are soldered to the NB switch common positions and connected to this plug (Fig. 3). I forced scrap resistor leads into the plug terminals. A pair of leads should run from the outer (off) switch position to the SSB/SSB position on the noncomponent side of the pc board. A third pair of wires connect from the in (on) switch position to the SSB/CW position on the pc board. Now the NB switch stands for "narrow band." Owners of other rigs with similar shortcomings may benefit from my solution. — *Don Hayford, NØBPI, Aurora, Colorado*

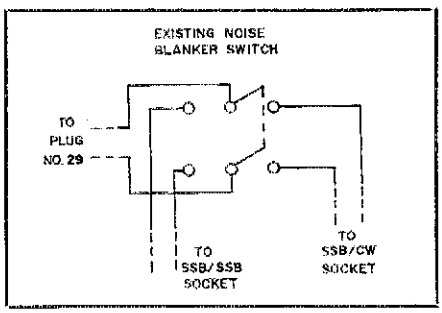


Fig. 3 — Switch-wiring diagram showing how to provide selectable wide- or narrow-bandwidth filters in the cw position.

BATTERY-PACK SAFETY FOR HAND-HELD RIGS

I recently noticed a small rust spot under one of the screws on the top of my ICOM BP-3 battery pack. I was concerned about the possibility of battery leakage and deterioration. When I opened the case, I found damage to the insulation on the wires, and one wire was burned off. The open lead was between one of the screws on the bottom of the pack and an internal NiCd cell. Since I never use a drop-in charger, the problem had probably gone undetected for some time.

I believe this failure was caused by the two bottom contacts being shorted. This could occur if the unit is carried in a pocket with keys, or by contact with any conducting material. I modified my battery packs by placing a diode in the line between the screw and cell to prevent a recurrence of a short circuit. Alternatively, one or both contacts could be insulated with electrical tape or a dab of silicone sealer. — *John E. Noel, W4UGV, Huntsville, Alabama*

☐ I was concerned about shorting the contacts on the top of an extra battery pack for my ICOM IC-2AT. I solved the problem by cutting a credit-card-thick piece of plastic to fit into the slide connector. A 15/16 × 2-1/4 inch card fits nicely. Whenever I change batteries the plastic cover is transferred to the unused battery. This prevents the cover from being misplaced. I believe other radios use a similar battery-pack connection arrangement, so my idea may be adaptable to other hand-held rigs. — *Tom Karnauskas, N9BWY, Cary, Illinois*

LINE-VOLTAGE ADJUSTER

☐ A few years ago, I was living in a place where line-voltage regulation was not very good. In the evening, when there was time to operate, line voltage would sag. Frequently, the sag was bad enough to cause the power supplies in my equipment to lose regulation. That in turn caused VFO drift. I was, even at that, surprised by the first report of chirp on my signal; the second chirp report helped me decide to cure the problem. An autotransformer to control station voltage would have been nice, but I didn't have one that was suitable for 10 A. Some filament transformers and a 1.5-A autotransformer were all I could find for possible use.

I solved the problem by building a circuit similar to the one in Fig. 4. The secondary of a filament transformer, T2, is wired in series with the high side of the ac line. All current to the load flows through the T2 secondary; therefore, it must have a heavy enough rating to carry that current. Depending on phasing, the secondary voltage in T2 will either subtract from or add to (BUCK or BOOST) the line voltage. S1 reverses the phasing of T2. T1 allows smooth control of the amount of BUCK or BOOST. — *Chuck Hutchinson, K8CH, ARRL Hq.*

CLIPPERTON-L 60-Hz HUM

☐ The January 1982 Hints and Kinks column offered a solution to the problem of 60-Hz hum caused by the Clipperton-L power supply. That solution places an additional 1.6-A load on the filament winding. My solution to this problem reduces the filament-winding load.

I had a spare Hammond 166G6 filament transformer (with center tap). Fig. 5 shows how I connected this transformer in parallel and in phase with the original filament winding. D1 connects the center tap to ground, and C44 is used to bypass any rf. The primary winding is connected to terminals 3 and 4 on the power-network terminal board. — *W. H. Galpin, VE4AB, Winnipeg, Manitoba*

REWINDING AUDIO TRANSFORMERS FOR 60-Hz USE

☐ I needed a power supply for a transistorized project. Since I had a few "boat anchors" from the vacuum-tube era, I picked out a transformer to be rewound. After checking the cross-section and window area of the core, I used tables to select the primary and secondary wire sizes for the required power. *The Radio Amateur's Handbook* supplies information on rewinding transformers.

When the transformer was rewound, I connected a voltmeter to the secondary and plugged in the line cord. In 60 seconds it would have fried an egg! I tried rewinding twice the number of turns on both the primary and secondary, half the total turns, and doubling the wire size on both the primary and secondary. Nothing seemed to help. Finally, I discovered that I had rewound an audio-transformer core. The moral is: Don't try to use one of these for a 60-Hz power transformer. — *Glenn Knox, W7ERS, Kent, Washington*

KENWOOD TS-830S "TALKBACK"

☐ Some Kenwood TS-830S transceiver owners have experienced transmitter "talkback." This quirk may be manifested during transceiver operation, with or without an amplifier. It may be eliminated by adding an rf filter to the receiver audio power amplifier.

Cut the 12-V supply-line foil between R47 and C28 at IC Q4 on the af unit (X49-1140-00). A 1-μH choke is bridged across the gap. One lead of a 0.01-μF disc-ceramic capacitor is soldered to Q4, pin 1; the other lead is attached to a solder lug secured beneath the IC mounting screw on the heat sink. That's all there is to it! — *Paul K. Pagel, N1FB, ARRL Hq.*

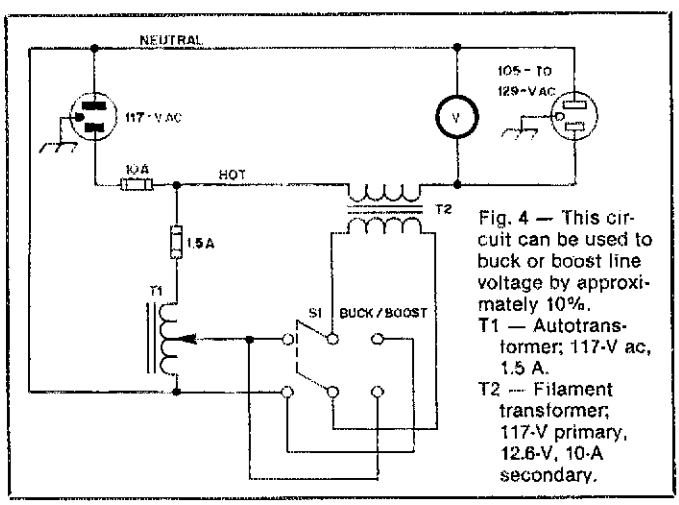


Fig. 4 — This circuit can be used to buck or boost line voltage by approximately 10%.
T1 — Autotransformer; 117-V ac, 1.5 A.
T2 — Filament transformer; 117-V primary, 12.6-V, 10-A secondary.

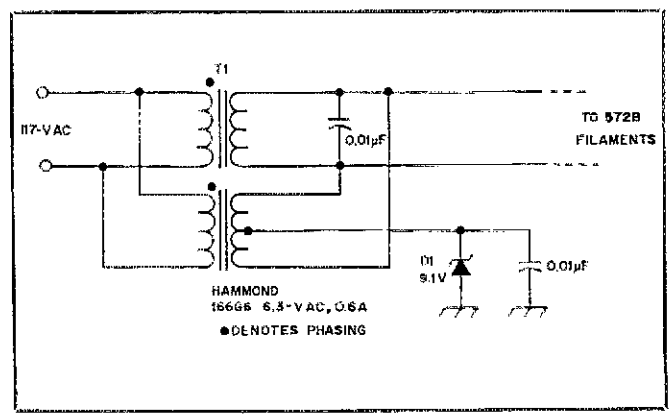


Fig. 5 — Schematic diagram showing how a center-tapped filament transformer can be connected in parallel with the one in a Clipperton-L to eliminate 60-Hz hum.

Technical Correspondence

Conducted By
Dennis J. Lusis,* W1LJ

ANTENNA CURRENT DISTRIBUTION

☐ McDonald's article, "An End-Fed Extended Double Zepp for 2 Meters" (June 1982 *QST*), is an excellent one. However, I believe the current distribution diagrams for the double Zepp and extended double Zepp (Fig. 1) are incorrect.

Since it is necessary for the current to reverse every 180° (or half wavelength) of its travel, currents in the transmission line of the double Zepp must be the reverse of that shown. Likewise, the current in the center sections of the extended double Zepp must be the reverse of that in the outer two sections of the antenna. Also, currents cannot flow in the same direction on opposite sides of the transmission line. Please refer to Fig. 1 for what I believe to be the proper representation of current flow in these antennas. — *Floyd X. Passmore, W7KLE, Beaverton, Oregon*

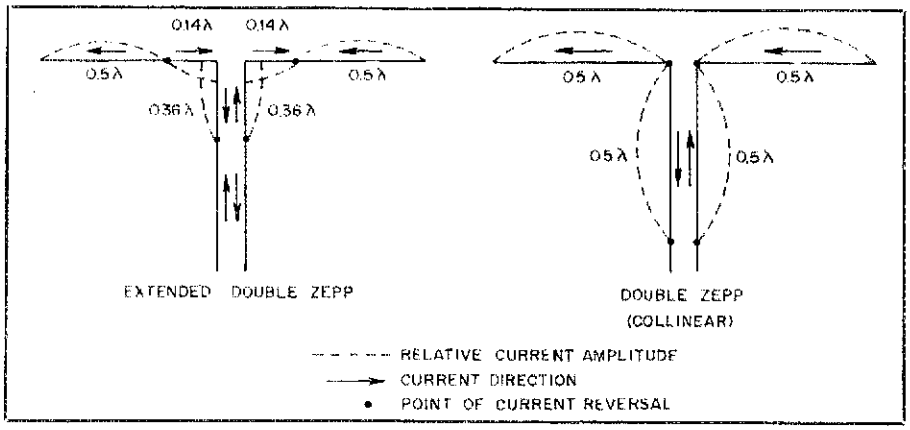


Fig. 1 — Corrected current distribution for the antennas described by Passmore.

PROBE POLARITY CONFUSION

☐ Doug DeMaw's article in December 1981 *QST* on the basics of equipment servicing raises a very important issue. In the OHMS position, the probe polarity is usually reversed between VOMs and VTVMs. In the VOM, the red terminal almost always has the negative voltage. In the VTVM, red is, indeed, positive.

Some VOMs have a polarity-reversing switch. My experience has been that these units do have positive voltage on the red jack when the unit is set for positive polarity. Your best bet is to follow Doug's advice: "Make certain that a positive potential does, in fact, exist at the positive output jack." — *Frank Dukat, K6NL, Los Altos, California*

HENTENNA, OR SKELETON SLOT?

☐ In the February 1982 issue of *QST*, Sugihara, JJ1UMS, describes the "Hentenna." After building one for 145 MHz, I noticed that it bore a striking similarity to a skeleton-slot radiator! Chapter 7 of the *RSGB VHF/UHF Manual* verified this. The skeleton-slot dimensions given there vary slightly from Sugihara's design. The height of the rectangular loop in inches is 6740/f(MHz),[1] and the width is 2250/f(MHz). As with the Hentenna, the feed point should be near the center of the vertical legs. Using the above formulas, feed-point impedance is given as 72 Ω, and a delta match is recommended.

In Europe, the skeleton slot (or Hentenna) is very popular as a driven element in stacked Yagi arrays. One set of parasitic elements is positioned parallel with the upper horizontal section of the loop, and one set with the lower. This configuration allows a pair of stacked Yagis to be fed with a single feed line, and eliminated the need for a phasing harness. Commercial versions of this antenna, utilizing stacked 8-over-8 element Yagis, produce a theoretical gain upwads of 13 dBd. Perhaps North American amateurs will recognize the Hentenna as an alternative to the driven-element systems they are presently using. —

[1]mm = in. × 25.4.

*Assistant Technical Editor

Thomas D. Feise, DC6XT, Oberhausen, Federal Republic of Germany

W1VD FETVOM IMPROVEMENTS

☐ The FETVOM described by Jay Rusgrove, W1VD, in March 1978 *QST*, and subsequently included in the ARRL *Handbook* (1982, p. 16-5) is a terrific instrument. But I had some problems, and the solution of these, along with some modifications, may interest others.

In the original article, Rusgrove cautions against using anything except MPF102s. Since I live in the "boonies," access to these was restricted, so I had to be content with Radio Shack FETs, not all being suitable. The problem was twofold: poor matching and frequent failure. I came to the conclusion that the failures were because of possible design conditions in the ohms mode, which could provide higher voltage to the gate of Q1 than was furnished to its drain, particularly at turn on (S1). I believe the Zener diode, D1, was intended to prevent this, but in my case it did not.

I made two changes and one substitution. The latter was to use 2N3821 FETs (RS 276-2028), which are rated for 50 V_{dss} and also provided an acceptable match. The first of the changes was to move the voltage supply line from the high side of the 100-ohm resistor connected to the two drains, to the low side (or drain connection point). This makes it impossible to get more voltage on the gate of Q1 than on the drain. And second, by connecting an NC push-to-open switch across D1, the lead to the gate of Q1 (in the ohms function only) is grounded while the meter is idling in the OHMS position and/or while ranges are being changed. Then, when ready, push the switch and take the reading. After several months, no more failures.

As with many construction projects, one thing led to another, and when I discovered nonlinearity in the ohms readings, albeit small, a study of the problem led to several other changes. The first was to increase B1 to 12 V from a regulated supply, then to increase the values of all the resistor-bank arms substantially and thereby read a lower voltage across RX, which corrected the nonlinear hump in the middle area of the meter scale. The meter? I changed it also, from the 50-μA movement, to a 3-1/2 digit millivolt meter I had (it uses a 7107 with a ± 5-V regulated supply), and thus could accomplish two things: digital readout and increased sensitivity. This meter was buffered when used in the ohms mode by means of two 500-kΩ resistors, one in each lead with the meter positive terminal to the Q1 side. This made it possible to extend the range of the ohmmeter with excellent linearity for all measurements. Using the 200-mV range, the upper limit goes easily beyond 1 megohm, and a new lower range (by adding one switch position to S3) will read fractional ohms (in increments of tenths from 0.1 ohm) up through 10 ohms. The resistor-band arms are, starting with the lowest range: 8 k, 12 k, 120 k, 1 M, 7.5 M, 75.3 M, respectively. These values afford substantial range overlap. The range markings on S3 are: 10, 50, 500, 5 k, 50 k, 1.2 M, respectively. Use fixed-value resistors in series with the pc controls for calibration. To make operation of the zero set easier and less critical, I used a 5-kΩ potentiometer with a 22-kΩ fixed-value resistor on each side, in place of the R11 originally shown. Now, when the meter face reads 103 ohms, it is 103 ohms without any interpolation.

One little-stressed advantage of digital readout is freedom from upper and lower needle-swing limits, as experienced in analog meters. Where linearity of the instrument design (as in this case) extends reasonably outside the range markings, the reading is still possible and accurate, even though it may be 25% or more beyond the marked range limits.

Another addition uses a four-position function switch (S2) for added capability to the package. September 1978 *QST* carries a lead article by Douglas A. Blakeslee, N1RM, for the construction of a capacitance meter. His unit fits right into the package. The change here was the use of the digital readout, only this time the 3-1/2 digit meter is used in its 2-V range, and the regulated 12-V supply is switched over here. Again, the convenience and directness of digital readout is a big plus. Readings are

directly in microfarads, and the range switch can show the appropriate left-hand zeros to add to the reading.

Obviously, there is a negative side to this meter change: a ± 5-V supply and a + 12-V supply, both regulated, are required. This adds to the combination instrument when used primarily as bench test gear. This is no handicap. I feel the greatly increased accuracy, range and ease of reading the four-function combination instrument outweighs any disadvantage... — *Gilbert Earle, Cool, California*

VERSATILE SWITCHED-CAPACITOR FILTER WITH AUTOMATIC LEVEL CONTROL

☐ Unless you are using an ultra-modern receiver with both i-f band-pass and "tail-ending" filter schemes,[1] maximum selectivity is not being achieved. A switched-capacitor filter (SCF) is an economical answer to analog active filters, which require op amps with critical supporting components. By comparison, the SCF cutoff frequency is simply determined by a digital type of clock generator that controls the sampling rate and, hence, the passband.

The SCF I'm describing is a 10th-order, elliptic type of low-pass filter, which exhibits a ripple in the passband of less than 0.6 dB pk-pk. The stopband attenuation is greater than 60 dB using a single, inexpensive IC as the filter element. Fig. 2 shows the typical "brick-wall" band-pass characteristics of an elliptic filter, and is representative of what to expect from the SCF.

Because the SCF is intended for use in radio communication applications, it must accomplish low-pass filtering from at least 400 to 2400 Hz, allowing coverage of both cw and ssb emissions. In addition to audio filtering, it was deemed worthwhile to provide an automatic level control (alc) feature to protect the operator from uncomfortable variations in audio volume. These may be caused by sudden and unpredictable changes in propagation, or the presence of interference. The filter and the alc sections provide a useful measure of circuit gain, which makes the system useful when it follows a product detector, in which audio levels are low. The SCF is shown in Fig. 3.

The alc circuit consists of a single NE570 IC, which is used as a high-dynamic-range compressor and sidetone monitor. This circuit provides a gain inversely proportional to the receiver input level, so that a 20-dB *decrease* in input level will produce a 20-dB *increase* in stage gain. The system will maintain an output level of ± 1 dBm for an input change of + 14 to − 43 dBm at 1 kHz. The alc also features a fast-response characteristic without the pumping usually associated with other types of audio compressor circuits. An additional feature: the NE570 is internally biased for a quiescent current of only a few milliamperes, which conserves power.

A single CD4047AE monostable multivibrator is used in the pulse-generator section of the circuit. R1 controls the sampling frequency, which in turn governs the band-pass characteristic. Using the R and C values shown, the pulse generator will cover a range of approximately 9.5 kHz to 60 kHz in pulse rate. When applied to the clock input of the MC14414-2, this pulse rate will produce a cutoff frequency range from 400 to 2400 Hz. If the reader wishes to develop his or her own band-pass range, the filter cutoff frequency can be determined by the following equation:

$$F_{co}\,(Hz) = \frac{F_{clock}\,(Hz)}{24.22}$$

Since only one frequency-control mechanism is required, the CD4047AE may be located away from the remainder of the circuit. The clock output from pin 13 can be routed via shielded cable to pins 10 and 11 of the MC14414-2. R1 can be mounted on a front panel.

Power-supply requirements for the SCF are minimal. Any well-filtered and regulated dual 6-V supply capable of delivering 100 mA will suffice. — *Richard Schellenbach, W1JF, Reading, Massachusetts*

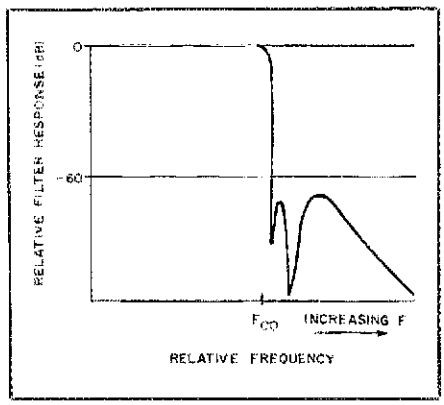


Fig. 2 — Relative frequency-response characteristic for the switched-capacitor filter (SCF).

[1]W. Hayward, "A Competition-Grade Receiver," *QST*, March and April 1974.

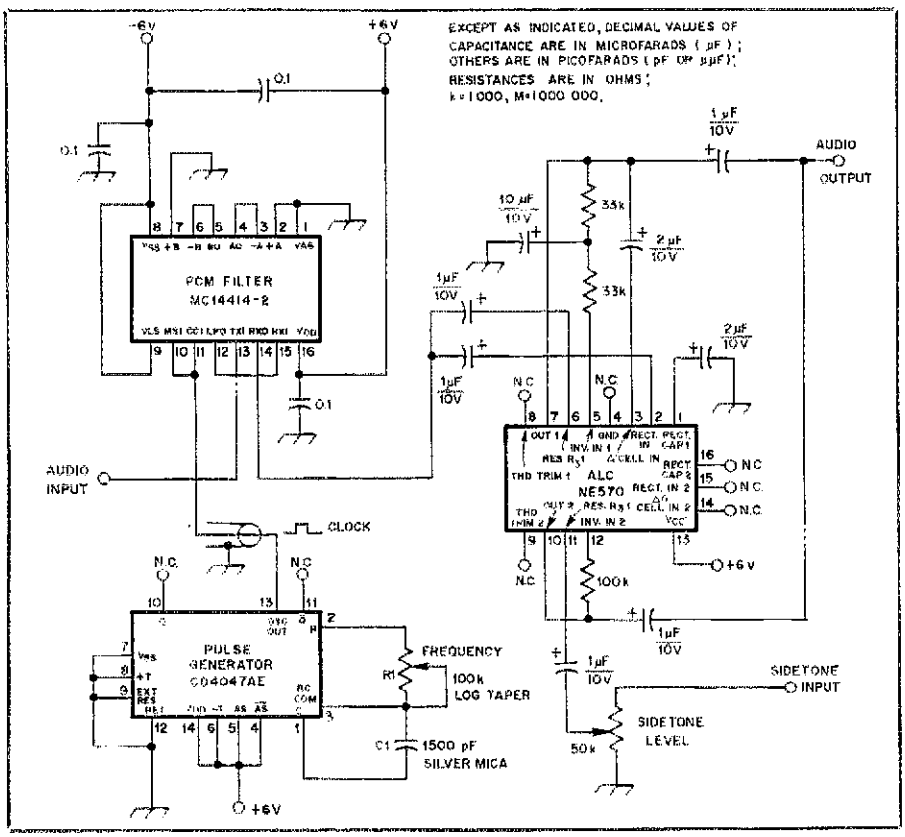


Fig. 3 — Schematic diagram of the SCF.

Feedback

☐ Greg McIntire, AA5C, has found an error in the 110-baud ASCII software for his "Microprocessor-Based RTTY Speed and Code Converter" (Jan. and Feb. 1982 *QST*). Line 175 of the listing should read: RXBTCNTL.D = 8; /*# BITS FROM TTY*/

Author McIntire also informs us that etched circuit boards for the converter are now available from him. Contact him at the address given in the *QST* article for details.

☐ The price of the ICOM PS-15 power supply and the corporation address are shown incorrectly in the August 1982 Product Review of the ICOM IC-720A HF Transceiver. The correct price class of the PS-15 is $150, and the correct address is: ICOM America, Inc., 2112-116th Ave., N.E., Bellevue, WA 98004.

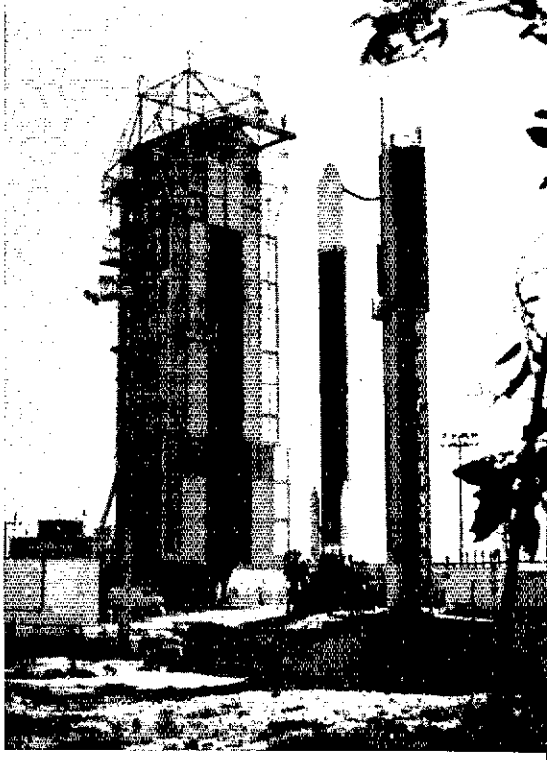
☐ The following corrections should be made to the information contained in "Build a Microprocessor-Controlled L-C Meter That Sends Morse Code," September *QST*. On page 15, Table 1, delete the second decimal point following the zero in both software versions of the character set. Add an apostrophe (') to the Standard Software set. In the first column, page 17, delete the overscore over ALE. In Fig. 3, delete the 1% P designation for C10. Also, the left side of R1 should be shown connected to U4, pin 3, not to the + 5-V line.

☐ Dick Stroud, W9SR, points out an error made in reproducing Fig. 3 of "Explore '220' with this State-of-the-Art Transverter," which appeared in August 1982 *QST* (p. 14). The 1.2-kΩ resistor just above U1 should not be connected to ground.

The UoSat Story

A behind-the-scene look at the final checkout of UoSAT-OSCAR 9, Britain's first amateur spacecraft.

By Bernie Glassmeyer,* W9KDR



NASA's Delta launch vehicle awaits final countdown. In a few hours, UoSAT-OSCAR 9 would be orbiting the earth. *(NASA/USAF photo)*

It was a cool morning in the Lompoc Valley the day I arrived from Los Angeles. This was the day I had looked forward to for three years, my first look at the first British OSCAR. It was September 1981, and the California farmers were in the fields all around us over the last 10-mile stretch of our journey to Vandenberg Air Force Base, near Lompoc. One would not know that among this rural beauty of vegetables and flower fields was the Western Test Range for the NASA/Air Force satellite launching facility. The only thing that seemed out of place was a large, white satellite-tracking antenna in the distance.

"That's it!" I said aloud. "That's Building 38, NASA's Spacecraft Laboratory." It had been 3-1/2 years since my last trip here, for OSCAR 8's checkout. It was easy to recall the experience and, at the same time, feel the excitement surrounding this new satellite that had just arrived with the University of Surrey launch team. (UoSAT, naturally, is named for the British university that lent staff and facilities for the project.)

Memories of parts of the OSCAR 8 checkout were easier to recall now. One in particular rushed back as I parked near the large hangar doors of Building 38: Suddenly, it was February 1978. Six security guards armed with machine guns and attack dogs had one of the AMSAT photographers "spread eagle" against the hangar door. "You have the right to remain silent," one of the guards said as he read him his rights.

"He is being arrested; my God, what's happened?" I asked. None of the guards would say anything, and it was not until later that we found out this person had been overheard innocently mentioning the details of the upcoming OSCAR 8 launch on his 2-meter radio while driving through the security gate. The military has jurisdiction over civilians on Vandenberg, and they considered this a classified launch. That evening all was back to normal, but we didn't speak much about the upcoming launch after that, especially on the radio.

A Once-in-a-Lifetime Experience

Inside Building 38 are two limited-access spacecraft checkout areas called clean rooms. Occupying one of the rooms was the large, 958-lb traveling companion of UoSAT, the NASA/Ball Aerospace Solar Mesosphere Explorer, the mission's primary payload. This satellite carries five instruments to monitor the ozone, minor atmospheric constituents, temperature, water vapor and the amount of incoming solar radiation. These help scientists determine the role each plays in ozone production in the mesosphere, the region extending 20 to 50 miles above the earth.

The other clean room, the one that had housed OSCARs 6 and 7 years before, now contained UoSAT, Great Britain's first Amateur Radio satellite. After meeting the UoSAT launch crew and renewing old acquaintances, I was formally introduced to UoSAT-OSCAR 9. Very few people ever get the chance to see an actual satellite. It's a once-in-a-lifetime experience. A feeling of quiet respect comes over you as you first view it. It's more than a carrier of electronics, a man-made object or a payload of a launch vehicle; it's a future star of the heavens, soon to be hurled into space. Though likely never to be seen again, it will be heard — by amateurs all over the world.

No two people did more to overcome the mountain of obstacles, and bring this satellite to launch, than did Dr. Martin Sweeting, G3YJO, UoSAT Project Manager, and his wife Christine, G6APF. Dr. Sweeting and his team of dedicated professionals led the way, leaving a challenge to those who will follow to continue the efforts and achieve the goals of the Amateur Satellite Service.

Dr. Sweeting worked with Jan King, W3GEY, AMSAT vice president of Engineering, and Gordon Hardman, ZS1FE, South Africa's AMSAT engineer, to help the UoSAT launch team complete the system checkout. Others working as part of the team were: Ian Ferebee, G6BTU, project technician; Tony Jeans, G8ONO, microcomputer specialist, and Dr. Lui Mansi, telemetry systems, both University lecturers; Jerzy Slowkowski, power systems; and Dr. Paul Traynar, CCD (Charged-Couple Device) camera specialist. After thousands of hours of effort, this special team spent the last few hours in California readying the UoSAT spacecraft for launch.

G3YJO described the UoSAT mission's purpose as, primarily, to stimulate interest in the space sciences in schools, colleges and universities. Traditional amateur spacecraft such as OSCARs 6, 7 and 8 have flown transponders, which make it possible for hams to have two-way satellite contacts. The UoSAT satellite, however, would be strictly experimental and scientific, and would not have transponders.

Many of the experiments would be the first of their kind, and offer Amateur Radio operators and students an opportunity to take an active part in the space sciences. The experiment modules will provide propagation studies with phase-reference hf beacons on 7, 14, 21 and 28 MHz; particle radiation counters; a three-axis, multirange, flux-gate magnetometer; and beacons operating on 2.3 and 10.4 GHz. The education experiments include

*OSCAR Program Manager, ARRL

an earth-pointing slow-scan TV camera and a synthesized-voice telemetry system. Future systems experiments will test a two axis, earth-pointing, gravity-gradient spacecraft stabilization system and an onboard microcomputer.

Some of the spacecraft systems developed last-minute problems that made the checkout task even more difficult. One major problem was a "dark spot" on the video monitor from the CCD Camera imaging unit. Though a backup unit was available, the time required to disassemble the spacecraft and install the replacement unit would be too long. This prompted one of many decision-making meetings that the launch crew held during the checkout.

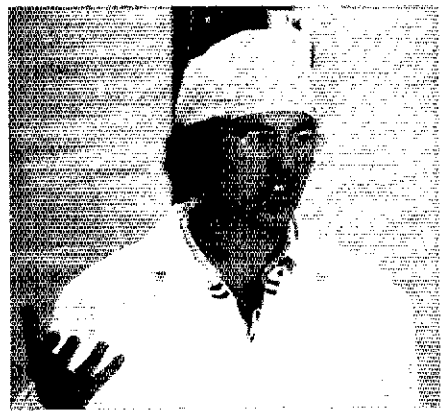
Another problem was a capacitor failure in the power-regulator system. Where do you find a special capacitor that is classified as "space qualified hardware" at 9 P.M. on a weekend? John Fail, KL7GRF, from Project OSCAR, came up with the part only after scouring the West Coast electronics industry.

It was easy to sense the enthusiasm that had been building since the start of the UoSAT project over three years ago. No matter how gloomy or demanding the problems were, someone was there carefully calculating the answer. Some of the meticulous thermal wrapping of exposed components was ordered redone. It had to be right — no exceptions; you don't get second chances in the satellite business. You might expect that the team would become weary or irritable, but they always bounced back and continued with even more enthusiasm each day. The only unhappiness observed was during the break periods when coastal clouds prevented the crew from getting a California tan to take back to England. When the sun did show through, most of the crew took their breaks less the surgical cap-and-gown uniform of the day. Part of the daily routine was for someone to pick up lunch. The crew could have eaten in the Air Force Officer's mess, but that would have required everyone to leave the spacecraft. Besides, it was the same distance to Wendy's in Lompoc. The attraction of "Wendy's burgers" and "Frosties" was too much for the British to resist.

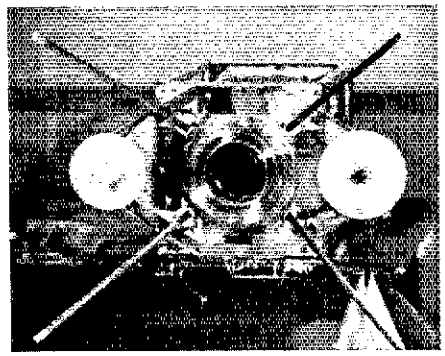
Checkout

The checkout of the various UoSAT systems schedule was on time with the NASA schedule, but it required the crew to work 24-hour shifts. One of the most interesting systems was the synthesized-voice experiment. This electronic "male" voice was very natural, with a 120-word vocabulary. After repeating the numbers and alphabet, the "chip" would start with its words. Then, a "female" voice would say one word, "Digitalker," the name of the National Semiconductor chip. Everyone was anxious to hear the satellite speak for the first time.

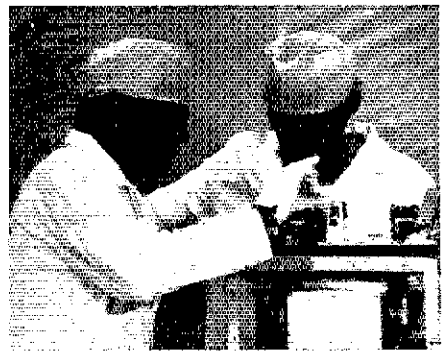
In another part of the laboratory, we monitored the hf beacons on an old Drake 2B that an AMSAT volunteer had lent for the test. "Again, Ampere, And, At . . .," the electronic voice echoed loud and clear from the speaker. The memory can be computer programmed by a ground-control station to provide messages as the satellite orbits the earth. The spacecraft telemetry can also be programmed to use the Digitalker. You won't have to know Morse code to monitor this bird; Radio Shack may have a talking clock, but we have a talking satellite! When the Digitalker was first turned on, I asked Dr. Sweeting why the voice didn't have a British accent. He quickly replied with a grin, "Oh, that would have cost a few more pounds."



Project Manager Martin Sweeting, G3YJO, addresses the launch team at one of the many meetings of the team during checkout. *(photo by Sharon O'Brien)*



The bottom of the spacecraft, showing the CCD camera (center), four whip antennas for 2-m and 70 cm, a 2.4-GHz antenna (left) and a 10-GHz antenna. *(photo by W9KDR)*



AMSAT's Jan King, W3GEY (left), explains some of the "tricks of the trade" to Gordon Hardman, ZS1FE. *(photo by Sharon O'Brien)*

The CCD Camera imaging experiment is the first of its kind. Most of the electronics were breadboarded in the spacecraft testing laboratory. The CCD receiving apparatus was set up in an adjoining room, so the signals received were actually transmitted from the spacecraft. Dr. Paul Trayner designed the circuits, most of which stemmed from his research and were used for the first time. The CCD design would permit a high-resolution picture of much greater detail than we can see on our home TVs. These images could be enhanced to a greater degree using memory storage and the microcomputer. The dark-spot image that developed during the checkout could be taken out electronically by the computer. According to Dr. Traynar, the only time the dark spot would appear would be when the camera was sending live images. All other images could be cleaned up by the computer.

Computer Systems

The UoSAT satellite's nerve center is its microcomputers. Tony Jeans, G8ONO, who teaches courses in electronics, telecommunications and microprocessors at the University, was responsible for their checkout. The primary computer, based on the RCA 1802 microprocessor, has 8 parallel ports, 2 serial ports and 16k bytes of RAM linked with an additional 32k bytes in the Video Display Experiment. The parallel ports handle the telemetry sensors, the speech synthesizer, the radiation magnetometers and the command systems. The serial ports carry redundant data and pass data for the beacons. The software is written in IPS, a language developed by Dr. Karl Meinzer, DJ4ZC, from AMSAT-DL. This flight would help in evaluating the IPS software prior to its use on Phase IIIB. The secondary computer is based on a Ferranti 16-bit F100L microprocessor, and has 32k bytes of CMOS static RAM. It is configured as a minimal system with serial interfaces to the telemetry and command systems.

The software for both computers is loaded via command link from earth stations, and can be modified in flight. [As this is written, in July, the spacecraft suffers from a malfunction that occurred during an up-load of computer information. The result is that both the 2-meter and 70-cm beacons are on constantly, and the spacecraft is unable to receive ground commands. After several unsuccessful attempts by Amateur Radio moonbounce experts to solve the problem, SRI International in California was asked to attempt to command the satellite with their 150-foot dish. Dr. Sweeting is optimistic

that this attempt will be successful. When this has been done, the Surrey command station will complete the spacecraft stabilization, deploy the 50-foot magnetometer boom and complete the in-flight testing. — Ed.]

The most important information link between an orbiting spacecraft and earth is telemetry. This information can be sent in many different ways. Dr. Lui Mansi was excited about using the telemetry information in his classroom work. He teaches electronics, digital and logic communications to graduate students at the University, and started developing the telemetry system more than 2-1/2 years ago. At that time, it was decided to use a "hardwired system;" that is, one that continues to operate at all times so the spacecraft condition can be monitored constantly.

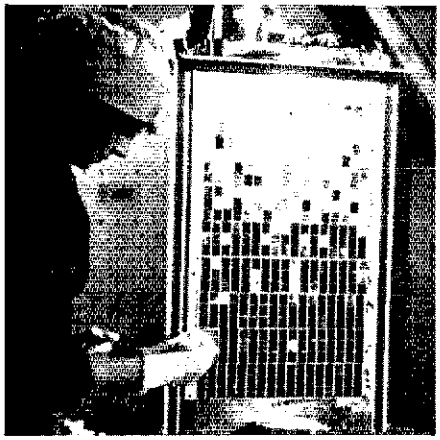
The telemetry system consists of 60 channels that continually check 45 different status points at the same time. The electronic "heartbeat" is contained in three small boxes that can produce ASCII, Baudot, Morse and synthesized voice. Many frames of telemetry were copied on a Drake 2B by the launch team to determine if all systems were functioning properly.

The power system was checked by Jerzy Slowkowski, who replaced a faulty capacitor in the power regulator. Jerzy did most of the tedious thermal-wrapping of exposed wires and components that would otherwise have "cooked" in the high temperatures in orbit. Power for the spacecraft was developed by four solar panels, each capable of producing 27 W when fully illuminated. Since the panels were mounted on the four sides of the spacecraft, total average power to the battery, allowing for sun angle and eclipse periods, was around 17 W. This solar power was stored in a 14-V, 6-Ah battery.

The last member of the checkout team, and the least vocal, was Ian Ferebee, G6BTU. Ian seemed to be involved in all aspects of the overall operation. His quietness was probably the result of being totally engrossed in his work. Work as full-time project technician, Ian assisted Dr. Sweeting. It was impossible to get an interview or a good picture of Ian because of his constant involvement with the spacecraft.

Listen for UoSAT

Find out when you can hear the beacons aboard UoSAT-OSCAR 9 by checking the OSCAR/RS Satellite Schedule in this and every issue of *QST*. All beacon frequencies are listed, from the 7.050 MHz Morse code telemetry beacon to the 10.470-GHz steady carrier. Tracking OSCAR 9 across the skies is simple if you've made the modification to your OSCARLOCATOR, as described in December 1981 *QST*, page 69.



Just before the spacecraft is enclosed in a large plastic bag, it has to be cleaned thoroughly. Christine Sweeting, G6APF, uses a camel hair brush to eliminate any specks of dust on the solar arrays. *(W9KDR photo)*

A Toast for a Job Well Done

When the final day came and the spacecraft was ready for transport to the launch pad, a sense of sadness came over the team. But there was also a degree of relief that the long, three-year trek was about to end. All members of the University of Surrey launch team took part in the final ritual seven stories above the launch pad inside the gantry. When the satellite was finally "mated" to the launch vehicle, little was left to do but await the countdown. Asked if the launch team would be toasting with champagne after a successful launch, Dr. Sweeting replied that was not his drink, but a large "whiskey" would be appropriate at that moment. Dr. Mansi followed with, "I think I'll make mine a stiff Scotch." The rest of the crew joined in, and the thoughts of a successful launch and the trip home to England filled the nervous pre-launch conversation. Someone commented that the only regret about leaving was that they would miss the "Frosties" from Wendy's.

A justifiably proud crew returned to England and celebrated the successful October 6, 1981 launch. Satellite enthusiasts are thankful to British industry, research organizations, AMSAT, RSGB and the University of Surrey for financial support, components and test facilities. A special thanks goes to NASA for its perfect launch of the first British amateur satellite. QST

References

Glassmeyer, B. "UoSAT-OSCAR 9," *QST*, Dec. 1981.

Sweeting, M. "UoSAT — the AMSAT Scientific and Educational Amateur Spacecraft," *Radio Communication*, Feb. 1981.

UoSAT-OSCAR 9 Technical Handbook. For details, write to Ron Broadbent, G3AAJ, Secretary, AMSAT-UK, 94 Herongate Rd., Wanstead Park, London E12 5EG, England.

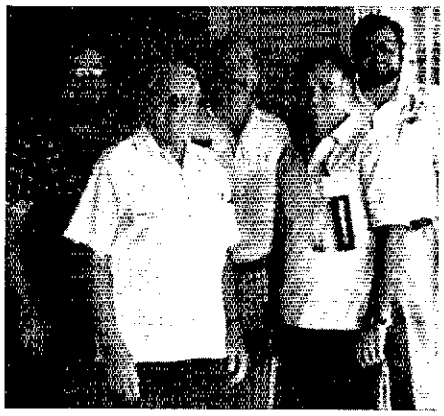
Strays

TECHNICAL ADVISOR CONCLAVE

☐ The ARRL has 50 technical advisors (TAs) in its field-service organization, and the list continues to grow. These technical experts are engaged professionally in their respective areas of specialty, are licensed amateurs and are members of the League. Their duties include the reviewing of *QST* manuscripts, answering "knotty" technical questions, critiquing the ARRL technical books, making technical contributions to our League publications, giving technical talks at conventions and serving as expert witnesses in court cases.

Recently, at the ARRL Southwest Division Convention in San Diego, a group of TAs had the good fortune of getting together to discuss the TA program as well as the technical contents of *QST* and the ARRL books. The group took part in the convention by delivering technical papers and answering numerous technical questions.

If you're at an ARRL convention, hamfest or club meeting where a TA is present, don't hesitate to seek from him the answers to your technical questions. He can be identified by his ARRL lapel pin, which has a white background. If he's not wearing a TA pin, look for an ARRL official ribbon (blue) on his shirt or jacket. Other ARRL officials wear the blue ribbon too, so you'll have to sort the TAs from the multitude! — *Doug DeMaw, W1FB*



Taking a break during the ARRL Southwestern Division Convention are (l-r) TAs Dan Petersen (WA6OIL) and Mike Hiehle (W6RZ), W1FB, and TAs Tom O'Hara (W6ORG) and Rick Olsen (N6NR).

On the Road with Kaw Valley ARC

It took time and a lot of hard work, but the Kaw Valley Amateur Radio Club has taken on a new look — and a more effective means of handling emergencies.

By Steve W. Carriger,* WAØVRS

The Kaw Valley Amateur Radio Club has always played a very active role in emergency communications, with close ties to the American Red Cross, the Civil Defense and the U.S. Weather Service. After a review of our needs to serve the community effectively in times of emergency or disaster, our club started a program to upgrade our emergency preparedness. When it ended, it had lasted two years and had involved over 10,000 hours of volunteer work from more than 100 Amateur Radio operators.

The upgrading program began with the building of three 2-meter repeaters. Topeka had two repeaters in service, but they needed to be replaced with more-modern solid-state equipment. A third repeater was needed to relieve traffic and to serve as a backup during tornado watches. One of the repeaters was to have 911, autopatch and 1050-Hz tone-encoding capabilities. This turned out to be the 146.67-MHz repeater system. All of the repeaters were to have emergency power and be spaced several miles apart to prevent one disaster from wiping out all three systems. In addition, a portable repeater, with a link that could be set up at a remote site to provide hand-held coverage of the disaster area, was set up on 146.34/146.94 MHz, with a link to the 145.45 repeater. This provides coverage back to the Topeka area.

Remodeling

Next, we remodeled our club room at the American Red Cross, making more room for operators. We placed maps on the walls and added a complete, new hf station, a Teletype machine, a programmable scanner, a TV, telephones, a 2-meter unit and new antennas for hf and 2 meters. The club room was to function as our primary traffic-handling area and be our standby for local net control during storm watches if the Emergency Operations Center went down.

The Civil Defense Emergency Operations Center, located in the subbasement of the Shawnee County Court House, was remodeled in much the same way as our club room. This area serves as our net control for all call-ups of the Zone 4A ARES net. At all area hospitals, we installed 2-meter stations, with four operators assigned to each location. Also, we installed antennas at two ambulance services and in the radar room of the Weather Service.

With the above projects completed, our club had one final task: tie all amateurs at a disaster site together with other emergency agencies at the site. A communications van full of radios was the only answer.

The Van

Club members decided that the communications van was to be the most important of projects in our upgrading program. The van would service as a mobile communications center with amateur equipment, and commercial gear for other agencies.

All club projects tend to be long on ideas and short on money; ours was no exception. Much of the money needed for the van was raised from a garage sale. The rest came from two primary sources: "passing the hat" at club meetings, and out-of-the-pocket money spent by various members for necessary materials and equipment for the van. This brought the total amount of money raised or contributed by club members to about $3000. The value of the radio communications equipment, volunteer labor and all equipment assigned to the van by public service agencies is not included in this figure. Estimates have placed the commercial value of the van in excess of $35,000.

Ken Burgett, Topeka-Shawnee County Civil Defense director, came through with a 1966 C-20 Chevy step van from government surplus. He also provided funding for sandpaper, paint and lettering of the van. Of course, the van had a few problems. The engine was replaced, the brakes and exhaust system rebuilt and the wheel bearings replaced. We now had a van that was mechanically sound; we were ready to do the body work. Club members hand-sanded the inside and outside, fiberglassing small dents and rusted areas as they went.

*3812 S.E. 32nd, Topeka, KS 66605

The rear bumper was removed and extended. This allowed for easy access in and out of the vehicle. The front bumper was fitted with an extension to allow for the mounting of a 3-kW, 120-V ac generator, which was mounted with quick-release hardware.

The roof was fitted with 10 Motorola antenna mounts and a total of eight 12-V, sealed-beam flood lamps — three on each side and two to the rear. In addition to the roof lighting, we installed two spot lights on the front, along with six yellow flashing lights — two in front and four to the rear.

Inside the van, we insulated the walls and covered them with paneling, and installed indoor-outdoor carpet. Overhead 12-V lighting was installed also; everything on the van was designed for a 12-V system, instead of 120-V ac.

Our communications van was beginning to take shape, and was finally ready for painting. After a few coats of white paint inside and out, lettering was added for identification to both sides and to the roof.

Rossville Flood — AM-COM 1 Rolls Into Action

On the afternoon of June 9, 1982, the Shawnee County, Kansas, Sheriff's office requested that AM-COM 1 be activated. Its mission was to assist with information coordination at Rossville, a community of less than 2000 located northwest of Topeka, during what has been referred to as the worst flood in the area since 1951.

AM-COM 1 set up operations at the command post at Rossville, and communication was begun immediately with the Topeka Police Department helicopter, the Shawnee County Sheriff and Civil Defense. Amateur communications were established also with the Red Cross and the Civil Defense Emergency Operating Center in Topeka, and a 2-meter autopatch was set up between the National Guard operations officer on the scene and the Adjutant General's office. An hf liaison was established on the Kansas emergency frequency (3.920 MHz), and SEC Doc Bemmels, WØKL, was notified of the emergency.

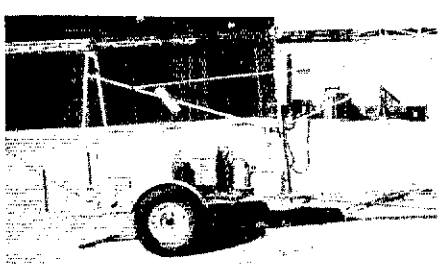
Initial reports indicated that rising flood waters might make the Rossville community inaccessible during the evening (this later proved not to be the case). EC Marshall Reece, NØBLD, requested additional amateurs with portable capabilities; they were dispatched to the Rossville High School, which served as an evacuation center. A few health-and-welfare messages were handled from the scene.

Commercial power, as well as some local telephone service, was available in Rossville, although phone lines were not always readily obtainable. AM-COM 1 operated from commercial power, although a small gasoline-powered emergency generator, carried at all times on AM-COM 1, was tested and remained ready. The club's 5-kW generator remained in Topeka on standby. Ten amateurs were present in Rossville, with about another 10 helping at the Red Cross and Civil Defense centers, and others running errands around the Topeka area. A special "thank you" is extended to all who assisted or stood ready to assist in this emergency, which occurred on the heels of other public service work in weather watches over the two weeks preceding the flood. An additional 100 hours were utilized during the flood, bringing the club's total weather-related public service hours to just under 1000 in a two-week period. The civic-mindedness and dedication by local amateurs demonstrated in this total is certainly something they can be very proud of. — *Marshall Reece, NØBLD, EC Zone 4B Kansas*

Equipping the Van

It now was time to start looking for radio gear. The Topeka Fire Department came through with the first two-way radio. Then, the Topeka Police Department provided a radio for their frequencies. Surplus radios were purchased from a local company that was upgrading its system. Club members rebuilt these radios and placed them in service to cover other emergency agencies. We still needed a radio for the medical frequency; Hospital Ambulance Service helped out, providing the last commercial radio required for the van. Two consoles were stripped of their old electronics and installed along one wall of the van. The console provides room for four operators to sit and operate in comfort. Behind each operator, along the wall, runs a long bench seat with a storage area underneath. This bench allows people to assist the operators. At the front of the van is a small work area over the engine cover, which is used for minor repair of equipment while in the field. It also doubles as a coffee-donut counter.

The inside of AM-COM 1 is laid out to provide four operators with enough room and equipment to handle, simultaneously, health-and-welfare traffic with Civil Defense, area hospitals, local and county police and fire departments, and the Weather Service.



A trailer that club members rebuilt tags along on emergencies. It carries no less than a 40-ft crank-up tower, a 2-meter beam antenna, a portable repeater (not shown), a generator and extra lighting.

As more radios were installed, it became clear that the van's 12-V system was undersized. Club members installed an 8D 200-Ah battery, a 120-A alternator on the engine, and an 80-A regulated power supply (120-V ac input) to float across the battery. No. 4 wire was run for positive and ground throughout the van. Three 120-V ac outlet strips were installed behind the consoles so extra radios and portable chargers could be plugged in. Two large ball mounts were attached on each side to the rear of the van for hf work, and a PA system was added.

When work was completed on the consoles, we installed radios to cover 2 meters, hf, vhf public service (scanner), the Topeka Fire and Police Departments, four county fire departments, Civil Defense, Shawnee Sheriff, the Hospital Ambulance Service, CB and a small TV. All operating positions have headphones to keep noise down — a must with this many radios. Each console also has two telephones with two lines to each phone. If the phone service is still available in a disaster area, we will have the capability to use the lines.

On the Road

AM-COM 1 (Amateur Communications Unit No. 1) is the call assigned to the van by all agencies when we use the commercial radios. AM-COM 1 also has onboard extension cords, 800 feet of coax in varying lengths, tools, telephone books for all cities within a 60-mile radius, flashlights, maps, a first-aid kit and a variety of spare parts. The club rebuilt a tower trailer, which carries a 40-ft crank-up tower, a generator and extra lighting, to go along with AM-COM 1.

During tornado watches, club members provide information to the Weather Service, hospitals and the Civil Defense so that early warning may be given in time to save lives. We also provide on-site communications during any disaster, and coordinate communications with the ambulance pool, medical teams, hospitals and other agencies. The communications we provide keep everyone informed as to the number injured, the supplies needed, the injury load to each hospital and any other communications requirements. In all, 100-plus members of the Kaw Valley Amateur Radio Club were able to find 10,000 spare hours for the Amateur Radio hobby, and put together a communications system equaled by few.

Two New Hams: How (and Why) They Did It

Traversing the road to hamdom can be a challenge for any of us. These two hams did it, but over two very different routes.

Prime-Time Radio

The biggest problem getting myself on the air was the antennas. The home QTH is a rented, first-floor apartment in an old, three-family house with a peaked roof. There is no yard, and the building is virtually wrapped in telephone and power lines, as it nestles among similar structures. Fortunately, the landlady is a good friend, and she trusted my discretion. But I didn't want responsibility for holes in her house.

Finally, plan number 3749 came to fruition. Skywalker friends draped a couple of dipoles on the roof, and strapped a 2-meter fm antenna to the chimney. The problem remained of how to get the cables into the shack. I'm still kind of proud of the custom-fit, wooden window bulkhead I designed and built myself. It's held in the top of the window by the window itself so you can see out the bottom, and there are no holes in the building. The ports on the sides deliver cables hidden by curtains, and it's finished to match the woodwork.

And so on. I could probably talk about radio for the rest of my life, and I probably will. It's a new love.

Getting There is Half the Fun

In the two-full-shifts life-style of a single, working parent for about 18 years, I don't remember ever wondering what to do next. When the kids grew up and left home, they didn't need me on a daily basis anymore. One day after work, sitting in my car on the parking lot, I took a moment to think. Going home probably meant being bored. There wasn't any other idea of what to do. I went home anyway, and was bored. On weekends, also, I was often lonely and bored, especially in the mornings, waiting for the rest of the world to be available.

I never belonged to a club, never spoke in front of a group and have written precious few letters. I am well known among my friends for just plain never writing anything. I'm a talker and a telephone jockey. I never played a musical instrument or learned a foreign language.

Even when I was busy raising my family and working full time, I always had a nagging need to do some volunteer public service, which I feel we all owe the community we live in. Now was a chance, and I had lots of free time. I was aware of some needs I could donate my time to, but somehow it seemed hypocritical and counterproductive to work with mental patients or to be a "Big Sister," if my dedication wasn't genuine. Some observers might have said I was in a middle-age crisis. My son said I was in my second adolescence. By my calculation, I should have been in the prime of my life, but I didn't know what to do with myself.

Then, at Thanksgiving 1978, I went to Lockport, New York, to visit folks I hadn't seen for years. They had a friend, Jim, living with them, whom I had never met. Shortly after arriving I wandered into a den, and there was the most elaborate hi-fi I had ever seen, complete with a microphone for making home recordings.

You guessed it; it wasn't hi-fi. It was Amateur Radio station WA2NFG. It didn't take much to get Jim to show me some of the marvels. People we didn't know, thousands of miles away, were greeting us warmly. Jim could remotely turn that metal spider web outside so it was pointing to those people halfway around the world as easily as I could turn in my chair to ask him a question. What an expanding sense of communication!

I couldn't ask Jim questions fast enough: "What do you mean '*Amateur* Radio'?" "What do you talk about?" "Can anyone be a ham?" "How do I get started?"

The only thing I didn't get a straight answer to was how much it cost. It seemed to cost whatever one could afford. "Oh well," I rationalized, "I'm already a hobby photographer, and I don't have time." Imagine that. No time!

Back home from New York, I got a telephone call from a cordial ham delivering a piece of traffic initiated by Jim. Unfortunately, I didn't have the presence of mind to jot down his name and telephone number, which I could have used shortly after. To this day, I don't know who he was to thank him.

I Thought I Was Only Curious . . .

The next day, driving to work, I thought I might find out a little more about this radio thing (I do a lot of thinking in my car). I had some trouble finding a ham, but eventually got in touch with the Middlesex Amateur Radio Club in nearby Newton, Massachusetts. I thought I was only curious, but after working my way through several license study guides and radio books I knew the jig was up, and I was going for my license.

I went the self-study route. I pulled everything together in my mind and turned the corner from total confusion to success, and got my Novice ticket in May 1979. In January 1980, I upgraded to General.

I have not only joined the Middlesex club since, but am now honored to serve as its President. If I wake up too early on weekends, no problem. I know that a flick of a switch at any time of the day or night can bring me in touch with people around the world. I have an honest vehicle for public service. I don't wish anyone problems, but, if they come, I'm acquiring equipment and developing skills that may be helpful.

It's funny now for me to look back and remember that in the 1930s, as a young girl, I asked a physicist what electricity was. He said nobody really knew. I figured then that, if it could hurt you and nobody knew what it was, I didn't want any part of it. Except for learning to put jiffy-snap power plugs on lamp cords, I did manage to avoid all that watts and amps stuff until just before I solved the cable problem. Today, I still want to know more. I put together a code

oscillator, which wasn't nearly as hard as I had imagined, and was absolutely amazed when it beeped. Today, two hams could call me "Elmer," and another one is on the way.

I have made my share of mistakes. I got a little heady with my new-found friends, Messrs. AC and DC, and was suitably humbled with some minor jiggles to wet palms. I've hooked things up backwards, but so far most have been forgiving, so no serious damage yet. I've learned how much I tend to interrupt people, because it can't be done on the radio. The "alligator" is teaching me not to be so long-winded. Now that I've learned Morse code, I love it. It's my musical instrument and foreign language all in one.

Today, besides the modest antenna farm, my station includes a cw transceiver, a general-coverage receiver, an SWR meter and a dummy-load that I built myself. I also have a Hammarlund SP-600, which I love, and a Hallicrafters SR-160, my first rig, which I keep to lend to newcomers. My 2-meter hand-held transceiver lives in my pocketbook and works through a 5/8-wavelength whip on my famous "thinking" car, which I now also use for talking.

My dreams for the future include improving my cw, getting into traffic handling and moving to a high, lonely place to put some real dandies on maybe a 150-ft tower. I'd especially like to try SSTV and ATV so I would be able to combine my two favorite hobbies, photography and radio. Who knows: I might even make a contribution to the state of the art.

Radio for me is not only manipulating the ions, it's a constant reminder in a variety of ways of people's importance to each other. It has been the single most rewarding activity in my life. I have a sense of joining the whole human race. I feel I may have something to give in addition to the immense pleasure I get. Now it feels like the prime of my life. — *Pat Sheppard, KA1DEI, Cambridge, Massachusetts* QST

Domestic Tranquility? You Bet!

Most of my QSLs from you guys say you can't imagine what it would be like to have your wife as a ham. My first answer is that the difference is, instead of a back bedroom or the garage, the ham shack is in a corner of the livingroom. But let's go a little deeper.

I suppose we should start at the beginning — Spring 1980. Jerry (N6DDP) and I had been married for a little over 14 years and have two young daughters. I had quit work before the youngest was born (I used to be a police matron/dispatcher), and just stayed home to tend the kids, to clean, to cook and to make all our clothes. Jerry had his work as a parts manager for a car dealer and his own hobbies, mainly radio-controlled airplanes (which I hated). Anyway, we were both occupied with our own little worlds, and never actually did anything together.

We sat down one night and talked, a rare happening in itself, and decided we needed something in common besides the kids — something we could do together. I had no ideas, but Amateur Radio is something he had been interested in for many years, so we settled on "ham."

Not quite knowing where to start, we went to Sacramento with the intention of buying some books to study. Well, we got the books, a radio and some accessories. What's $700 when you're having fun? I guess you could call that a commitment! We didn't get far on our own, and heard that a class was being offered at a junior college, 30 miles away. So, with lots of grumbling from the grandfolks about having to keep the kids an extra night each week, we started our class.

It lasted from April to June, and was for the General class license. With a lot of extra study (frustrating for me, complete with tears and temper tantrums), we managed to keep up with the class, and the discussions even began to make sense. Our instructor, WA6NKQ, was swell; all the time he spent on the telephone with us when we'd get stuck really made the difference.

Going for Broke

Then June came. The class ended on Tuesday night, and Wednesday morning found us on the way to San Francisco and the FCC office. We never got a Novice license, so it was go for broke: Either pass the 5-wpm code and the General/Technician written test, or wait the 30 days either to send for the Novice test or to go back to the FCC and try again. We shook in our boots through the whole thing, but we both happily came home Technicians, then had to wait that long six weeks for the license to arrive. (As I am writing this, one year later, we have just returned from another trip to San Francisco. This time we both came home with our Advanced license.)

It pays to *make* the time to take an interest with the OM. There are innumerable breakfasts, dinners, picnics, potlucks, swap meets, conventions, campouts — you name it — and they really are fun. Jerry has trouble with me at the swaps because I always want to buy something, instead of the other way around.

Our little area has a group, eight of us who are licensed, the WHOs (Women Ham Operators). We have potlucks (we even let the guys come and eat, too) and luncheons that we don't let the guys join. None of us are builders or experimenters, but we do enjoy operating, both cw and phone.

Don't say you don't have the time. Since we started in radio, Jerry and I have had another daughter. When our latest little one was born, Jerry stepped out of the delivery room and announced her arrival on the 2-meter hand-held radio. (I had one on my bedside table to keep in touch with our friends.)

I have no mechanical or electrical background, and I'm no good at fixing things around the house. Now I'm a little more helpful; I don't get on the roof or climb the new tower, but I do attempt to help by holding the guy wires or running for the tool he aways manages to forget when he works on the antennas.

If you'll spend a little time with the OM and get a license, you too could begin to enjoy what he spends his time at, *and* enjoy the equipment he spends all that money on. There are a whole bunch of really swell folks out there — next door and across the oceans as well. You could never find any single facet of the population any more congenial or willing to assist in any way than the "ham family."

If you work, you can still find a few minutes a day to study (that's really all it takes). When you get your license, I know you will find the time to get on the air. And for those of you like me, there's always someone to talk to on the air, in the middle of the day, when you really need a break from the daily routine. And, if you've been going "stale" at home, the code is great for sharpening the mind — it's just like a foreign language. By the way, with the baby now six months old, I must do my operating between bottles and diapers, but I *do* find the time for it.

Amateur Radio is a rewarding endeavor, especially in the self-satisfaction from just knowing you really can do it. You will be surprised how different the OM's attitude toward you and your favorite activity can be when you take the time to share in his interest. — *Jan Manford, N6DDO, Live Oak, California* QST

Strays

IEEE OFFERS REBATE ON COMPUTER COURSE

☐ Amateurs who are also members of the IEEE can benefit doubly from the Heathkit® ETS-3401 Microcomputer Training System (Product Review, Sept. *QST*). First, it can help hams gain a better understanding of microcomputers. Second, IEEE members who purchase the course from IEEE and complete it can get a rebate. For details, write to ETS-3401 Course Registrar, IEEE, 345 E. 47th St., New York, NY 10017. — *John F. Wilhelm, K2OZW*

ARRL was well represented at the Department of State ARC (W3DOS) annual banquet, held last May at the Foreign Services Club in Washington, DC. Standing with W3DOS President W4KM (left) are ARRL President W4KFC, past President W2HD, Washington Area Coordinator W1UED, Counsel N3AKD and Atlantic Division Director W3ABC.

CHECK YOUR GUNS — OOPS, HTs — AT THE DOOR, GANG!

☐ We've all seen those Wild West movies in which the saloon patrons were required to check their guns at the door before commencing an evening of frivolity. But, have you ever seen or heard of the same rule applied to HTs when a convention crowd entered a hospitality suite?

It happened to those who entered the highly active DRØNK hospitality room during HAMCOM '82 (Southwestern Division ARRL Convention) at San Diego's Town & Country Hotel in June 1982. The DRØNKs are a group of technically oriented fm/repeater people who believe wisely that HTs should be set aside at party time, lest someone at the peak of high spirits do something "naughty" over one of the repeaters. When N6NR, who is one of our ARRL TAs, took this writer to the DRØNK suite to meet the gang, I was surprised to see the vast array of HTs parked on the table (see photograph). This was indeed a new gimmick to me, and after the purpose of the rule was explained, it made good sense. It's a technique that could be adopted by many groups in the interest of

W1FB stands guard over a table-full of HTs DRØNK members checked in before a night of frivolity during HAMCOM '82.

on-the-air decorum! The "honor among thieves" rule seemed also to prevail, for I heard of no one who had his or her HT ripped off.

My thanks to the DRØNKs for allowing me to pose with their thousands of dollars worth of HTs (they kept an eye on me!), and for the fine hospitality, homemade chili con carne and stimulating conversation provided for this "easterner." — *Doug DeMaw, W1FB*

ARRL WAS VIA AMATEUR RADIO SATELLITE

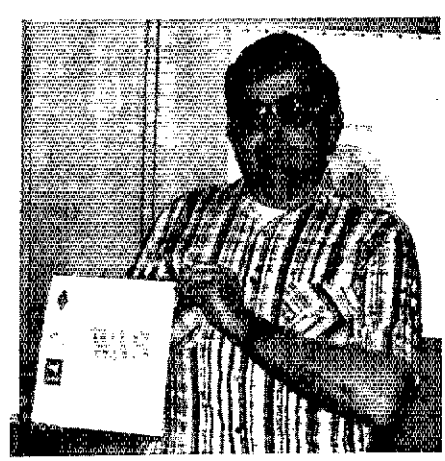
☐ Worked All States via satellite is at an all-time high. Since the first award in 1975, a total of 71 amateurs have been issued this coveted certificate. The most remarkable thing about the current activity is that more than 20 Satellite WAS awards have been issued so far in 1982. The new Soviet RS satellites, in addition to the faithful operation of AMSAT-OSCAR 8, have made all of this possible.

Anyone with a 2-meter transmitter and a 10-meter receiver can complete the WAS satellite requirement. If you are new to satellite communication and you have a Technician class or higher Amateur Radio license, you can soon join those on the elite WAS list. If you want additional information or need some help getting started, just write to ARRL and ask for Amateur Radio satellite information.

This may be the best opportunity anyone will ever have to work all 50 states via satellite. When you do get your certificate, we can guarantee it will become a testimonial that you will be proud of for many years. — *Bernie Glassmeyer W9KDR, OSCAR Program Manager*

Official WAS Satellite List

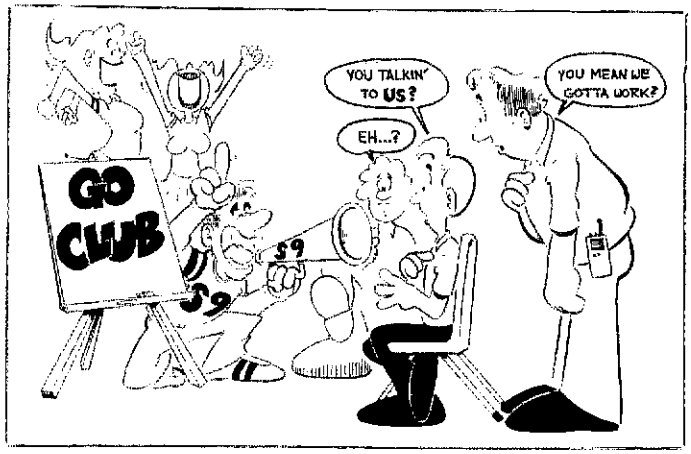
	1975	25	W6ABN		
1	K9JUU	26	WØWMP	47	W9HR
2	K9GWE	27	WB5PMU	48	WB8OTH
3	W9OII	28	WBØIUT	49	W6XN
4	WA6RQP	29	N4DT	50	WA6VGS
5	W6CG	30	K9SM		*1982*
6	VE5XU	31	W7ZC	51	KA7DLC
7	W7MCU	32	N3ES	52	W2RS
	1976	33	KØRZ	53	W1NU
8	W8CSM		*1978*	54	WA7GCS
9	WB4RUA	34	KØSE	55	WA2CBB
10	W6ETJ	35	W7US	56	K4UAS
11	W6NZX		*1979*	57	K2ZRO
12	WØIT	36	K1HTV	58	W2BXA
13	W6HEW	37	W9MXC	59	W2YY
14	WA6TUF		*1980*	60	W2LV
15	WØII	38	WØCA	61	W2GN
	1977	39	W5UCY	62	WA1ZUB
16	K9EIV	40	W7UFE	63	W9KE
17	WBØNST	41	W9HAD	64	W1PV
18	K5KQG	42	W7ID	65	W9KDR
19	W4JRC	43	W2SBI	66	W5VVR
20	W4AIT	44	K3NW	67	WB4ZXS
21	W7FF		*1981*	68	WD4FAB
22	WØSL	45	K9CIS	69	KØCY
23	WØRWC	46	WA5ZIB	70	WØRPK
24	W4BE			71	WA8LLY



Two New England AMSAT area coordinators recently completed their satellite WAS. Jim Buckley, WA1ZUB (left photo), of East Douglas, Massachusetts, received no. 62 on April 20, 1982. Skip Paulson, W1PV, of Danbury, Connecticut, was issued no. 64 on May 4, 1982. Both brought their cards to Hq. to be checked. *(photo by Karl Townsend)*

Not Me!

By John G. Troster,* W6ISQ



"Thank you. Thank you, club members. Don't get up. No big appreciation demonstration, please. Now you elected me your new president on my 'New S9 Action Program' to make this miserable group into the best club in the whole U S of A . . . right?"

"Right . . . Yippee . . . Wah hoo wah."

"And we're gonna be a world champeen club . . . right?"

"Right on . . . Hoooorrrayyy . . . S9-plus, Old Man."

"And we're gonna move forward and onward . . . and ahhh . . . upward . . . and ahhh . . . right?"

"Right . . . We're ready . . . What you gonna do, Mr. Prez?"

"Okay, the first thing in my New S9 Program is to make us a big winner in Field Day . . . right?"

"Hooorrraaayyy . . . We're number one . . . What kinda trophy we get?"

"Okay! First thing we need is a hard-charging, good-organizing Field Day chairman who's gonna ramrod this club into an oiled, smooth-running, efficient QSO machine to pile up points . . . who wants to volunteer to be chairman?"

Z Z Z Z Z Z Z Z Z

"Ahhh . . . who wants to volunteer to be the leader of this winning team? Ahhh . . . volunteers?? . . . hmmmm . . . you're all too modest . . . ahh . . . okay, then, I'll appoint a leader. I'm gonna appoint our club fireball, old Charlie. Charlie, I want you to take ahold of Field Day and move us forward . . . multi rigs . . . multi antennas . . . every member in there CQing for the glory of this stagnant old club . . . the XYLs cooking chow and the kids running hamburgers and drinks to the ops . . . right?"

"Waalll . . . I dunno if I want to volunteer to get appointed Field Day skipper or not . . . lot a work, you know . . . all them rigs . . . putting up all the antennas . . . and all them XYLs and kids . . . ugh. . . hear 'em now . . . makes me kinda tired just thinking about it."

"Yeah, Mr. President, you appoint old Charlie our Field Day skipper and first thing you know he's out appointing a lot of us assistants. And second thing you know we'd all have to be out there in the hot sun working on Field Day . . . Lot a work there . . . I was trying to get away from the XYL for one weekend anyway . . . We ain't never been in a Field Day before . . . Not me."

"You mean you fellas is gonna pass up a opportunity for this miserable club to make the greatest score in the history of Field Days?"

"Naw, he's right, Mr. President . . . Not me . . . We never done it . . . I was planning a barbeque that weekend . . . Me too . . . All that work . . . Not me."

"Okay, okay . . . let's forget Field Day for a while. But let me tell you there's no way we're gonna have a 'New S9 Action Program' without a great, first-class club paper . . . right?"

"Right! Sure thing . . . Great thinking . . . Give us prestige. . ."

"Glad to hear everybody's in favor of a great paper. Now, who wants to volunteer to edit our new award-winning club paper? Come on . . . somebody volunteer . . . volunteers anybody? Hmmmm . . . Okay, I appoint Jimmy. There you are, Jimmy. You gotta start investigative reporting. Nobody ever got a Nobel Prize without investigating. Gotta crusade for better band conditions . . . less sun spots . . . ahhh . . . smaller pileups. . . more DXCC countries."

'Weeeellll . . . ahhh . . . I dunno, Mr. President. Takes a lot a time, and I ain't never done no Nobel prize investigating . . . 'course I could appoint a bunch of columnists to help."

"Naw . . . Not me . . . Forget that appointing stuff, Jimmy . . . Write it yourself . . . Not me . . . For this club you only need a cartoonist . . . Not me. . . Yeah, a comic book maybe . . . Not me . . . I can't draw."

"Here I'm trying to progress this lousy club into S9 world class ranking, and nobody will do nothing! If you didn't like my 'New S9 Action Program,' how come you elected me president?"

"You was the only one running. Yeah, Old Man, your S9 program is down to about a S5 right now."

"Okay, you lost your chance. I'm not gonna let nobody else volunteer. I'm only going to appoint people from now on. So, I'm gonna appoint Old Sam to be chairman of our new program committee. We need new exciting speakers . . . people who are gonna tell us what we ought to know . . . get us all fired up . . . what do you say, Sam?"

"Ahhhh . . . waaalll, Mr. President, I don't know nobody who's excited about much . . . only exciting fella I ever knew finally made DXCC, but then he went back to full-time rag chewing . . . maybe somebody else . . . not me."

"Come on, Sam. We need speakers to educate us . . . launch us onto the wave of the future with outstanding speakers . . . ahhh . . . the way to the future is forward . . ."

"Maybe Sam he don't wanna go forward on a wave . . . You're down to about a S2, Mr. President."

All right . . . okay . . . I'll get the speakers myself. But one thing the S9 Program is gonna do right now is to save us all from poisoning . . . ha ha. I'm gonna move us out of this terrible Mom's Pizza Parlor here into a decent restaurant. We can't move forward if we all get ptomaine poisoned in the back of a pizza parlor . . . I'm gonna appoint a restaurant committee."

"What you got against old Mom's Pizza? Yeah, we like her cheeze and them hot peppers . . . Not me . . . I stay . . . Love that Polish sausage . . . Me too . . . Not me . . . You're down to a S-nothing, Mr. President . . . Not me!"

"You elected me president to turn this club around and progress, to move forward into world-class contention . . . ahhh . . . or did you? All I need is a little help . . . a few committee chairmen . . . right? . . . ahhh . . ."

"Not me . . . you're the president . . . You do the work . . . Yeah, we elected you and now you're trying to make us do the work."

"Okay, okay . . . hmmm . . . well . . . all right. That's about all for this meeting tonight. Next meeting . . . ahhh . . . we meet here in the back room of Mom's Pizza . . . no speaker program . . . just swap lies like usual . . . forget winning Field Day . . . forget our Nobel-winning paper."

"Hey, sure like your 'New S9 Action Program,' Mr. President. Learning fast . . . Good program . . . gonna make a great president . . . You're back up to S9-plus . . . Yeah, with a good club Action Program like that, maybe we'll elect you president again next year."

"Not me!"

*82 Belbrook Way, Atherton, CA 94025

Happenings

Conducted By Carol L. Smith,* AJ2I

Amateur Radio Bill Signed by President Reagan

On September 13, 1982, President Ronald Reagan signed the Goldwater-Wirth Amateur Radio legislation, H.R. 3239, into law. It has been designated Public Law 97-259. The new law amends the Communications Act of 1934 by giving FCC the authority to: establish RFI-rejection standards for home electronic equipment, enlist the aid of volunteers in monitoring the amateur airwaves for rules violations, and use volunteers for preparing and administering amateur examinations. The law also gives the Commission the authority to extend the license term of its licensees to 10 years, and it exempts amateur communications from the secrecy provisions of the Communications Act. Details about the law's effect on Amateur Radio appeared in last month's Happenings. Also, be sure to read "RFI Bill Becomes Law," which begins on page 11 of this issue.

ARRL FILES COMMENTS ON RM-4040

The League has submitted its comments in support of RM-4040, which would preclude cable television operation on Amateur Radio frequencies. RM-4040, a petition for FCC rulemaking, was filed by ARRL in January 1982. The League earlier had requested an unusually long extension of time for filing comments so the ARRL could (1) meet with primary trade cable TV associations to seek an ultimate *national-level* remedy for the problem of CATV interference, and (2) explore the ability of the National Cable Television Association, Inc. (NCTA), to resolve individual *local-level* interference on a cooperative, case-by-case basis.

The comments state, in part: "With reluctance the League is constrained to report that, despite perceived good faith efforts on the part of NCTA, no solution to this most serious interference problem has been forthcoming, either on an individual, case-by-case basis, or on a national basis." ARRL's comments also note that, though the NCTA has attempted to bring the seriousness and the extent of the CATVI problem to its member systems, no overall preventative measures have been suggested.

Moreover, the prospects for remedying the problem on a national scale are no brighter than they were in January 1982! For example: (1) *The problem of CATVI is still significant.* No notable degree of system integrity is apparent in the cable systems now operational. (2) *The voluntary approach is not working.* The NCTA has been unsuccessful in influencing the resolution of several test cases recently referred to them. This reflects the need for regulatory action. (3) *A mandatory regulatory approach through membership organizations is not feasible.* No trade or membership organization can require its affiliated member groups to take certain actions. The League points out that "neither the present state of the art, reflected in the increasing number of interference cases, nor the case-by-case approach, shown thus far not to be even minimally effective in stemming the tide of interference complaints, can be depended upon to lead to a resolution of the problem."

The ARRL also stressed that this interference situation is not a matter of numbers. Some cable companies guilty of serious interference often attempt to justify continued interference on amateur frequencies by discussing the number of cable subscribers served compared to the number of amateurs in the U.S. The League cited examples that the relief provided by RM-4040 would *not* be a public service detriment, nor would it be considered extraordinary. It again requests that ". . . the Commission amend its rules to prohibit operation of cable television systems on frequencies assigned to the Amateur Radio Service, either on a blanket basis or on a case-by-case basis, automatically upon receipt of a complaint of interference to or from an amateur station, until the integrity of the system is restored and the ingress or egress problem is nonexistent."

ARRL DIRECTOR AND VICE DIRECTOR NOMINEES

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 ARRL Board of Directors is ultimately responsible for all League matters, including deciding ARRL policies, priorities and services that will be made available to members. 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 *QST*.)

This year, nominations were open in the *Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern* and *West Gulf Divisions*. The ARRL Board's Executive Committee met September 11 to examine the nominating petitions filed by members in these eight divisions. The following were the only candidates nominated and eligible in their divisions, and for that reason the Executive Committee declared them elected without need for membership balloting.

New England Division: For Director — John C. Sullivan, W1HHR.

Northwestern Division: For Vice Director — Mel C. Ellis, K7AOZ.

Roanoke Division: For Director — Gay E. Milius, Jr., W4UG. For Vice Director — John C. Kanode, N4MM.

Rocky Mountain Division: For Director — Lys J. Carey, KØPGM.

Southwestern Division: For Director — Jay A. Holladay, W6EJJ. (The Committee was also in receipt of a petition nominating Fried Heyn, WA6WZO, as a candidate for Director. Mr. Heyn declined to have his name placed in consideration for this office.)

West Gulf Division: For Director: Raymond B. Wangler, W5EDZ. For Vice Director — Thomas W. Comstock, N5TC. (The Committee was also in receipt of a petition nominating Amelia E. Wise, W5OVH, as a candidate for Vice Director. Mrs. Wise, however, withdrew her name from consideration.)

Ballots already have been sent to all ARRL full members (of record as of September 10) in those divisions in which two or more candidates were found to be eligible for elective office. Those divisions and the eligible candidates are as follows:

Central Division: For Director — Edmond A. Metzger, W9PRN, and Don C. Miller, W9NTP. For Vice Director — Kenneth A. Ebneter, K9EN, and Howard S. Huntington, K9KM.

Hudson Division: For Director — George A. Diehl, W2IHA; John J. D'Luhy, K2EXI; and Linda S. Ferdinand, N2YL. For Vice Director — Philip H. Bradway, KB2HQ; Paul A. Lindgren, AH2M; Dennis B. McAlpine, K2SX; Stephen A. Mendelsohn, WA2DHF; and Alex M. Pontus, W2FCR.

New England Division: For Vice Director — Richard P. Beebe, K1PAD, and Clevis O. Laverty, W1RWG.

Northwestern Division: For Director — Mary F. Lewis, W7QGP, and Joseph N. Winter, WA7RWK.

Rocky Mountain Division: For Vice Director — Marshall Quiat, AGØX, and Robert A. Scupp, WB5YYX.

Southwestern Division: For Vice Director — Fried Heyn, WA6WZO; Peter F. Matthews, WB6UIA; and Joseph Merdler, N6AHU.

To be valid, ballots must be received at Headquarters by noon, November 20. A committee of tellers, under the supervision of the accounting firm of Price Waterhouse, will count the ballots, and results will be announced over W1AW and in *QST*. Any full member of record September 10 in one of the divisions in which elections are being held should receive a ballot by November 1. Those members eligible to vote who have not received a ballot should immediately contact Donna Frechette at Hq.

BURBANK UPDATE

Amateur Radio operators have filed a class-action suit against the City of Burbank, Illinois. The complaint names as plaintiffs 10 amateur and CB operators who are suing on behalf of themselves and all other persons similarly situated who reside in Burbank. The action is backed by League-pledged financial support. James C. O'Connell, W9WU, the plaintiffs' attorney, seeks a declaration by the Court that Ordinance 9-4-82 and Section 4-295 of the Municipal Code of the City of Burbank and the policies they implement are unconstitutional abridgments of the plaintiffs' rights. Section 4-295 (1) places a moratorium on the issuance of building permits for the installation

*Membership Services Assistant, ARRL

of Amateur Radio and CB radio antennas for one year from the effective date of the Ordinance; (2) requires existing antennas to be registered and owners to submit proof of bond and proof of homeowner's liability insurance; (3) requires that every CB or Amateur Radio antenna be inspected annually for a fee; (4) requires approval of local building officials for all antenna structures more than 20 feet high, whether ground- or roof-mounted, and; (5) sets forth other overly broad and restrictive conditions. (See Happenings, page 56, September 1982 *QST*, for further details.)

The complaint also asks for an order temporarily restraining, and permanently and preliminarily enjoining, the City of Burbank from bringing any civil or quasi-criminal action or complaint against anyone erecting or maintaining an amateur or CB antenna. The action further seeks recovery of costs and attorneys' fees, plus any other relief the Court deems just.

CANADIAN DIVISION DIRECTOR POWELL RESIGNS; ATKINS IS NEW DIRECTOR

Citing an unexpectedly heavy schedule, and his feeling that he would be unable to do justice to both his job and his League responsibilities, Mitch Powell, VE3OT, has resigned, effective September 20, from his position as Canadian Division Director. Mitch served as director for about three years and did an outstanding job for the ARRL and CRRL during that time.

Succeeding VE3OT as Canadian Division Director is Thomas B. J. Atkins, VE3CDM. Tom as served as vice director and was the Canadian representative at the IARU Region 2 Conference in Lima, Peru, in 1980. He has served as assistant director since 1978 and was also a member of the ARRL Public Relations Advisory Committee. Born and educated in the United Kingdom, Tom has lived in the Toronto area for 30 years and is vice president of Standard Broadcast Sales Co., Ltd.-Television.

ARRL President Clark has appointed Harry MacLean, VE3GRO, as new Canadian Division Vice Director. Harry is the conductor of Canadian NewsFronts in *QST*, and has been active in both ARRL and CRRL affairs. He has also been appointed to the Ad Hoc Committee on the Strengthening of the CRRL.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Montana, Mississippi, Iowa, Arizona, Ontario, Orange, Northern Texas, Arkansas, Kentucky, Wyoming and West Indies sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. In accordance with the restructuring of the ARRL Field Organization, the position of Section Manager will supersede the position of Section Communications Manager in each section. Incumbent SCMs are listed on page 8 of this issue.

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)

General 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 Manager for this Section for the next two-year term of office.
(Signature . . . Call . . . City . . . ZIP . . .)

An SM 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 10, 1982.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on December 31, 1982. Returns will be counted February 22, 1983. SMs elected as a result of the above procedure will take office April 1, 1983.

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, 1983.

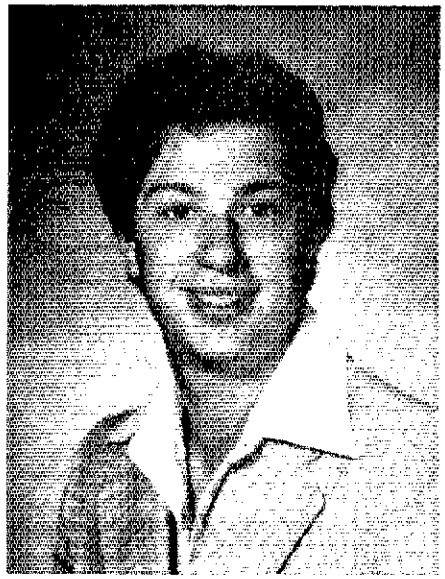
If no petitions are received for a section by the specified closing date, such section will be resolicited in April *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by appointment by the General Manager.

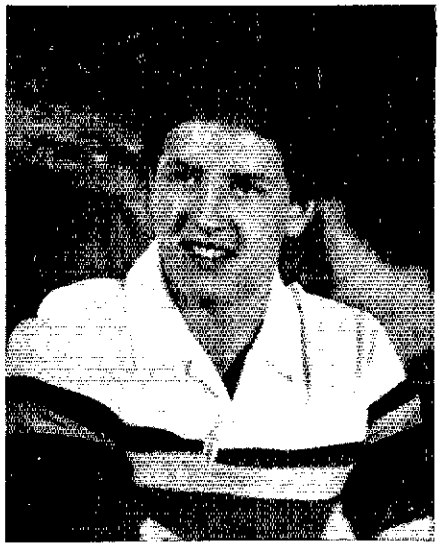
You are urged to take the initiative and file a nominating petition immediately.
David Sumner, K1ZZ
General Manager

ARRL FOUNDATION SCHOLARSHIP RECIPIENTS

The officers and directors of the ARRL Foundation take pride in announcing the recipients of two awards for the 1982-83 academic year. The Long Island Scholarship, for youths attending Long Island colleges or universities, has been granted to Paul Michael Silverman, KA2DSP, of Levittown, New York. Paul enters the State University of New York at Farmingdale in September to pursue courses in electronics technology. The $250 ARRL



Paul Michael Silverman, KA2DSP



Larry Edwin Smith, Jr., WB9UKE

Foundation-administered award was given to this young man for his demonstrated interest and excellence in promoting Amateur Radio, and for his aspirations to an electronics career.

The YL ISSB Memorial Scholarship has been awarded, for the second year in a row, to Larry Edwin Smith, Jr., WB9UKE, of Vincennes, Indiana. The awarding of $709 to Larry concludes the Foundation's administration of this scholarship fund for the YL ISSB. Larry is pursuing associate and bachelor's degrees in electronics engineering, and he aspires to a career in communications with NASA. An Amateur Extra Class and 2nd class commercial licensee, Larry maintains an A average and remains very active in extracurricular activities at Vincennes University.

ARRL Foundation-administered scholarships are open to all applicants. Qualifications and specific criteria are reviewed by screening boards of Foundation officers and directors and panels provided by sponsoring organizations. Application closing date is May 1, 1983, for the next academic year. Address all inquiries to Andrea T. Parker, K1WLX, Secretary, ARRL Foundation, 225 Main St., Newington, CT 06111.

ENERGY-EFFICIENT RF-EMITTING DEVICES NEED MORE TESTING

The ARRL commented unfavorably regarding a North American Philips Lighting Corp. request for a waiver of FCC Rules 18.142(b) and 18.142(c) to permit the manufacture and marketing of a new energy-efficient light bulb. League comments on an International Energy Conservation Systems request for waiver of FCC Rule 18.142 to permit manufacture and marketing of an electronic ballast for a fluorescent lamp were also negative.

The ARRL contended that there was inadequate testing of the NAPLC light bulbs; only 250 lamps were field tested, and the manufacturer submitted no data related to the effects of the light bulb on Amateur Radio or other hf receivers. NAPLC nevertheless proposes to market a million of these units in 1983. Its only reference to potential interference problems was the statement: "Through our Corporate Quality Assurance Department, we will report any field complaints to the FCC during the first

six months after introduction with a statement of all actions taken."

The IECS is silent about the potential interference problems caused by its electronic ballast. It proposes, rather, ". . . a grant of the requested waiver *prior* (emphasis added) to evaluation of the test data it promises to submit."

In both these cases, the League submits that such after-the-fact attention to potential interference problems is not a substitute for adequate pre-certification testing. Furthermore, the potential benefits of precaution in these matters far outweigh the slight detriment to NAPLC and IECS caused by a marketing delay of their new devices. Therefore, the ARRL requests that the waivers sought by NAPLC and IECS *not* be granted unless and until "appropriate engineering data, which establishes the interference potential of these devices to Amateur Radio or other high frequency receivers, is prepared and submitted to the FCC."

FCC NIXES GRADING, LABELING OF TV RECEIVERS

The Commission has ended a proceeding that considered a program of government involvement in labeling and grading of television receiving equipment, begun four years ago in a Notice of Inquiry in General Docket 78-307. This proposal was an effort to help consumers get technical information that would help when choosing, installing and operating TVs.

ARRL comments at that time supported the proposal because it would have been a step forward in the resolution of the overall RFI problem.[1] The League's concerns about RFI have just been addressed with the enactment of P. L. 97-259, which allows the FCC to place responsibility for rf-interference susceptibility on manufacturers of the equipment. The League hopes the RFI problem ultimately will be diminished as a result of this legislation.

The Commission's termination of the proceeding was based on industry and consumer response that it would be "an unwise expansion of our authority to initiate such a (grading and labeling) program," and that the existing environment "does not, however, call for a labeling and grading program for television receiving equipment sponsored or mandated by government." The FCC has asked, however, that these six key points regarding the most important aspects for adequate uhf television reception be passed along to the public:

1) An outdoor antenna is much more likely to provide better picture quality than an indoor antenna.

2) Separate uhf and vhf outdoor antennas can provide better performance on uhf than can a combination uhf/vhf antenna, at little or no extra cost.

3) Four-bay and eight-bay "bowtie" uhf antennas provide good performance at low cost. (The most expensive antennas are not necessarily the best.) A two-bay bowtie uhf antenna is a good choice for an indoor antenna.

4) Antennas should be installed by "probing' for the best receiving location. Signal strength can vary significantly over a very short distance; thus, the antenna should be installed at the location that provides best picture quality.

5) Shielded cable (either coaxial or shielded twin lead) generally is recommended over conventional "twin lead" cable to connect an outdoor antenna to a TV set. RG-6 is a good quality cable. Coaxial cable should be used with baluns when connected to the antenna and the set.

6) Preamplifiers that boost the TV signal may provide improved uhf picture quality, but a television service technician should be consulted about their use, since in the wrong circumstances "preamps" can cause interference.

[1]See *QST*, Jan. 1979, p. 63.

CURRENT RECIPROCAL OPERATING LIST

The United States has reciprocal operating arrangements with the countries listed below. U.S. amateurs wishing to apply for a reciprocal permit from one of these countries should write to the Membership Services Department at Hq. (be sure to include an s.a.s.e.) for information.

Governments that have reciprocal arrangements with the U.S. are:

Argentina	Greece	Nicaragua
Australia	Grenada	Norway
Austria	Guatemala	Panama
Bahamas, The	Guyana	Paraguay
Barbados	Haiti	Peru
Belgium	Honduras	Philippines
Belize	Iceland	Portugal
Bolivia	India	St. Lucia
Botswana	Indonesia	Seychelles
Brazil	Ireland, Rep. of	Sierra Leone
Canada*	Israel	Solomon Is.
Chile	Italy	Spain
Colombia	Jamaica	Suriname
Costa Rica	Jordan	Sweden
Denmark	Kiribati	Switzerland
Dominican Republic	Kuwait	Trinidad & Tobago
Ecuador	Liberia	Tuvalu
El Salvador	Luxembourg	United Kingdom
Fiji	Monaco	Uruguay
Finland	Netherlands	Venezuela
France	Netherlands Antilles	Yugoslavia
Germany, Fed. Rep. of	New Zealand	

*The U.S. and Canada have an automatic reciprocity agreement, and visiting amateurs no longer need reciprocal operating permits.

FCC TAKES ACTION IN SOUTHERN CALIFORNIA DX CLUB REPEATER CASE

Armstrong, ex-WA6CGI

An Administrative Law Judge recently revoked the Advanced class operator license and station license, WA6CGI, of Henry C. Armstrong, III, of Sylmar, California, for "willful and malicious interference with the transmissions of other amateur operators." The action stemmed from continuing complaints of interference to the Southern California DX Club repeater.

Commission engineers determined that Armstrong's signals, one-way transmission of his call sign by synthesized voice, was interfering with the repeater, making it virtually useless for days at a time. Armstrong contended that he was performing tests related to the development of a "pseudo-intelligent computer program with whom a human could communicate by voice in plain English." However, Armstrong "tested" very close to the SCDX club repeater's input frequency despite complaints that he was causing interference. Club members even offered by buy crystals for him to do testing on a different frequency.

The presiding Judge found that "Armstrong's story that he was engaging in legitimate testing was only a subterfuge to disguise his campaign to drive the SCDX repeater off the air. This willful interference . . . and his attempt at subterfuge through the hearing process are bases for finding him lacking in the requisite qualifications to be a Commission licensee in the Amateur Radio Service." — *from FCC News Release*

CALIFORNIA AMATEUR CLEARED OF RULES VIOLATION

An FCC Judge has vacated an order to show cause why the license of Amateur Radio station W6UCB should not be revoked, and has set aside the suspension of Robert N. Frizzell's amateur Advanced class operator license. Frizzell, of Dana Point, California, had been accused of violating station i-d requirement rules, transmitting music and making unidentified communications.

Resolving the case on the credibility of Frizzell's denial, as opposed to the evidence presented by the Bureau, the presiding Judge found that the Private Radio Bureau "failed to meet its burden of proof and [failed] to establish that Frizzell was the source of the transmissions at issue." — *from FCC News Release*

ARIANE LAUNCH FAILS

According to the European Space Agency (ESA), the failure of a September 9 launch of the L5 Ariane rocket was caused by a malfunctioning turbo pump in the third stage of the launch vehicle. Because the failure was specific to that individual pump, the unsuccessful launch is expected to result in a delay of only one or two months for the Phase IIIB satellite.

ESA came into being to fill the rocket-launch void created by NASA's decision to rely on reusable space shuttles for launches. ESA provides commercial rocket launches. In fact, Ariane 6, scheduled for launch in November, will carry two commercial satellites loaded one atop the other. There is, however, a possibility of swapping the Ariane L6 and L7 launches, allowing Phase IIIB to ride on the L6 vehicle.

FCC DISMISSES PETITIONS

James C. McKinney, FCC Private Radio Bureau chief, has dismissed a petition filed by Peter Wechter to permit the assignment of specific call signs to General class and higher operators. The Commission had considered this issue previously and had found that the entire licensing system had become burdensome and difficult to administer properly. Accordingly, and because the petitioner presented no new issues, the Commission dismissed this petition.

Another petition, to implement the allocation of 902-928 MHz at the earliest possible date to the Amateur Radio Service, was also dismissed. The Commission said it would be inappropriate to proceed until the 1979 WARC Agreement has been ratified. Thus, the FCC felt that this petition, filed by William Tynan, was premature and was therefore dismissed.

GEOSTATIONARY AMATEUR RADIO TRANSPONDER PROPOSED

By 1986, Amateur Radio may have two operational geostationary transponders. Thanks to

RCA, the Cablesat General Corporation and ARNET (see League Lines, October *QST*) we may be using state-of-the-art communication to commemorate the 25th year of satellites carrying Amateur Radio.

Early this year, ARRL was contacted by Cablesat President Ray Kassis, WA4OHK, about the possibility of these transponsers being donated for Amateur Radio use. The ARRL replied:

Dear Mr. Kassis:

We have read with considerable interest the preliminary draft of the CGC proposal prepared by RCA Astro-Electronics, to include a C-Band Amateur Radio Network Experimental Transponder (ARNET) aboard the CGC satellites. We would very much appreciate the opportunity for the American Radio Relay League to participate in this project on a no-cost basis.

For more than 65 years, the ARRL, a nonprofit, bi-national organization with more than 150,000 members world wide, has been the principal spokesman for radio amateurs. In 1961 the ARRL granted backing to Project OSCAR, in the name of the amateurs of the United States, to help launch the first Amateur Radio satellite, OSCAR I. The same support and enthusiasm for amateur satellites has continued since then and we thank you for the consideration and attention you have given this project.

A 10-MHz-wide transponder with a 5.67 GHz uplink and 3.40 GHz downlink in a geostationary orbit would provide Amateur Radio with a valuable new resource. We could expand into new areas of experimentation, education, public service and emergency communication. Such a transponder would provide the amateur community with an important opportunity to broaden its involvement in space communication and experimentation.

We are looking forward to working with you in helping Amateur Radio benefit from this opportunity. Please let us know of any way we may be of assistance.

Sincerely yours,
David Sumner, K1ZZ
General Manager

Should a geostationary transponder come to pass, it is conceivable, for example, that earth stations could be erected at repeater sites and used to communicate directly with other sites in all 50 states, Canada, Central America and northern South America using hand-held transceivers. A national emergency and traffic-handling network could be established that would operate 24 hours a day, regardless of terrestrial or ionospheric conditions. Experimental and special modes of communication could be accommodated, perhaps even live TV. These are a few of the possibilities that could become a reality.

There is much that still remains to be done to make the dream of an Amateur Radio geostationary satellite a reality. We'll be reporting as progress is made toward this ambitious goal. — *Bernie Glassmeyer, W9KDR*

EXPERIMENTAL DIGITAL CODES NOW PERMITTED ABOVE 50 MHZ

Effective October 28, 1982, the FCC will permit the use of any digital code on amateur frequencies above 50 MHz, except those frequencies on which only A1 emission is permitted. A1 emission is the only emission permitted on 50.0-50.1 MHz and 144.0-144.1 MHz. This action amends Section 97.69 of the Amateur Rules so that "an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information."

In October 1980, ARRL petitioned the FCC for a rules change to permit greater experimentation with digital techniques (see January 1981 *QST*, page 65). Citing a "compelling need" if radio amateurs are to continue as the primary contributors to the advancement of the radio art, the League requested that amateurs be permitted a wider scope of authority to conduct digital experiments.

One of the major issues considered by the Commission was balancing its objectives of encouraging new technologies against assuring FCC enforcement capability. The ability of the Commission to verify that the content of messages complies with its rules would be hindered by authorizing experimentation with "exotic" technologies. However, the FCC agreed with the ARRL that special provisions, such as providing that identification be made in plain English or with the international Morse code, combined with the zealous effort of the amateur community to protect their frequency bands, provide adequate protection against unauthorized use of amateur frequencies.

Communications using such digital codes are authorized for domestic operation only, except where special arrangements have been made between the U.S. and the other country concerned. The bandwidth of such digitally coded transmissions may not exceed 20 kHz on frequencies between 50 and 220 MHz, and 100 kHz between 220 and 1215 MHz. On frequencies above 1215 MHz, any bandwidth may be used, provided the sidebands are confined within the authorized amateur band and all spurious emissions are reduced or eliminated in accordance with good engineering practice. Furthermore, the station log must contain a description of the experimental code, and the FCC engineer-in-charge may require that further steps be taken by an amateur to ensure compliance with the rules.

More specific rules dealing with use of the International Telegraphic Alphabet No. 2 and the American Standard Code for Information Interchange (ASCII) remain. The commission, is also authorizing greater ASCII sending speeds, however, and it is eliminating the requirement that stations "using the Baudot code" maintain the sending speed within certain tolerances.

Accordingly, the Report and Order in PR Docket 81-699 amends Sections 97.7 and 97.69 as follows:

§97.7 Privileges of Operator licenses.

* * * * *

(e) Novice Class. Radiotelegraphy in the frequency bands 3700-3750 kHz, 7100-7150 kHz (7050-7075 kHz when the terrestrial station location is not within Region 2), 21,100-21,200 kHz, and 28,100-28,200 kHz, using only type A1 emission and using only the international Morse code.

2. Section 97.69 is revised to read as follows:

§97.69 Digital Communications.

Subject to the special conditions contained in paragraphs (a), (b) and (c) below, an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information. These digital codes may be used for such communications as (but not limited to) radio teleprinter, voice, facsimile, television, communications to control amateur radio stations, models and other objects, transference of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such digital codes are not intended to obscure the meaning of, but are only to facilitate, the communications, and further provided that such operation is carried out in accordance with other regulations set forth in this part. (For purposes of this section, the sending speed (signaling rate), in baud, is defined as the reciprocal of the shortest (signaling) time interval (in seconds) that occurs during a transmission, where each time interval is the period between changes of transmitter state (including changes in emission amplitude, frequency, phase, or combination of these, as authorized).)

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot code) is subject to the following requirements:

(1) Transmission shall consist of a single channel, five unit (start-stop) teleprinter code conforming to the International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in the "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The sending speed shall not exceed 100 words per minute (75 baud).

(3) When frequency (or phase) shift keying (type F1 emission) is utilized, the deviation from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 hertz.

(4) When audio frequency shift keying (type A2 or F2 emissions) is utilized, the highest fundamental modulating frequency shall not exceed 3000 hertz, and the difference between the modulating audio frequency for the mark signal and that for the space signal shall be less than 900 hertz.

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4-1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 28 MHz where its use is permitted; and the sending speed shall not exceed 300 baud.

(3) F1, F2 and A2 emissions may be utilized on those frequencies above 28 MHz where their use is permitted; and the sending speed shall not exceed the following:

(i) 1200 baud on frequencies between 28 and 50 MHz;

(ii) 19.6 kilobaud on frequencies between 50 and 220 MHz;

(iii) 56 kilobaud on frequencies above 220 MHz.

(4) A1 emission may be used for ASCII where F1 is permitted; and the sending speed shall not exceed that specified for other ASCII coded emissions on the same frequency.

(c) In addition to the above provisions, the use of any digital code is permitted on amateur frequencies above 50 MHz, except those on which only A1 emission is permitted, subject to the following requirements:

(1) Communications using such digital codes are authorized for domestic operation only (communications between points within areas where radio services are regulated by the U.S. Federal Communications Commission), except when special arrangements have been made betwen the United States and the administration of any other country concerned.

(2) The bandwidth of an emission from a station using such digital codes shall not exceed the following (where for this purpose the bandwidth is defined as the width of the frequency band, outside of which the mean power of any emission is attenuated by at least 26 decibels below the mean power of the total emission; a 3 kHz sampling bandwidth being used by the FCC in making this determination):

(i) 20 kHz on frequencies between 50 and 220 MHz;

(ii) 100 kHz on frequencies between 220 and 1215 Mhz;

(iii) On frequencies above 1215 MHz any bandwidth may be used provided that the emission is in accordance with §97.63(b) and §97.73(c).

(3) A description of the digital code and the modulation technique shall be included in the station log during all periods of use and shall be provided to the Commission on request.

(4) When deemed necessary by an Engineer-in-Charge of a Commission field facility to assure compliance with the rules of this part, a station license shall:

(i) Cease the transmission of digital codes authorized under this paragraph.

(ii) Restrict the transmission of digital codes authorized under this paragraph to the extent instructed.

(iii)Maintain a record, convertible to the original information (voice, text, image, etc.), of all coded communications transmitted under authority of this paragraph. — *W. Dale Clift, WA3NLO*

Correspondence

Conducted By Peter R. O'Dell,* KB1N

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

BLOODY BORE?

☐ Must agree with W1BNN saying that *QST* is a "bloody bore" *(QST* Aug. 1982, p. 61). Please, cut your pages and pages of station activity drivel, etc., because none of it has any practical value for the average radio amateur. *QST* can't seem to get their minds out of the thirties, and I cannot remember having seen any important innovations to the world of radio in *QST* in the last 10 years (including that NBVM system)!

I just cannot see how *QST* can claim any technical superiority when the rest of the world is racing ahead. That includes many of your homebrew projects that are much too expensive when you consider you can buy the same thing for half the price ready-made. It is often said reform must come from the bottom up, because it never comes from the top down. Your *QST* (or should I say "our *QST*") proves it. — *Robert H. Fransen, VE6RF, Sherwood Park, Alberta*

TEMPUS FUGIT

☐ Just received the 50-year member plaque, and it is beautiful. I hung it above my station, which is in a spare bedroom. Thanks very much, and I am very proud to have it. It doesn't seem like 50 years. — *Robert E. Valgren, W9IPH, Villa Park, Illinois*

CHINA REVISITED

☐ Thank you for publishing BY1PK's photograph with caption (July, p. 49). I would like to tell you a story which developed from that photo. Mr. Dave Kennedy, N4SU (formerly W8BRA), saw that photo and was attracted by my old call sign — C1BC. He then dug into his old QSL file and found my C1BC card confirming a QSO 34 years ago, which he sent me.

I was surprised and very happy to see my old card. I almost forgot this card, even though I designed it myself. Gratefully, I sent him a thank you note and told him that I had never received his card due to the Chinese civil war.

Dave is a nice guy. He immediately filled out and sent me his W8BRA card addressed to C1BC confirming that QSO of 34 years ago. In addition, we renewed our long missed ham friendship. I want to thank you again, because if it were not for ARRL and *QST* this dramatic ham radio story never would have happened. — *Frank Wen, KM2X, Woodside, New York*

SLUSHY, SLOPPY FISTS?

☐ Deliver me from slush-hand key hacks and sloppy-bug buffoons who, with their pseudo old-timer fists are easily outclassed by any conscientious first-year Novice. — *Dean E. Lewis, W7TC, Klamath Falls, Oregon*

COMPUTER KEYING

☐ A new computer will be available in the U.S. around the end of this year with a price tag of about $100. The secret of this computer is a new microprocessor chip running at 3.58 MHz. With the low price and marketing they should sell at a fast rate. Maybe I should purchase one and key it on 80 meters for a superduper microprocessor controlled QRP rig. When will it end? — *Richard Gunn, K7EXO, Sioux Falls, South Dakota*

TURKEYS OF THE MONTH AWARD

☐ I recently witnessed a serious automobile accident, which took place on a very remote stretch of highway near Hancock, Maryland. My 2-meter rig is crystal-controlled, and with our local repeater off the air, I was somewhat limited in communication ability.

Due to elevation, I was able to break a QSO on a repeater in a neighboring state. I explained my situation to the other hams and asked them to notify their state police, who could relay the message to our local authorities.

I could not believe their response! They told me that they had no autopatch on their machine and suggested several other repeaters that I might try (including my local repeater, which was down). I reminded them that I had a life and death situation on my hands and that I had to QRT in order to render first aid.

Although I'm sure that my fellow amateurs thought that they were doing the most helpful thing, they left me hanging in somewhat of a limbo. Other passersby did drive to the nearest town (about 5 miles away) and report the accident. — *Duke Ward, K3QWO, Hagerstown, Maryland*

A LEAGUE OF HIS OWN

☐ A year and a half ago my daughter moved out of state. My first thought was the League. I sent to the "building in Newington" *(QST,* Dec. 1981, p. 99) for information on a League-sponsored club in her city, which I received in the mail. I sent a letter to this club of "radio amateurs banded together" in her city for assistance. I never received a reply.

I looked in *QST* for the SCM in her state. Hooray! He lived in the same city. Off went the letter to this amateur for assistance. I never received a reply.

In July, my wife and I went to visit our daughter. My first time on one of the local repeaters put me in contact with Ted. Ted not only invited me to his home and made me welcome, but supplied me with the names, addresses and phone numbers of the ham class instructors at the university radio club. My daughter will be enrolled in a Novice class this fall.

For reasons of his own, Ted is not a member of the "alliance of radio amateurs banded together for a common cause." From my experience, however, Ted and others like him are in a "league" of their own. — *Bill Maggs, WB7DLM, Portland, Oregon*

LISTS

☐ The law says we may run 1000-W dc input to the final, and that is the only sign of equalization amongst operators. [See September *QST,* page 44 — Ed.] Those hams who have the real estate, financial power, time and interest to create tremendous antenna facilities will always be the first in the pileups. Because someone else doesn't have those resources and/or doesn't expend the energy does not give them the right to demand equality. Nor does someone who by his choice runs QRP have the right to demand equality.

I'd like to hit the big gun argument once more. W9BG, who was top of the Honor Roll, never had more than a TH6 at 55 feet. Of the Honor Roll members in our DX club, the largest array is a tribander at 65 feet. I submit that skill and dedication are the key ingredients to success once you're on the air. To me, the final answer rests with the DX station. It's always been his ball game. — *Ed Toal, K9QXY, Cross Plains, Wisconsin*

☐ At last! An article in *QST* with some meat to it! The real issue here is the importance of a DXCC certificate. If a ham thinks he should have one and gets it the hard way, he and his friends will know it. That's what is important. I hope this article on DX lists is an indication that members can expect at least one issue-oriented piece each month. — *David Zeigler, KA7FAT, Bellevue, Washington*

THE STORM RAGES

☐ It's encouraging to see many who haven't touched a key in years coming out of the woodwork to sing the praises of cw now that the FCC is threatening to issue licenses without a code test. And yet, the proposal does have merit, although not in the form presently being proposed, everything above 50 MHz. Make it everything above 500 MHz, and it could be as beneficial for Amateur Radio as was the Novice license program.

It would stimulate more activity on our microwave bands (if we don't, we could lose them). It would encourage manufacturers to develop microwave gear for the mass market. The FCC could always open the lower-frequency bands later, should it seem to be in the public interest, but it would be much harder to close them later, if it decides it was a mistake. — *Chuck Clark, K4ZN, Moncks Corner, South Carolina*

☐ I've been telling my wife about the discussion in the ranks of ham radio about the codeless license. Her reaction was that the use of phone should be ended since if you're going to talk you might as well use the landline. After all, cw is the hobby. — *David L. Wiesen, K2VX, Newark, New Jersey*

☐ If there are, in fact people who can not master five words per minute then there must also be people who can not handle the simple theory involved in getting a license. Why not do away with the written exam as well? Then hams could say with pride, "That's a big 10-4, good buddy," while using their rubber duckies on 2 meters. Next they will try to wipe out our cw subbands. Keep the code! — *Hessel Kooistra, III, NG6Y, College Station, Texas*

*Public Information Officer, ARRL

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Biological Effects of RF Energy — Part 1

The Federal Communications Commission regulates the use of radio waves and microwaves for communications. Because of its responsibilities in this area, the Commission often receives inquiries concerning potential hazards to human health and safety from radio-frequency (rf) and microwave radiation. In recent years, there has been a noticeable increase in public awareness and concern over this issue. Increased publicity about new uses of rf and microwave technology has generated much discussion and speculation concerning the alleged "electromagnetic pollution" of the environment.

The matter of rf exposure standards is the subject of a current FCC proceeding in General Docket 79-144 looking toward the agency's responsibilities in this area. The League's Committee on the Biological Effects of RF Energy has focused its resources on the Commission's proceeding, and continues to participate formally in each stage. See Happenings, April and October 1982 *QST*.

This month, and next, we turn the reins over to FCC's Office of Science and Technology for answers to common questions concerning the biological effects of radio-frequency energy.

Q. What is radio-frequency radiation?

A. Radio-frequency radiation is a form of electromagnetic radiation found near the low-frequency end of the electromagnetic spectrum. The electromagnetic spectrum includes all of the various forms of electromagnetic energy from extremely-low-frequency (elf) radiation with very long wavelengths to X rays and gamma rays, which have extremely high frequencies and correspondingly short wavelengths. In between these extremes lie radio waves, microwaves, infrared radiation, visible light and ultraviolet radiation.

Electromagnetic radiation consists of waves of electric and magnetic energy moving together through space. Each electromagnetic wave has associated with it a wavelength and a frequency that are inversely related to each other by a simple mathematical formula. The rf part of the electromagnetic spectrum ranges from frequencies below 100 kHz to frequencies above 1 GHz.

Q. What is radio-frequency radiation used for?

A. Modern society has developed literally hundreds of uses for rf energy. The most familiar applications are a-m and fm radio, television, citizens band (CB) radio, hand-held walkie-talkies, Amateur Radio, shortwave radio and other communications services. Not so well-known, but also important, are devices that use rf radiation in industrial heating and sealing operations. These devices generate rf energy that in turn rapidly heats the material being processed in the same way that a microwave oven cooks food. Radio-frequency energy also has medical applications in a technique called diathermy, which takes advantage of the ability of rf energy to heat tissue below the surface of the body.

Q. What is microwave radiation?

A. Microwave radiation is also a type of electromagnetic radiation. It is usually characterized as electromagnetic radiation at the high-frequency end of the rf spectrum and includes frequencies from about 300 MHz to 300 GHz. The most recognizable use of microwave energy is probably in microwave ovens, which rely on the principle that microwaves generate heat beneath the surface of an object rather than just at the surface as in conventional ovens. Other common uses of microwave energy are: in the transmission of telephone and telegraph messages through microwave relay towers; in military and civilian radar systems; in the transmission of signals between satellites and earth stations; and in the relay of signals in certain broadcasting operations, such as subscription television. Medical diathermy is a therapeutic application of electromagnetic energy that utilizes microwave radiation as well as radiation at other frequencies.

Q. Are some forms of radiation more hazardous than others?

A. The amount of energy contained in an electromagnetic wave depends on its frequency (or wavelength); the higher the frequency (and the smaller the wavelength), the greater the energy. Therefore, X rays and gamma radiation, which have very-high frequencies, contain a large amount of energy; at the other end of the electromagnetic spectrum, elf radiation is much less energetic. In between these extremes lie ultraviolet radiation, visible light, infrared radiation, and rf and microwave radiation, all differing in their energy content. Of these various forms of electromagnetic energy, X rays and gamma rays present the greatest relative hazard because of their greater energy content and consequent greater potential for damage. X-radiation and gamma radiation are so energetic, in fact, that they possess the ability to cause ionization of atoms and molecules and thus are known as *ionizing* radiation. Ionization is a process by which electrons are stripped off of atoms and produce chemical alterations that can lead to genetic damage. Other forms of electromagnetic radiation, such as rf and microwave radiation, that lack the ability to ionize atoms are often referred to as *nonionizing* radiation.

Q. What biological effects can be caused by rf radiation?

A. It has been clearly established that rf radiation can be hazardous because of its ability to heat biological tissue rapidly. This is the principle by which microwave ovens cook food, and rf fields of sufficiently high intensity can result in significant heating of the human body and an increase in body temperature. However, rf environmental levels normally encountered by the public are far below those necessary to produce this effect. It is generally agreed that exposure to levels of rf energy of about 10 mW/cm^2 or more can cause significant heating of biological tissue.[1] However, the extent of the heating would also depend on factors such as frequency of the radiation (see discussion below), the length of exposure and environmental conditions.

Two areas of the body, the eyes and the testes, are particularly susceptible to heating by rf energy. Laboratory experiments have shown that acute exposure to high levels of rf energy (100-200 mW/cm^2) can cause cataracts in animals, and there are some cases of cataract production in humans allegedly caused by exposure to high-intensity rf radiation. Temporary sterility, caused by such effects as changes in sperm count and in sperm motility,is possible after exposure of the testes to high rf levels.

At low levels of rf energy, i.e., below the intensities that produce significant heating, the evidence for harmful effects is less clear. Although there have been reports of a wide range of "non-thermal" biological effects, most of these reports have come from the Soviet Union and Eastern Europe. Western scientists have, in general, not been able to confirm the existence of these effects.

The low-level effects reported have included behaviorial modifications, effects on the blood-forming and immunological system, reproductive effects, changes in hormone levels, headaches, irritability, fatigue and cardiovascular effects. Research is continuing to determine whether these effects do indeed occur and, if so, whether they may be harmful.

In addition to intensity of the radiation field, scientists have found that the electromagnetic frequency is important in determining the relative hazard. Data have shown that the human body absorbs rf energy at a maximum rate in the region of the electromagnetic spectrum between about 30 and 300 MHz. Because of this phenomenon, rf safety standards are being developed to take this frequency dependence into account. For example, the most restrictive standards will be in the frequency range of maximum absorption.

Another biological effect of rf radiation that has received attention in recent years is the so-called microwave "hearing" effect. Under certain specific conditions of frequency, signal modulation and intensity, it has been shown that animals and humans can perceive an rf signal as if it were heard. Although a number of theories have been advanced to explain this effect, the most widely accepted hypothesis is that the microwave signal produces thermoelastic pressure within the skull that is, in turn, perceived as sound by the auditory apparatus.

Next month: How safe are some common rf energy sources? Who can you contact regarding a possible rf hazard? QST

*Assistant Manager, Membership Services, ARRL

[1]Rf radiation is often measured in units of power density, such as mW/cm^2.

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Saint Paul '82

It's fun to work a DXpedition, but it's even more fun to go on one, even if it doesn't take you thousands of miles from home.

Saint Paul Island is located in the Cabot Strait, 18 miles northeast of Cape Breton, 42 miles southwest of Newfoundland. Really, Saint Paul is two islands. The larger one is about three miles long. The smaller one, where the DXpedition was held, is less than a quarter of that. Total population: two people — a lighthouse keeper and his assistant.

So what's the attraction at Saint Paul? Saint Paul is part of Canada, but it's not part of any province. It's administered directly from Ottawa. Because of this, Saint Paul has been able to qualify as a DXCC country. And because permission to visit Saint Paul is difficult to obtain, it's become a rare DXCC country.

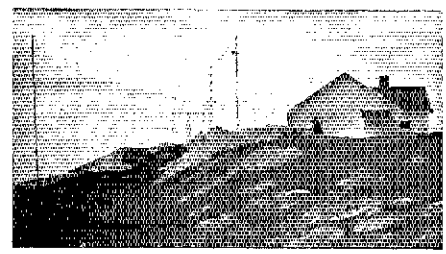
Saint Paul '82 was organized by John Perkins, VE1FH, and Gerry Hull, VE1CER/AK4L, (of ARRL Hq.). The group included Maritimers VE1AI and VE1ASJ, and other ARRL Hq. staffers K1WJ, W1GNC and W1XX. Everything for the five-day DXpedition was brought to Saint Paul on a 42-foot fishing vessel. Unfortunately, the vessel could only approach Saint Paul's rocky shore. Rigs, tower section, antennas, generators (there is no commercial power on Saint Paul), food and bedding had to be transferred to smaller craft, taken to the dock, and carried up a long incline to the vacant house where the station, VE1SPI/1, was set up. It was hard work.

VE1SPI/1 was active on all bands from 160 to 2 metres, on cw, phone and RTTY. Dipoles were used on 160 to 30 metres. Tri-banders were set up for 20, 15 and 10. Long Yagis, at rather low elevations, did the trick on 6 and 2. It took five hours to set up the station, and no contacts were attempted until the entire station was set up. First contact: VE3FRA, at 1854 UTC July 8.

From then on it was operate, operate, operate. Over the next five days, VE1SPI/1 operators logged 258 contacts on 160, 681 on 75-80, 1612 on 40, 120 on 30, 5625 on 20, 2454 on 15, 1099 on 10, 440 on 6 and 122 on 2, including 20 RTTY contacts and 53 contacts through the Soviet RS satellites, for a total of 12,411 contacts. There were plenty of tired operators when the station closed down. Last contact: NU4B, at 0725 UTC July 13.

During the five days, the group had few problems. The first director did fall off the 6-metre Yagi. The normal problem of exhaustion was compounded by the fact that the DXpedition's entire supply of pillows had fallen off VE1ASJ's truck somewhere between Saint John, New Brunswick, and the Nova Scotia border. (VE1ASJ is still looking for his pillows, his pots and pans, a butter dish and two lawn chairs. A reward is offered. . .) And the group was not especially proud of its signal through the RS satellites. But what can you expect when you send cw by keying the press-to-talk switch on the microphone of a 2-metre fm transceiver?

On the other hand, there was plenty of good stuff. Rf from the transmitters did not trip the foghorns out in the strait! The lighthouse keepers were friendly and helpful, and served great lobster. The group asked us to publicly thank John McEvoy and Bill Fitzgerald for their kindness. And, finally Saint Paul '82 was able to chalk up a few firsts: the first use of the 30-metre band from the island, and the first really successful 6- and 2-metre operation there. Saint Paul to South Dakota on 2 is an achievement that any amateur would be proud of. *(Compiled with notes from VE1ASJ)*



Left: Unloading the boat. Rigs, generators, food, everything had to be brought from the mainland. Centre: The VE1SPI/1 group. Included (l-r) were Dick Grantham, VE1AI; Bill Jennings, K1WJ; John Nelson, W1GNC; John Lindholm, W1XX; John Perkins, VE1FH; and Gerry Hull, VE1CER/AK4L. Not shown in the photo is Andy McLellan, VE1ASJ. Right: The operating site. Beams for 20, 15, 10, 6 and 2; dipoles for 160, 75-80, 40 and 30. Yes, that 2-metre beam is *very low. (VE1ASJ photos)*

CRRL NEWS

☐ Bill Loucks, VE3AR, and Ray Perrin, VE3FN, have successfully established liasion with representatives from the Canadian cable television industry. Bill, along with Tom Atkins, VE3CDM, recently met with the chief engineers of MacLean-Hunter Television in Toronto. Out of this meeting came a procedure that will be used to uniformly report on cable television interference problems. Interference would be reported to the local cable company, with copies going to the District Office of DOC, and to the Canadian Cable Television Association, 405-85 Albert St., Ottawa, ON K1P 6A4. Ray Perrin subsequently met with representatives of the Canadian Cable Television Association. He found them sympathetic to amateurs and their problems involving cable television. They agreed to cooperate in every way.

☐ The Ad Hoc Committee on the Strengthening of CRRL, created at the ARRL Board Meeting in Cedar Rapids this year, met at League Headquarters on September 12. Task of the committee is ". . . to study possibilities for strengthening the Canadian Radio Relay League, and to examine and make recommendations as to such rearrangement of resource allocation and responsibility sharing between ARRL and CRRL, as would result in optimum benefit to each corporation and its respective members."

☐ Audrey Staines, VE3KGS, is our new manager of CRRL Box 7009, London. For the past six months, Audrey and her husband, Ray, VE3ZJ, have been processing inquiries, membership renewals, book orders and requests for ARRL-CRRL materials in a speedy and efficient manner. It's really become a big job. CRRL Box 7009 receives 20 to 30 pieces of mail each and every day.

☐ Earlier, we reported that Bill Gillespie, VE6ABC, had set up a Western depot for ARRL-CRRL publications and materials. Bill is at 10129 90th St., Edmonton, AB T5H 1R5. Now, Don Welling, VE1WF, has set up a similar depot in the East. Contact Don at 36 Sherwood Dr., Saint John, NB E2J 3H6.

☐ Here are the totals for the CRRL Central QSL Bureau in Saint John, New Brunswick, up to the end of July: January, 20,399; February, 34,074; March, 21,984; April, 66,819; May, 56,994; June, 44,236; and July, 35,189, for a total of 279,695 QSL cards processed by mid-summer. Yes, there have been more since.

☐ CRRL has three new assistant directors. Dave Fancy, VE7EWI, of Surry, British Columbia, is involved with distribution of the CRRL *Questions and Answers Book*. Wally Garret, VE7CJT, of Burnaby, British Columbia, is widely known as the voice of VE7QST on the Sunday Trans-Canada Net. Dave Toth, VE3GYQ, is an expert on vhf-fm repeaters.

☐ CN Rail has officially recognized ARES, the ARRL-CRRL Amateur Radio Emergency Service. Emergency coordinators in Ontario are now listed in CN Rail's "crash book." They will be called for assistance if a need arises. Similar listing of emergency coordinators in other provinces is expected soon.

*163 Meridene Crescent West, London, ON N5X 1G3

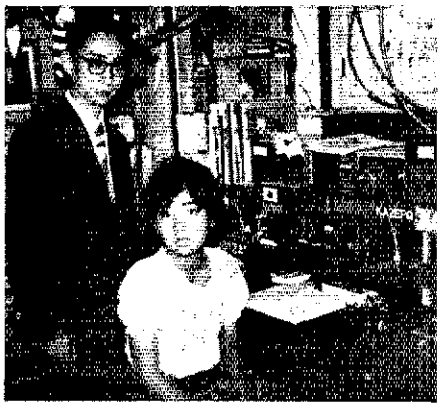
International News

Conducted By Richard L. Baldwin,* W1RU

CHINA

Amateur Radio in the People's Republic of China continues to be a subject of outstanding interest in international Amateur Radio. Recently, in June, Mr. Wang Chuan-Shan, professor and chief engineer of the Space Science and Technology Center, Chinese Academy of Science, visited Japan and paid courtesy calls to the Hq. of the Japan Amateur Radio League in Tokyo and to the Hq. of Region 3 IARU. Professor Wang is ex-C1SS and currently an advisor of the Chinese Radio Sports Association. His visit to Japan extended over a period of three weeks, during which time he attended the 13th International Symposium on Space Science and Technology, and visited the Japan Broadcasting Corporation and the stations of two JA amateurs, JH1WIX and JI1VLV. He was also the guest of honor at a dinner party hosted by Shozo Hara, JA1AN, president of JARL. Professor Wang indicated that five more Amateur Radio stations might soon commence operation in China — two in Beijing, and one each in Nanking, Chungking and Kwangchow.

*Vice President International Affairs, ARRL



Professor Wang, ex-C1SS (left), visits the station of JI1VLV.

At a dinner party by JARL honoring ex-C1SS are (l-r) JA1AN, ex-C1SS, JA1BK.

BRAZILIAN 10-METER BEACON

IARU societies around the world have put into operation a number of 10-meter beacons in order to provide indications as to when the band is open over a particular path and to provide the basis for propagation research. The latest such beacon to come to our attention is PY2AMI, operating on 28,399 kHz, with a power of 10 W. It is located in Americana City, which is 80 miles from Sao Paulo. This beacon was designed and assembled by PY2VRX and PY2FUZ. Reports on its reception may be sent to the PY2AMI Beacon Project, P.O. Box 31, 13470-Americana-Sao Paulo, Brazil.

INTRUDERS

A perennial problem for Amateur Radio is the presence of intruders in the amateur bands. Most of these intruders are stations of other services operating out-of-band, and there are extensive Intruder Watches organized in each of the three IARU Regions. Yet another intruder, however, is the kind who moves down from the vicinity of the 11-meter band to operate in the amateur 10-meter band. This appears to be a problem of great severity in some areas of the world, and we were encouraged by the report of Robert G. Wheaton, W5XW, who relates what is being done in Brazil. There, Dentel (Brazil's equivalent of the USA's FCC) has cracked down in no uncertain manner, the result being jail sentences and confiscation of equipment for those illegal operators. If you want to applaud Dentel for this support of the Amateur Radio Service, write to Mr. Antonio Fernandes Neiva, Director-General, Dentel, Ministry of Communications, 4th Andar, 70066 Brasilia, D.F., Brazil.

VE3CJ HONORED

For his long service to Amateur Radio, including his service as President of the International Amateur Radio Union for nearly a decade, Noel Eaton, VE3CJ, has been named a Knight of the Golden Key by the Norwegian Radio Relay League. This award is presented by NRRL only for outstanding contributions to Amateur Radio, and has only twice before been presented to an amateur who was not a resident of Norway. Thus, VE3CJ has received a high honor, indeed.

In June, the Irish Radio Transmitters Society celebrated its 50th Jubilee Year at a dinner in Dublin. Present to honor IRTS on this 50th anniversary were (l-r) Robert Barrett, GW8HEZ, executive vice president of RSGB; Louis van de Nadort, PAØLOU, chairman of IARU Region 1; Tom O'Conner, EI9U, president of IRTS; and Con Hunter, EI9V, past president of IRTS. *(photo by K1CM)*

At the General Assembly of the Reseau des Emetteurs Francais (REF) in May, these distinguished leaders of REF were present. From left to right are Past Presidents Pierre-Louis Trolliet, F5PT, and Pierre-Beo Herbet, F8BO; President Jacques Hodin, F3JS; Past President Claude Bare, F9BC; and Honorary President Robert Brochut, F9VR.

Strays

Peter D. Martin, WD9EKV (center), of Oconomowoc, Wisconsin, has been named this year's recipient of the $500 Tri-County ARC Scholarship, given annually to a second-year electronics student from Jefferson, Walworth or Rock counties. Presenting the award are Scholarship Committee Chairman KA9KFC (left) and club President WA9WFA. *(WA9SAB photo)*

QST congratulates . . .

☐ Arthur Westneat, W1AM, of Newmarket, New Hampshire, on being selected a Fellow of the Marine Technology Society.

☐ Jim Talens, N3JT, of Arlington, Virginia, on being promoted to Chief of the Domestic Services Branch, Common Carrier Bureau, of the FCC.

☐ retiring Hudson Division Director Stan Zak, K2SJO, who has been elected to the first Board of Trustees of the new village of Rye Brook, New York.

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE MEETING
NO. 402
SEPTEMBER 11, 1982

Agenda

1. *Recognition of new Life Members*
2. *Affiliation of Clubs*
3. *Approval of Conventions*
4. *Report of requests for direct Antenna Case funding*
5. *Report of FCC actions*
6. *Review of status of H.R. 3239 implementation*
7. *Review of actions taken by General Manager in response to previous Board Meeting actions*
8. *Funding for Ad Hoc Committees created during 1982*
9. *Certification of candidates for Director and Vice Director, and review of candidates' statements*
10. *Discussion of policy concerning candidates' statements: Is a requirement for camera-ready copy preferable to the existing requirement?*
11. *Regional Emergency Coordinators*
12. *Request from Director Wangler for consideration of Houston as site for 1983 Second Meeting of the Board*
13. *Request from REACT for support of their position in opposition to CB delicensing*
14. *Progress reports from Ad Hoc Committees*
15. *Appointment of Committee of Tellers for the November 20 ballot counting*

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at 9:15 A.M. EDST Saturday, September 11, at the Headquarters offices of the League in Newington, Connecticut. Present were President Victor C. Clark, W4KFC, in the Chair; First Vice President Carl L. Smith, WØBWJ; Directors Paul Grauer, WØFIR, Jay A. Holladay, W6EJJ, and William J. Stevens, W6ZM; and General Manager David Sumner, K1ZZ. Also present as observers were Vice Presidents Larry E. Price, W4RA, and Gar Anderson, KØGA; Vice Director Thomas B. J. Atkins, VE3CDM; Counsel Christopher D. Imlay, N3AKD; and Washington Area Coordinator Perry F. Williams, W1UED. Director and committee member Mitch Powell, VE3OT, was ill and unable to attend.

On motion of Mr. Stevens, the Minutes of the previous meeting were accepted in the form in which they were distributed.

1) On motion of Mr. Grauer, the Committee recognized the names of 71 newly elected Life Members, and directed the General Manager to list their names in *QST*.

2) On motion of Mr. Grauer, the affiliation of the following clubs as Category I affiliates was approved: Amador County ARC, Pioneer, CA; Athens County ARA, Inc., Athens, OH; Clyde Amateur Radio Society (CARS), Bellevue, OH; Great River ARC, Dubuque, IA; Greater Louisville Hamfest Association, Inc., Louisville, KY; Gwinnett AR Society, Lilburn, GA; Lake Area AR Klub, Lewisville, TX; Megahertz Manor Maniacs, Cambridge, IA; Pompano Beach ARA, Pompano Beach, FL; Salt City DX Association, Syracuse, NY; Sandy River ARC, Wilton, ME; Selma ARC, Inc., Selma, AL; Southern Arizona DX Association, Tucson, AZ; Sylvania ARA, Mountain View, CA; 10-70 Repeater Association, Inc., Maywood, NJ; United Radio Amateur Club, Mansfield, LA.

With this action, the League now has the following number of active affiliated clubs: Category I, 1758; Category II, 10; Category III, 225.

3) On motion of Mr. Stevens, approval was granted for the holding of the following ARRL conventions: South Florida Section, October 15-17, 1982, Clearwater, FL; Roanoke Division, March 19-20, 1983, Charlotte, NC; Southwestern Division, September 2-4, 1983, Anaheim, CA; Southwestern Division, September 4-7, 1986, San Diego, CA.

4) Mr. Imlay reviewed the status of local litigation and regulation concerning Amateur Radio, as follows:

4.1) In the Bynum (WB2SZK) case, at its November 21, 1981 meeting the Committee had voted to provide financial support in the event the Supreme Court of New Jersey accepted certification (i.e., agreed to hear) the case on appeal. This decision is still pending.

4.2) In the matter of the Burbank, Illinois, anti-amateur ordinance, a class-action complaint on behalf of affected residents of Burbank was filed with the U.S. District Court in Illinois on September 10 by attorney James C. O'Connell, W9WU.

5) Mr. Imlay reviewed recent FCC matters as follows:

5.1) Mr. Imlay summarized the comments received by FCC in Docket 82-83, concerning expansion of the hf telephony subbands. On motion of Mr. Smith, it was voted to authorize the preparation of suitable reply comments in support of the League's position in this proceeding.

5.2) Comments were filed September 1 supporting the League's request for rulemaking, RM-4040, which seeks a prohibition on the use of amateur frequencies by cable television. Comments in reply to those of the National Cable Television Association, which opposes the petition, are in preparation, in coordination with the RFI Task Group, for filing by the deadline of September 16.

5.3) Based upon the exchange of letters between Senators Goldwater and Schmitt and FCC Chairman Fowler on the subject of 10-MHz amateur operation, favorable Commission action is expected within the month.

5.4) Comments have been filed by ARRL in opposition to requests for waivers of FCC rules by two manufacturers of energy-efficient lighting systems. The products appear to have a potential for causing rf interference, and should be tested thoroughly before marketing is permitted.

5.5) As the result of the signing into law of H.R. 6955, the membership of the Federal Communications Commission will drop from seven to five as of next June.

6) The Amateur Radio legislation previously identified as H.R. 5008 and S. 929 has passed both Houses of Congress as H.R. 3239, and now awaits President Reagan's signature. A discussion of the steps being taken in anticipation of H.R. 3239 becoming law included a preliminary report by Mr. Anderson as chairman of the Ad Hoc Committee on Preparations for Monitoring and Licensing Activities created at Minute 57 of the Second 1982 Meeting of the Board.

7) Mr. Sumner presented an oral report on actions taken in response to previous Board Meeting actions. All actions arising from the 1982 Annual Meeting of the Board have been completed with the exception of Minute 60, on which work is continuing. Action on several matters arising from the 1982 Second Meeting is underway, including implementation of the section-level reorganization and the new affiliated-club program. The Committee was in recess from 12:00 to 1:34 P.M.

8) On motion of Mr. Stevens, it was voted that each Ad Hoc Committee formed during 1982 is authorized up to $6000 for reimbursement of expenses incurred prior to the 1983 Annual Meeting of the Board.

9) The Committee then proceeded to examine the nominations for Director and Vice Director for the 1983-1984 term. During the course of the examination, the Committee was in recess from 2:32 to 2:40 P.M. while a telephone call was made to one candidate to clarify the text of the candidate's statement. The Committee's findings and actions are detailed below:

Central Division — For Director: Edmond A. Metzger, W9PRN, and Don C. Miller, W9NTP, were found lawfully nominated and eligible, and their names were ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: Kenneth A Ebneter, K9EN, and Howard S. Huntington, K9KM, were found lawfully nominated and eligible, and their names were ordered listed on ballots to be sent to Full Members of the Division.

Hudson Division — For Director: George A. Diehl, W2IHA, John J. D'Luhy, K2EXI, and Linda S. Ferdinand, N2YL were found lawfully nominated and eligible, and their names were ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: Philip H. Bradway, KB2HQ, Paul A. Lindgren, AH2M, Dennis B. McAlpine, K2SX, Stephen A. Mendelsohn, WA2DHF, and Alex M. Pontus, W2FCR, were found lawfully nominated and eligible, and their names were 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 1983-1984 term without membership balloting.

For Vice Director: Richard P. Beebe, K1PAD, and Clevis O. Laverty, W1RWG, were found lawfully nominated and eligible, and their names were ordered listed on ballots to be sent to Full Members of the Division.

Northwestern Division — For Director: Mary E. Lewis, W7QGP, and Joseph N. Winter, WA7RWK, were found lawfully nominated and eligible, and their names were ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: Mel C. Ellis, K7AOZ, 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 Northwestern Division for the 1983-1984 term without membership balloting.

Roanoke Division — For Director: Gay E. Milius, Jr., W4UG, was found lawfuly nominated and eligible. Being the only eligible nominee he was thereupon declared, pursuant to the By-Laws, to be duly elected as Director of the Roanoke Division for the 1983-1984 term without membership balloting.

For Vice Director: 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 of the Roanoke Division for the 1983-1984 term without membership balloting.

Rocky Mountain Division — For Director: Lys J. Carey, KØPGM, 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 of the Rocky Mountain Division for the 1983-1984 term without membership balloting.

For Vice Director: Marshall Quiat, AGØX, and Robert A. Scupp, WB5YYX, was found lawfully nominated and eligible, and their names were 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. However, the Committee was in receipt of a letter from Mr. Heyn withdrawing his name from consideration, as he preferred to run for Vice Director, for which he had also been nominated. Therefore, Mr. Holladay was declared, pursuant to the By-Laws, to be duly elected as Director of the Southwestern Division for the 1983-1984 term without membership balloting.

For Vice Director: Fried Heyn, WA6WZO, Peter F. Matthews, WB6UIA, and Joseph Merdler, N6AHU, were found lawfully nominated and eligible, and their names were ordered listed on ballots to be sent to Full Members of the Division.

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 of the West Gulf Division for the 1983-1984 term without membership balloting.

For Vice Director: Thomas W. Comstock, N5TC, and Milly Wise, W5OVH, were found lawfully nominated and eligible. However, the Committee was in receipt of a Mailgram from Mrs. Wise withdrawing her name as a candidate. Therefore, Mr. Comstock was declared, pursuant to the By-Laws, to be duly elected as Vice Director of the West Gulf Division for the 1983-1984 term without membership balloting.

Messrs. Anderson, Grauer and Williams left the meeting at 3:07 P.M.

10) At the request of Mr. Stevens, the Committee discussed the policy that invites candidates to submit statements of not more than 300 words to accompany ballots mailed to members in their respective Divisions. The advantages and disadvantages of requiring candidates instead to submit statements in the form of camera-ready copy of a particular size, without a limitation on the number of words, were explored without formal action.

11) On motion of Mr. Stevens, after discussion, it was voted that the Communications Manager is requested to investigate the desirability of reactivating the Regional Emergency Coordinator appointment in the state of California, with a recommendation of an appointee, if appropriate, to be submitted to the Executive Committee for ratification.

12) On motion of Mr. Holladay, it was voted to conduct a mail vote of the Directors, as prescribed in By-Law 21, to assess the desirability of holding the 1983 Second Meeting of the Board in Houston, in con-

junction with the ARRL National Convention.

13) A request from REACT for support of its efforts to retain CB licensing in the face of Congressional action on H.R. 3239, which authorizes the FCC to delicense CB, was discussed. It was agreed that, at such time as the FCC initiates rulemaking on this subject, the League should consider filing comments emphasizing the need for the U.S. to honor its international commitment to maintain adequate control over any radio station capable of causing harmful interference to stations in other countries.

14) Mr. Price presented a preliminary report on the work of the Ad Hoc Committee on the Intruder Watch created at Minute 16 of the Second 1982 Meeting of the Board. Some correspondence already has been exchanged by committee members, and background material prepared by Mr. Steinman at Headquarters is being circulated. Mr. Price anticipates the need for two in-person meetings for the committee to complete its work.

15) On motion of Mr. Stevens, a Committee of Tellers for the November 20th ballot counting was appointed as follows: Director Zak, Vice President Price, Mr. Huntoon, W1RW; alternates, Director Sullivan and Honorary Vice President Chapman.

There being no further business, the Committee adjourned at 4:57 P.M.

The next meeting is scheduled for 8:30 A.M., Saturday, November 20.

Respectfully submitted,
David Sumner, K1ZZ — Secretary
Victor C. Clark, W4KFC — President

LIFE MEMBER APPLICANTS
SEPTEMBER 11, 1982

List No. 1: David H. Barstow, WA1WVC; Sandra M. Boatman, NØDPX; Philip H. Bradway, KB2HQ; Robert B. Bruce, WD4EPO; Richard H. Burke, VE3NMH; Gary D. Foster, WD8OXE; William H. Gleason, W7JAZ; Laurent N. Horne, N2NY; Yadin Kaufmann, WB2FHO; Thomas L. Kramer, KEØY; Charles V. Lanza, K5PR; Scott A. Larson, KCØTY; Martin Lewis, KA2CHO; John T. Ronan, III, K3ZJJ; Herman F. Schnur, K4CTG; Russ Schwandt, VE3JUZ; George Walter Sebastian, WA4QXT; Donald R. Smith, AE1Q; Miriam W. Smith, KB4C; Roy G. Smith, N4BYU; Sally L. Taylor-Gardner, N8EEG; Robert Tims, WDØAQZ.

List No. 2: William K. Barr, KA1EJE; Robert C. Beach, W8LCZ; Scott Pryor Belfield, KD6FY; A. E. Britton, KIØJ; David J. Brownell, WB2EFB; Chester L. Buchanan, W3DZZ; Gary Lee Carpenter, KA9CZD; Craig A. Cooper, KA9DUS; Edward Demarest, WB2LVC; Herman J. Doetsch, WB2PHC; Richard H. Doolittle, WD9GMA; Randall Lea Elliott, WA4QXV; Cleyborn Emert, K5TRW; John W. Farrish, Jr., NM4N; Robert J. Fehr, K4HLT; Marvin Fleischman, N1AWJ; John A. Forslund, N9EZ; Rex A. Gage, WA4OAS; Barrie S. Gauthier, K6ICQ; Peter S. Gingras, KA4IBI; Bruce Goff, KC5CR; Gerald Griffin, W8MEP; Ronald J. Griffin, N8AEH; James M. Hairston, WB6HFL; David B. Hamilton, NØCLW; James C. Hepburn, W2IIC; H. James Hire, W8ZET; Stephen J. Huss, WØVY; Gregory Hussey, KT8Q; David L. Jordan, N1ACM; Wayne Keeney, N6CCU; Garry G. Kraemer, WDØDUD; Michael A. Krzystyniak, K9MK; Leo A. Le Bel, K1DPO; George Liepins, KE4HW; Lawrence P. McCauley, N1CAY; John H. Mineham, KG1M; Kenneth D. Moak, WA2JQW; Robert D. Moseson, W4CFF; Terry L. Nelson, AD7P; Oscar L. Nugent, N5LN; Martin J. Oppenheimer, KB6BW; William H. Pattillo; Carter P. Pfaelzer, W1TCD; Don Louis Scherig, KA4LSX; Mary A. Webster, KA3HDM; Ron Wheeler, NØCRR; Harold Winard, KB2M; Robert J. Woodward, KA6LJP.

Club Corner

Conducted By Sally O'Dell,* KB1O

NOT ME? VOLUNTARISM WITH A VENGEANCE!

If your club's S9 action programs fizzle when Vinny Volunteer fades into the QRN, you've got a problem. (See "Not Me!" this issue, page 61.) But it's a problem with a remedy.

Your club is, obviously, a collection of individuals. Whether it amounts to more than that, whether the whole is greater than its parts, depends on your *shared* goals and ambitions. If your members' interests lie solely in contesting, for example, you'll probably have little trouble scrounging volunteers for multi-single or multi-multi operations. But try to get a commitment from someone to head up a Novice class! The "Not me!" will ring loud and clear. Conversely, general-interest clubs, the backbone of Amateur Radio at the local level, usually field Novice classes each year with little more than the usual logistics problems; attempts at getting all-out 24-hour participation by all club members in both the cw and ssb November ARRL Sweepstakes, however, will certainly have the "Not me's" echoing down the hallways as members flee in terror.

The first step, then, is to know why your individual members joined the club, what their shared interests are and what they want out of the club this year. You don't squeeze a watermelon to get lemonade.

Once you know where your club is heading during a particular year — don't rule out trying new activities as long as you have a consensus, a shared interest in the activity — you can get the ball rolling effectively by using a few straightforward techniques. The foundation for a successful year is planning by your officers, delegating the tasks (effective voluntarism) to your club members well in advance, and following through. The planning part is easy if you're mindful of the desires of all your members. Pinpoint those activities that your club will try this year and lay out an annual calendar. Don't take on more than your club can pull off! If events fall too close together or fall on typical holiday or family seasons, you're building trouble into the schedule. When the calendar is roughed out, share it with the rest of your members in the club bulletin or at the monthly meeting. By involving everyone before the annual plan of attack is finalized, everyone will feel they have more of an investment in creating a successful season.

Early in the year, once you know what the club will be doing, you'll have to find members to oversee each activity. If your club is like Mr. Prez's, when the call for volunteers goes out faces turn to stone, eyes glaze over and a deathly hush settles over the clubhouse. Why should volunteering be so threatening? We suspect that *process* issues have a lot to do with it. Process is the *how*, not the what of the situation. How is your president asking for help? Is he so uncomfortable that he asks for the "next sucker" with a nervous chuckle? He'll get what he asks for. A better approach is to describe the job on an upbeat note, mentioning anecdotes and successes from years past, offering realistic expectations for the upcoming year and giving a concise description of the responsibilties.

Seen as an interesting opportunity and a well-defined challenge, the job will be more appealing. Volunteers will gain, not lose, prestige among fellow club members, and will know what to expect once they've offered their services. The final touch is to make sure your volunteers know that (1) you stand behind them, (2) you believe their job is a vital one for the club and (3) they won't be left floundering if they need help.

No volunteers still? Don't despair if you've done your homework. Who is the best qualified? Second best qualified? Who has relevant experience? Useful contacts? Untapped leadership ability? The respect of the majority of club members? If you don't know what your club people-resources are, you'd better find out quickly! A beginning-of-the-year membership survey is the easiest way to find out who does what for a living, who belongs to what nonham organizations and who has what other hobbies. Knowing whom you'd like to do the job, you'll have less difficulty convincing that person. Don't limit your pool of "availables" to the famed inner circle — bring new blood into the inner circle from the periphery.

Once again, process issues will make or break you. When a president singles any individual out for a job by saying "Sorry Jack, you look like the best choice; better luck next time," he's looking for a laugh but asking for trouble. His stating, "Jack, you're active in emergency preparedness with the Red Cross, you're often heard on the state traffic net, and you've done a good job in the transmitter hunts we've had — I think you came in second last year; we'd like you to head up the SET this year," might just net him a dedicated volunteer! Stress the positive. Let him know that you take the event seriously and that you haven't made your choice lightly. You want success and you believe Jack is the man to deliver. When he accepts, thank him for the club and say you're really looking forward to a good SET this year.

The follow through begins here. Lay out the first few steps for your volunteer immediately. Let him know that it's his job to choose two or three others to assist, though the primary responsibility is his. He should arrange for them to meet before the next club meeting and should assign tasks to his volunteers so that each one is the responsibility of one individual. His committee should mutually agree to deadlines and should report to the club at the next meeting.

Subsequent follow through involves one of the officers periodically checking the progress of all committees to head off problems before they swamp otherwise well-intended efforts. Report progress to the rest of the club routinely, giving credit to the committee; use your club newsletter for this. A month or so before the event, the president should call a meeting of the committee to hash out final details. And certainly, once the job is done, recognize the efforts of the committee and its chairman loudly and often.

Effective voluntarism simply requires a little effort. Know what your club wants to do and don't force it in unwanted directions. Know your club people-resources; you may uncover a heretofore-unknown wealth of talent. Pay attention to the process issues when asking for volunteers or picking the right person for the job at hand. Follow through. A strong dose of "Voluntarism with a Vengeance" will drop the "Not Me" bug in its tracks! — *Steve Place, WB1EYI, Manager, Club and Training, ARRL*

*Club Program Manager, ARRL

FILM LIBRARY ADDITIONS

New shows available from the ARRL Film Library are:

1) "Field Day Fever" — A look at the annual outing in Texas that answers the question, "Why do they do it?" Videotape available in BETA and VHS formats.

2) "AMSAT Slide Show" — A short history and look at the accomplishments of the AMSAT-OSCAR Program. Videotape available in BETA and VHS formats.

3) "Amateur Television (ATV)" — A short overview of amateur TV and its uses. Videotape available in VHS only.

4) "Dayton Hamvention" — An amusing look at the activities surrounding the Dayton Hamvention. Slide/audio tape available.

5) "Service Beyond Subscription" — An in-depth overview of the services ARRL provides for its members. Slide/audio tape available.

For further information, contact Karl Townsend, ARRL Club and Training Department, 225 Main St., Newington, CT 06111.

Richard Lachenauer, W2JYF (center), gave 25 years of dedicated service to Amateur Radio in New Jersey before retiring to Florida. Mike Stencel, WB2ANK, president of the Nutley ARS, presented Richard and his wife Doris, with a plaque in appreciation of W2YJF's service before the couple left New Jersey. *(photo by Gordon M. Cox, WD2AHL)*

YL News and Views

Conducted By Jean Peacor,* K1IJV

DXer to be DXpedition

To chase DX is one thing. To be DX is a thrill and a half. As this issue is mailed, Jan O'Brien, K6HHD, and her OM, Jay, W6GO, will be in French Polynesia being DX. They leave October 21 with plans to be there for two weeks. Both incurable DXers, they're really looking forward to what it's like being on the other end.

Jan was introduced to ham radio in 1952 by a charming young man. His name was Jay, and his call was W6GDO. He drove a Hillman Minx that sported a mobile rig. On dates, they talked to the world. When Jay took Jan home to meet his parents, she was introduced to two more hams. His mother, Mildred, W6HTS, since widowed, is still very active. A year later, Jan and Jay were married.

Just prior to their first anniversary, Jan, six months pregnant took the Conditional class exam. Her family doctor, a ham, predicted the baby's birthdate for a Sunday in August. The doctor then scheduled his antenna raising for the same Sunday knowing first babies seldom respond to a schedule. Jan's first son entered the world on the predicted Sunday. Fortunately, he chose early in the day. Jan had a baby. The doctor installed his 20-meter beam. The proud new father helped with the antenna installation. The next day, Jay appeared at the hospital doubly excited: A new son, and he was carrying Jan's new Amateur Radio license, K6HHD.

Three Generations

Jan and Jay later had a second son. When the boys were teenagers, they both obtained Technician class licenses. Two meters provided a convenient and fun way to keep in communication with the family, both with mom and dad, and with their grandparents. They were truly a three-generation ham family.

In the mid '70s, the "D" fell out of Jay's call — he is now W6GO. Jan and Jay have been involved in many different aspects of Amateur Radio: RTTY, civil defense, MARS, vhf and uhf meteor scatter, satellite and moonbounce communications, and repeaters. In 1978, the microcomputer craze infected them too. With thoughts of computer communications via radio dancing in their heads, it was time for them to again become active on hf. With a new radio and antenna installed and the sunspot cycle about at its peak, they were hit by the DX bug. Pileups became irresistible. With all the DX contacts in the log, DXCC was beckoning. The quest was on for QSL cards for each contact.

They discovered a very useful QSL manager list that was published periodically by Gary Yarus, WB0MSZ. At the time, he worked at a university, and had access to a computer and the college print shop. His QSL manager list was started as an aid to his own DXing, but was soon being shared with others basically for the cost of handling and mailing. When he found employment outside of the university, he discontinued this service. DXers lamented the loss of this valuable tool, as Gary had proven his reputation for accuracy and completeness. At this point, Jan and Jay contacted him about the possibility of continuing his work. He was enthusiastic about having it continued and provided them with all of his data as the basis of a whole new project for Jan and Jay. In March 1980, their first issue was published. It's been going strong ever since. Jay develops the computer programs, handling all the data and subscriber records. Jan does the editing and publishing.

Jan O'Brien, K6HHD *(photo by W1YL/4)*

On a Moment's Notice

Jan still finds time to get on the air. Working at home, she can be on the air given a moment's notice. Since March 1979, she has amassed a DXCC total of 287 countries. Talking with people from all over the world (and having many visit) has added another most enjoyable dimension to their lives.

DXing prompted Jan to upgrade to Advanced after 25 years of hamming. She has been a YLRL member for that long. During that time, she has served as sixth district chairman and as disbursing treasurer. She is a member of QCWA and QCWW.

To repeat: To chase DX is thrilling. To write about it is exciting. But to *be* DX is both and more! Look for Jan and Jay from French Polynesia.

ROCK AWARDED TO DOROTHY DIRICKSON, WB5ELG

The 7290 Net presents their Rock Award each year to the net member who has demonstrated outstanding congeniality, cooperation and traffic handling. The 1982 Rock was awarded to Dorothy Dirickson, WB5ELG, of Oklahoma City, Oklahoma. It is just a "plain old rock," as Dorothy describes it, that lists her call letters and those of previous recipients, and it's now hers to proudly display for a year. Another determination will be made in 1983, in this fun way to improve net operating.

Bill Rogers, WA5RAW, who submitted the news of Dorothy, believes that she is one of the best examples he has ever known of the old adage, "Lose yourself in service to others in order to find yourself." Dorothy checks in regularly to several traffic and other daytime nets on 75, 40 and 20 meters. Oklahoma City is well served, as she passes traffic and runs phone patches for the area.

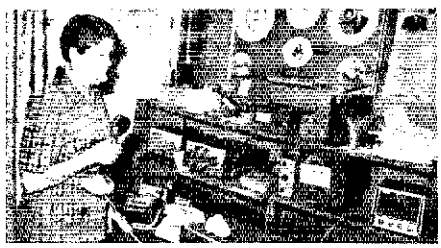
Amateur Radio reared its head in Dorothy's life at a point in time when she and her OM, Dearl, faced some very dramatic changes. After being successfully employed for 15 years, Dorothy learned that eye problems caused from diabetes were turning to blindness. A rehabilitation counselor and a teacher worked with her helping with housework and discussing possible job opportunities and hobbies. At this point, Dorothy chose Amateur Radio as her main pursuit. With the help of C. E. Waddle, WA5SUD, and Mike Head, WB0OCA (ex-WA5TWM), she passed the General class exam in 1971. C. E. and Mike also helped her to establish her first station, which consisted of a transceiver, a tuning aid and a trapped inverted V — all set up for 75 and 40 meters. She recently has added a new transceiver, as well as a beam antenna with rotator. This expanded her band capabilities to include 20, 15 and 10 meters. Bill Rogers contributed an audible beam-position indicator, together with the means for switching between the two rigs for Dorothy's present station.

Net activites began for Dorothy by checking into the Handicappers Information Net on 7.270 MHz. Net members, not necessarily handicapped, exchange ideas and information, and provide assistance when needed. She since has expanded her net operation to include other handicappers and traffic nets, as well as the Texas Young Ladies Roundup Net.

Dorothy works as a volunteer at a Veteran's Hospital and is a member of the Oriole Rebekah Lodge. Together, she and Dearl work with the deaf. They also enjoy camping and fishing.

Not only has she contributed to Amateur Radio, Dorothy has made many friends during her 10 years of activity. The Rock certainly was justly awarded.

*Country Club Dr., Monson, MA 01057



Dorothy Dirickson, WB5ELG

The Caribbean's best known YL, Hyacinth Mathew, V2AYL, was honored recently by her fellow hams throughout the Antilles region. Hya, in her home land of Antigua, was presented with a plaque featuring a map of the islands forming the network of the Antilles Emergency and Weather Net for her outstanding services. She has provided detailed weather reports for the region twice a day, every day, for the past four years. Ramez Hadeed, V2AU, vice chairman of the Antigua and Barbuda Amateur Radio Society, presents the award to Hya. *(photo courtesy V2AC)*

How's DX?

Conducted By Ellen White,* W1YL/4

WØDX — Early DXpeditions

Researching the pages of *QST* has led this writer down a retrospective path, on the search for clues that pointed to the start of the post-WW II era of DXpeditioning as we know it today. There surely had to be some specific point in time that could be focused upon. Luckily there was, and happily, at that, it turned out that one of the prime instigators of this particularly virulent form of operating turned out to be available for in-person inquiry. Part and parcel of the DX scene is Bob Denniston, VP2VI/WØDX, former ARRL President, distinguished under the former pseudonyms of WØNWX, W9NWX, W4NNN, FO8AJ, HKØTU, etc.

As has been noticed by this writer in past investigations, some of the really great contest and DX people evolved in the mid-'30s. Bob is further proof of this, having been licensed in 1933 — when W9NWX was Iowa (the call areas later being changed by FCC, resulting in WØNWX). During this period, Bob found special pleasure in 80/40 cw and 160-meter phone (that was during an era when you could play a phonograph record to test your a-m rig!). The insidious DX bug was nibbling on WØNWX, and Bob recollects that time quite well — when he built a 210 rig for the ARRL International DX Competition, turning it upside down in a bucket of oil to permit a little more power without it overheating. In that operating event, his big DX worked was Germany, D4.

The shadow of the "big war" was on the horizon, and radio operators were needed badly. Along with many others, Bob responded to *QST's* plea for radio operators to join the service. He went to Washington, DC, where he enlisted in the 17th Signal Service Corps. After a brief period of time, he — along with two other hams — was assigned as radio operator on President Roosevelt's train, a mobile assignment that kept him in contact with the District of Columbia as the President's train rolled along. Later in the war, he became radio operator on President Truman's train — staying in that post as a civilian when he left the service in 1946.

It was right after the war that several DC locals got together and formed the nucleus for what would prove to be the famous Potomac Valley Radio Club. Bob had worked a lot of DX from member stations (W3GRF, W3JTC [now W4AAV] and others), and kept thinking that it might be great fun to be on the other end of the pileups; a notion well ahead of its time. However, he had a mighty difficult time convincing others in the fraternity of the validity of his notion (Bob says he knows full well how Columbus must have felt!) Finally, though, a couple of hams agreed to go with him, and he promptly called Telecommunications in Nassau asking for a license, prepaying the answer. It came back as "Yes," resulting in VP7NG, the first of the Bahamian licenses to be issued following WW II. The whole world fell in on VP7NG when they opened up in the ARRL International DX Competition — a pattern that would occur frequently in the coming years. The July 1948 issue of *QST* covered VP7NG — "Expedition Gon Waki" — so named on the heels of Thor Heyerdahl's Expedition Kon Tiki.

Up to that time, DXpedition terminology — as we know it today — just wasn't known. VP7NG was a DX Expedition. The contraction in terminology Bob attributes to Phil, CM9AA, an American in Cuba, during the few years following the VP7NG "coup" — that period of time when the whole idea of going places to activate Amateur Radio caught on.

The Nassau foray was such fun that Bob knew he'd just have to do the expedition route again. There were several places on the ARRL DXCC List that had never seen operation. Clipperton looked to be a good choice, primarily because it was geographically close — off Acapulco and the west coast of Mexico. A Mexican general, XE1H, proved to be very helpful in aiding the party of four get the gear through Mexico. Prior arrangements had been made with the French Society, via a license issued in Tahiti, to operate from Clipperton. The French Government, however, pointed out most clearly (upon providing the call FO8AJ) that their government would not be responsible for injury to persons or property. The first chartered boat went out, couldn't locate the island, and returned to port. Happily, a second try a week or so later proved successful. In the brief period between the two trips, the group enjoyed the fruits of the devaluation of the peso, with rooms in a lovely hotel complete with three meals a day (including steak) at $4 a day per person! July 1954 *QST* came up with a cover first for our Amateur Radio journal — a DXpedition cover showing the crew landing on Clipperton, FO8AJ, eating coconuts. The story makes as exciting reading today as it did in the mid-'50s.

Denniston's ARRL political period began in 1955, when a number of Iowa hams asked him to run for Midwest Division Director, the start of five two-year terms. While Director, he went to VP1 in 1960, during the DX Competition, using VP1JH to put British Honduras on the air. It was a competitive effort that was particularly difficult for DXpeditions — a time when each mode of the DX Test was run over two different weekends (in February and in March). Regardless, VP1JH turned in the top score worldwide, a record that stood for seven years. He found the location ideal, directly south of Chicago geographically, with all those time zones "above" allowing him to work the USA on several bands all the time. He notes the location was perfect for both 160 and 10 meters to "work," and included a location just by the sea.

Malpelo, an inviting DX location with less than an inviting terrain was visited twice. HKØ proved even tougher than Clipperton for landing. In fact, the president of the Colombian National Society received a broken leg during the hazardous landing venture and had to be transported back to Bogotá for medical attention, leaving the HKØTU crew on Malpelo for five days.

VP2VI/WØDX, former ARRL president, reminisces over his memorable FO8AJ (Clipperton) expediton, reported in July 1954 *QST*. *(W1YL photo)*

Ten years as ARRL Director was followed by six years as ARRL President, following the retirement of Herbert Hoover, Jr. Bob served as President of the International Amateur Radio Union simultaneously and for an additional year, taking great satisfaction in involvement with IARU prior to the important World Administrative Radio Conference — a period of time that saw the start of both Regions 2 and 3.

Ham radio certainly has been very much a part of the fabric of his life. In the '60s, he took his family vacationing in the U.S. Virgin Islands (naturally to check out BVI, which had no operating at the time). During that trip, the Dennistons rented one of KV4AA's homes, staying three weeks (coinciding again with the DX Competition). The checkout of BVI led to the whole family falling in love with the island, and with Bob returning the following year, winding up in the hotel business, and as holder of VP2VI.

There have been many changes within Amateur Radio during Bob's ham career, but most significant to him has been the growth of Amateur Radio in many countries, leading to the continuing increase in strength of the IARU.

As a postscript to my recent talk with Bob, I asked him to denote those he considered to be the very cream of the crop operators. His list, though short, is certainly indicative of the quality he had in mind and included the recently departed KV4AA; the famous Juan Lobo y Lobo, XE1A/XF1A; W9BRD, outstanding DX Column editor of *QST* for 30 years; and still one other operator cut from the same bolt of cloth as Denniston himself, the inimitable Katashi Nose, KH6IJ.

As for future DXpeditioning, Bob says in his inimitable low-profile manner: "Well, every now and then KP2A gets an idea and off we go!"

*19620 SW 234 St., Homestead, FL 33031

DX TIPS

N6RJ suggests the start of a series dealing, in brief, with ideas that can help upgrade DXpertise (input hopefully supplied by you, the readership). Let's start this month with a reminder of the efficacy of shadow-edge or gray-line DXing. On the low bands (40, 80 and 160), in particular, optimum DX conditions will occur at sunrise/sunset, an event sure to surprise the newcomer. (A particularly useful tool for determining critical times continues to be advertised herein — the DX Edge, a Xantek product, Box 834, Madison Square Station, New York, NY 10159.) Now, how about sharing your ideas?

ARE U.S. AMATEURS SENDING OUT THEIR QSL CARDS?

1V3TQE has an interesting rebuttal to W1BBJ's analysis (Nov. 1981). Edgardo examined the period from the beginning of his activity in April 1978 until July 1982, including cards received through July 1982. He sent 1262 cards to U.S. stations with the following results: 503 (39.8%) replies received.

Call Area	*No. Cards Sent*	*No.Cards Received*	*% Received*
W1	109	41	38%
W2	126	52	41%
W3	85	42	49%
W4	173	60	35%
W5	107	41	38%
W6	249	84	34%
W7	112	48	43%
W8	93	42	45%
W9	95	33	35%
W0	113	60	53%

The worst percentage is in the W6 area, particularly discouraging to 1V3TQE, as he is trying to get the California certificate. Edgardo finds it all pretty discouraging: For every 10 cards sents out, six will not be confirmed.

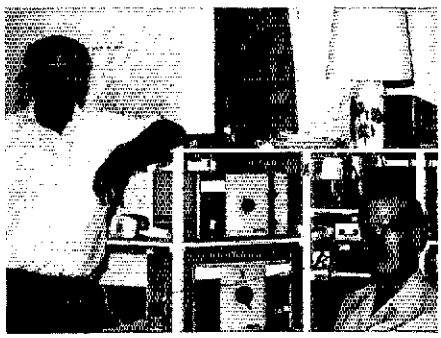
THE CIRCUIT

☐ K4YT relates the hectic proceedings that led to his early-July stint at TYA11 (N4HX). Thanks to some last-minute maneuverings, K4YT was able to rearrange his schedule and arrive in TY in time to run 1900 contacts in the Radiosport Contest (and a total of 5000 for his brief trip). The political situation between Benin and the United States is changing for the better, but N4HX feels it will be some time before another ham license is issued in Benin. Had it not been for his ambassadorial rank there never would have been a TYA11. (TY9ER, who was with the German Embassy, left last year for DL, as his assignment was finished.)

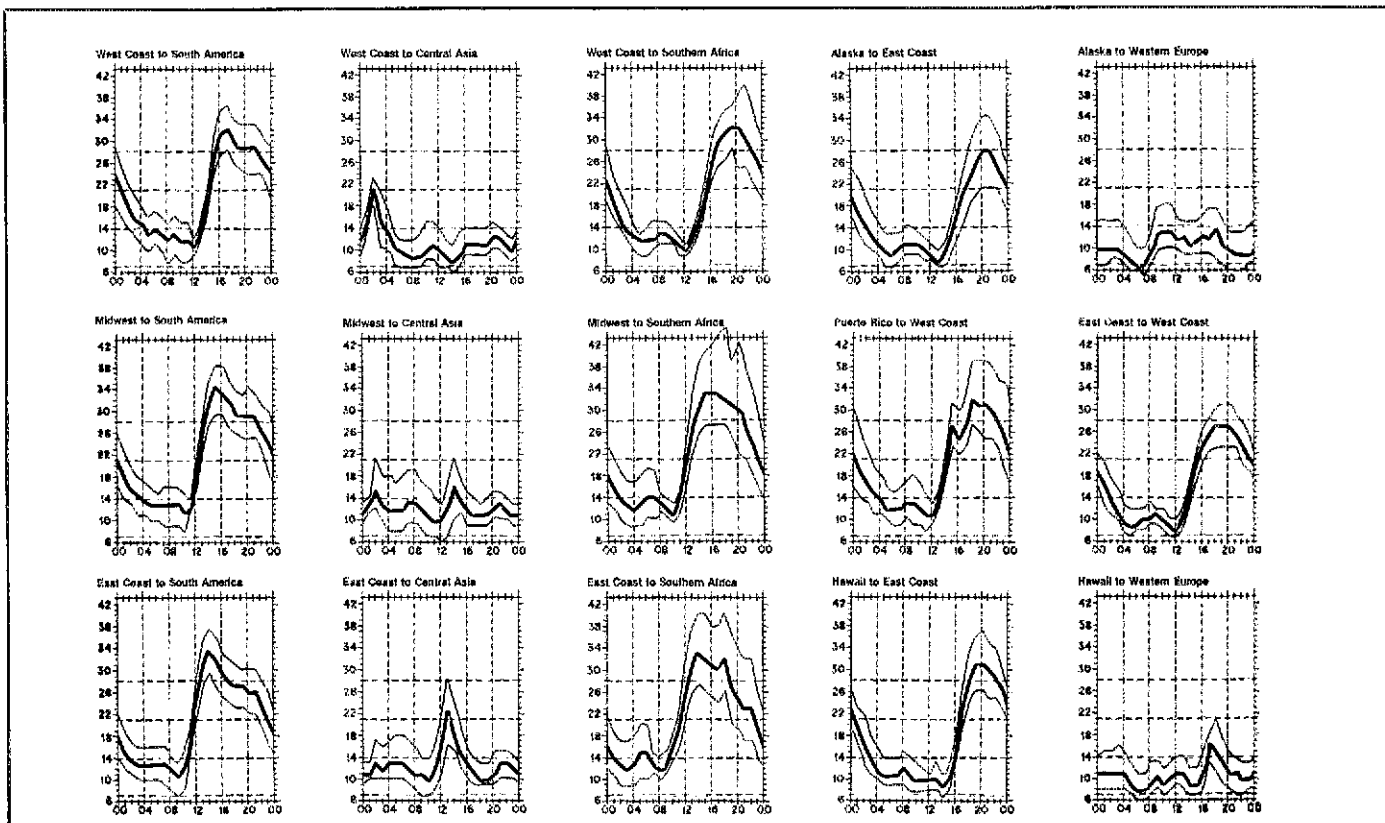
On July 29, K4YT went to Lagos, paid his licensing fee, and was immediately able to operate K4YT/5N0 (it takes 3-6 months to get a regular call from the PTT). In mid-September, 5Z4, 5X and ET3 were still on the agenda for visits. In January, Karl hopes to attend the SEANET convention with K3ZO. All cards go via his brother Bob, W2TK, 366 Rutherford Ave., Lyndhurst, NJ 07071. QSLs are not expected to be "ready" until the very end of the year, or possibly January 1983. AS

☐ Dave Bell, W6AQ, has been unanimously elected to the Board of Directors of the Northern California DX Foundation. Dave, a prominent business executive and well-known Southern California DXer, is expected to be an active board member and, as such will lend his expertise to several NCDXF standing committees. NCDXC was recently honored by the Iberia DX Club of Madrid with the award of the PLACA 1DXC, in recognition of "continuous contribution to DX." Previous award recipients include Geoff Watts, for his long-term production of the *DX News Sheet;* EA9EO, for his outstanding cw work at 3C1AA and 3C0AB; the Mexico DX Club, for XF4 expeditions; and the master DXer ZL1AMO, for his well-conducted DXpeditions in the Pacific Area. Further information on the NCDXC Foundation is available from Bud Bane, W6WB, 391 Monterey Blvd., San Francisco, CA 94131.

☐ G6DN, one of the pioneers within Amateur Radio, died June 29 at the age of 90 years. Charles Mark Denny was secretary of one of the earliest clubs, the Newcastle-on-Tyne Wireless Society (in 1911). At the



When not making last-minute appearances at exotic locations, you might well spot K4YT at DX meetings throughout the country. Here's Karl (in Washington last June) with Jane, KG3R (QSL manager for C53CG and VU2YOU). On the right, Karl visits Benin at TYA11's shack, last July.



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

outbreak of WW I, G6DN was a telegraphist in the Royal Navy, was commissioned in the Royal Flying Corps on its formation and was engaged in the development of early aircraft radio. Of recent years, he has been president of the Thornton-Cleveleys Amateur Radio Society, and will be sadly missed by the members and his friends worldwide. The Fylde, the area around Blackpool, feels it has lost a dear friend in G6DN, the first English amateur to work America.

☐ Record keeping: KA2HWW finds column material voluminous and of interest, but rather unwieldy in handling. If you've developed any ideas on keeping track of various column information for easy retrieval, share it with Jim and other readers of How's DX? by forwarding it to the column editor.

☐ IDXF member KA3BUJ/8R1 finished up his summer stint from Guyana; QSL via N7YL. Cards should have begun showing up about a month ago. IDXF volunteers continue to be needed. Contact Bob Schenck, N2OO, IDXF, Box 117, Manahawkin, NJ 08050.

☐ Cards for the March/April 1982 ZM7VU Tokelau operation have been showing up and, much to this author's surprise, manager, F6DYG turns out to be old contest/DX pro DL7AH — active since 1938.

☐ The September FPØJA foray, manned by KP2A of the International DX Foundation, will be confirmed via WB2MSH, Henry O. Feltman, Jr., 20 Progress Ave., Woodbury, NJ 08096.

QSL Corner

Administered by Joan Becker, KA1IFO

Here is some 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 accurate. The call sign in parentheses is the QSL manager.

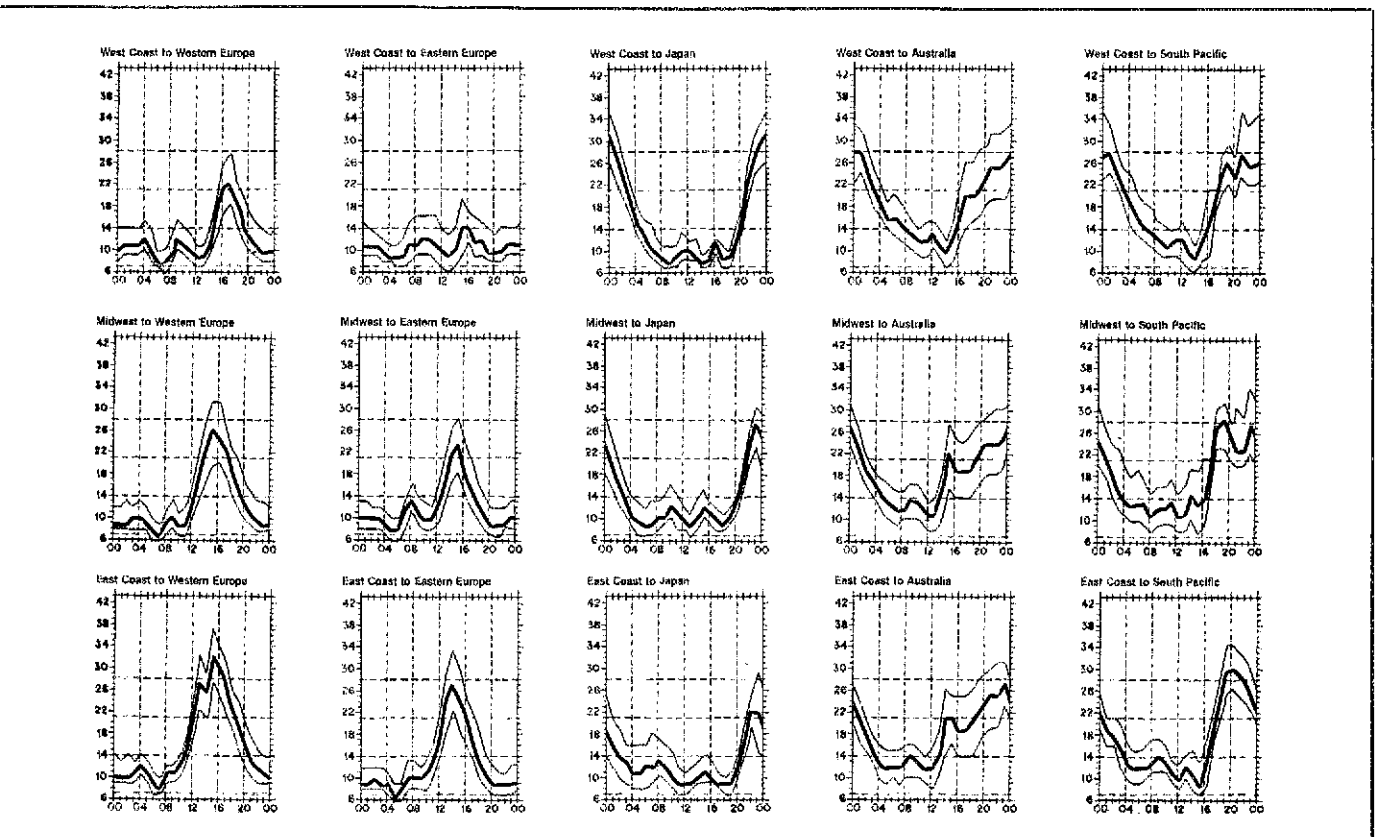
AMØ2AA1/Z P.O. 171, Zaragoza, Spain
CO2HQ (KB7SB)
CO2HS (KB7SB)
CR9BK (JA1HGY)
CT2CB P.O. 44, Santa Marie, Azores
CX4CC (W3HNK)
C31JX (DK9FE)
C3ØLM (EA3BKZ)
C3ØMK (EA3WZ)
DU7RLC P.O. 901, Bacolod City, Philippines
EKØK (UA9OBA)
FO8BW (W6JFM)
GJ3ZAY P.O. 146, Cambridge, England
GJ4LVH P.O. 146, Cambridge, England
HS1BV (KO2A)
HT1MAT P.O. 1474, Managua, Nicaragua
JY9RC (W1VBI)
J3AVT (W8UVZ)
J6LB (KO2A)
J6LZA (K4LTA)
OX3GH (WA2TTI)
OX5RD (N9BEM)
OZ7GI/5N9 (OZ7GI)
SMØGNU/OHØ (SMØGNU)
SVØCJI P.O. 349, Rhodes, Greece
S79ARB (WA4VDE)
TA2KS (G3SCP)
T32AF (WH6AIF)
VE1GU (WB2LCH)
VK9NA (VK3LG)
VK9ND P.O. Box 279, Norfolk Is., Australia
VK9YB (KB9UV)
VP2MDX P.O. Box 7681, Houston, TX 77270
VP2MN (WB2LCH)
VP5EPX (N4CTC)
VQ9CI (KA4UMB)
VS5HG P.O. Box 980, B5B, Brunei
V2AAW (KG6S)
V2ANH (KE1A)
YB9BV (W5GZI)
ZF2FM (N2DH)
ZK1YL (ZL2BAO)
ZP5JAL (KO2A)
3B8FA (N8ANC)
3B8FE (3B8CF)
3D2ER (W5RBO)
3V8AL (DL5MBY)
4S7XS (DL7XS)
4X6BL (KO2A)
5H3DM P.O. Box 9112, Dar es Salaam, Tanzania
5N8KRT P.O. 2773, Kano, Nigeria
6D5VIC (KV8U)
6Y5PL (G3SXE)
6Y5MJ (K8ZBY)
9M6VW (KO2A)
9X5WP Box 1, Nyana, Rwanda
9Y5ØNP (W3HNK)

QSL Manager Volunteers

KC8NO
KBØZP
KB3DH

SPECIAL NOTES

☐ K2CM is QSL Manager for BV2A only.
☐ K2IJL is not manager for these stations: 5U1BA, FM7AY, A4XIO.
☐ W8UVZ is not manager for J3AUT.
☐ June 1982 QSL Corner, page 72, contains information and addresses for the Incoming Bureaus. September 1982 QSL Corner, page 65, contains information on the ARRL Outgoing Overseas QSL Service. For information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 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, 1982, assume a sunspot number of 87, which corresponds to a 2800-MHz solar flux of 136.

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 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from July 1 through July 31, 1982. 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

DF3EK/171 DJ6XO/109 DK5JI/229 DL3EAP/116 DL5LAG/107 DL5NS/105 FG@FOK/105 FG@GOL/FS/105 FM@FOL/100 G3YMC/110 G4KHB/100 HB9ANY/109 JA1OMV/115 JE1HKW/157 JH1FDP/225 JE3DYW/116 JA9TOF/132 LZ1NG/198 OK1ACT/307 OK1JIM/103 PA3ABH/156 PY1DUB/199 PY2DSQ/288 SM3KHN/105 YU2AAT/133 YU2QU/105 YU7AEW/110 AA1U/178 K1DW/152 KA1SA/123 KA1UE/134 KF1B/100 N1BVZ/101 NV4O/120 W1IVB/107 KA2DLK/105 KB2FC/104 KB2HK/241 KB2ID/103 KI2S/101 W2BHK/286 W2KWW/112 WA2BDW/101 WA2DHZ/103 WA2IKS/119 WB2HQF/100 WB2SIB/124 AJ3F/101 W3DKL/107 W3BLHY/100 KC4IF/108 N4AKZ/106 N4AYJ/154 AA6G/308 KB6WW/106 W4NM/104 W4YVZ/102 W6KG/SV9/114 W8KG/4X/102 W6QL/SV5/100 WA6BCN/108 K7AJ/109 KB7VM/103 W7DJI/107 K9LJN/169 KB6WW/106 N6AX/116 N6DCJ/110 W6KG/SV9/114 N8AHA/100 N8CXX/104 W8UMP/119 WD8CZA/249 K9GMV/179 KK8C/155 KN8D/108 KW8G/166 K@ARO/104 KA@CDW/154 KB@UE/100 KR@S/100 N@BLD/107 N@IT/153 W@JMZ/314 W@OSK/102 W9ICZ/101 WD9IPW/106 K@WW/104 KA@CDW/152 KD@F/106 N@BLD/105 N@BZA/122 N@IT/132 W@JMZ/309

Radiotelephone

AA4IY/191 DF1AG/159 DK5DS/129 EA1ABT/226 EA5BWU/117 EA5CIX/127 FG7BG/144 GM4DKO/108 GW4IQA/101 GW4KAW/102 HM@OO/109 JA1OMV/114 JH1FDP/150 JE3DYW/104 JA9TOF/132 LX1FJ/142 OE1KJW/100 OK1KRS/109 ON7EJ/272 ON7WW/276 VK@AN/102 VP5PX/103 ZS6XS/103 4Z4VG/110 K1DW/115 KA1SA/123 KA1UE/130 KF1B/100 N1AIS/101 W1JCI/138 WA1OEZ/100 K2CU/109 KA2HHW/110 KB2CB/206 KB2FC/103 KB2ZQ/102 KI2S/100 W2GZA/215 WA2OQW/100 WB3AMO/110 K4VHT/114 KC4IF/107 W5DLQ/112 N4DSU/102 N4IR/102 NV4O/106 WB4BQM/113 WD4ISQ/106 WD4SCG/104 KC4IF/107 W5DLQ/112 WB5SAK/115 WD5ELJ/115 W6CDO/112 W6MND/129 WB6TJW/104 KC7DD/111 KK8C/105 KW8G/162 N8DFO/102 W8DTI/100 WB8PAT/107 WD8IXE/126 WD8LLD/105 WA8ZDL/227 WD8CZA/249 K8GMV/173 KB9LN/118 KB9OG/118 KC9MF/102 KA@CDW/152 KD@F/106 N@BLD/105 N@BZA/122 N@IT/132 W@JMZ/309

CW

DF3EK/165 DF8XP/106 DJ@EU/105 DL6QW/110 DL7QE/212 DL8BAB/109 EA1BAD/107 G3BBR/107 G3YMC/101 G4GIR/135 JE1HKW/100 JF1SLN/101 JA9BCB/109 AC1X/105 AB1U/137 KB2EN/108 W4ABI/102 N4BU/105 KD4PP/101 KR5D/102 KT5F/169 WA6LFF/133 W6PKB/103 W6CIT/103 N6AX/111 K6ZM/269 K8MW/149 WA9JWL/127 KG9N/106 K9LJN/121 AA9F/104 N@JP/107 KM@Q/100

RTTY

DK1BX

5BDXCC

LZ1NG SM7BYP W7ZR EA7AGO VE3GJH VE3DGX EA7OH

Endorsements

Mixed

CX1BH/253 DF2PW/197 DF3EC/170 DF8XP/182 DJ4XC/227 DK1YK/290 DK4BW/306 DL1LD/325 DL4FL/270 DL7UX/304 DL9TW/253 DL@AA/282 DL@II/157 EA2LY/196 EA8RL/230 G3BLS/130 G3TXF/277 G4GIR/220 HB9BLQ/256 HB9IK/335 HL1SX/236 I5EFO/290 IT9PUG/312 JA1HOM/290 JA1RLV/301 JE1GMM/271 JF1SLN/227 JH1QOJ/315 JH1XUP/200 JA2BOV/207 JA2CQX/175 JA2KVD/305 JA3BG/332 JA3PXH/279 JE3BIQ/210 JH4UVU/201 JA8BMK/316 JA8FKO/304 LA8LF/340 OH1SM/225 OH2FS/313 OK1KRS/264 ON7EJ/289 ON7WW/287 OZ1CTK/298 OZ7BG/310 PA@NOL/209 PA@TAU/333 PY1APS/335 PY4KB/203 SM5CAK/331 SM6VR/323 SM7BBV/319 SP6BZ/276 VE3LDT/261 V2DFE/301 VK3BFD/158 YU1AG/325 YU3CM/301 YV5BX/346 YV5BZ/345 ZL4BO/346 4X4NJ/325 AB1U/290 AE1T/247 K1CC/315 K1ITS/190 K1MM/310 K1RH/278 KA1KD/229 KA1NL/282 KA1UI/169 KB1BE/227 KE1F/275 KG1V/178 WA1UVX/297 WA1YIO/153 K2LWR/355 K2MRB/231 KA2HJS/126 KB2CB/216 KB2WI/185 KF2U/150 KO2K/205 KS2C/136 N2VW/273 W2BBK/290 W2BMK/352 W2WW/300 W2ZZ/331 WA2PPV/215 WB2KJL/239 K3PPI/200 KB3TN/276 N3AKD/225 N3BKZ/184 N3BQS/131 N3ED/324 W3BZN/286 W3KH/270 W3KV/328 W3LPL/327 W3NJL/154 W3NJV/130 W3TB/167 K4GLA/326 K4JAG/233 WD4NBX/260 K4RZ/313 K4ZIN/213 KD4OM/125 KD4PP/157 KS4Z/306 N4BU/149 N4AJZ/276 N4IR/277 NE4F/221 W4AVY/349 W4BV/315 W4DFU/201 W4DR/357 W4HYY/258 W4MBD/178 W4OMY/249 W4OWJ/331 W4PGK/185 W4PRX/278 W4TL/256 W4TM/361 WA4SAC/129 WA4VCC/270 WA4YVQ/305 WD4NBX/260 K4STT/294 N4BU/105 N4IR/102 NV4O/106 WB4BQM/113 WD4ISQ/106 WD4SCG/104 KC7DD/111 KK8C/105 KW8G/162 W5DLQ/112 W6CDO/112 W6MND/129 WB6TJW/104 WB8PAT/107 WD8IXE/126 WD8LLD/105 WA8ZDL/227 WD8CZA/249 K8GMV/173 KB9LN/118 KB9OG/118 KC9MF/102 KA@CDW/152 KD@F/106 N@BLD/105 N@BZA/122 N@IT/132 W@JMZ/309 W@OSK/102 W9ICZ/101 WD9IPW/106 K@WW/104 KA@CDW/154 KB@UE/100 KR@S/100 N@BLD/107 N@IT/153 W@JMZ/314 W@OSK/102

Radiotelephone

CX3BH/252 CX7BF/289 DF5CL/152 DF8XP/152 DJ1XP/306 DK2WH/285 DK6AO/204 DL4FV/126 EA2LY/173 G3OPL/175 G4GIR/186 HB9BLQ/237 HL1SX/236 I1TBE/310 I1XA/235 I5EFO/290 I5WT/341 IC8EGO/294 I@SSW/249 IT9YHR/215 JA1NLI/254 JF1SLN/205 JA2BOV/205 JA2CQX/175 JA2KVD/291 JR2UBS/130 JA3BG/272 JA3PXH/207 JE3BIQ/208 JA8BMK/291 JA8FKO/125 JH8MXH/238 LA8LF/333 LU8MBV/263 LU1BAR/W4/316 OA4OS/329 OH2FS/199 OZ7BG/225 PY2DSQ/286 PY3BXW/330 PY4KB/201 SM5CAK/313 SM6VR/308 VE3CE/280 YB2CR/205 ZL1AAS/317 ZL4BO/325 ZP5PX/262 ZS6FU/270 AA1U/178 AB1U/202 K1FEV/128 K1MM/305 K1RH/272 KA1NL/269 KA1UI/151 KE1F/241 W1WXZ/290 W1ICU/333 WA1UVX/294 WA1YIO/151 K2MRB/202 KB2EF/177 KB2HK/240 KB2HQ/160 KB2VK/275 KB2XP/186 KF2U/150 N2BJ/277 N2VW/273 W2MLH/160 W3AKD/200 W3ART/186 W3ED/306 W3GXK/202 W3KV/204 K4PQV/315 K4ZIN/161 KB4WY/200 KD4PP/133 KD4TS/149 N4AYJ/154 N4BVP/209 NF4Y/227 W4AVY/329 W4DFU/163 W4GXT/250 W4MBD/129 W4MOM/178 W4OMY/234 WA4GKT/250 WA4VCC/270 WA4YVQ/304 WD4DJA/180 K5GK/277 K5HT/226 K5MK/252 KA5DFE/226 KB5AC/264 N5BA/184 W5GZI/190 AC6V/286 K6SX/300 KD6EO/200 N6VO/213 W6NAC/156 WA6LFF/244 K7QLC/225 K7ZBV/274 KB7YX/200 W7AEP/271 WA7OBH/260 WB7SGU/199 WB7SGB/183 K8AXG/305 K8DYZ/341 K8NW/306 K8NV/333 K8UQ/200 KA8DBM/147 KB8XN/170 KC8BK/233 KC8JE/199 N8ANC/280 N8ASV/160 W8GIO/301 W8JRW/198 W8SET/307 W8TA/253 WA8SAE/139 WA8VPN/188 WA8ZDL/227 WD8CZA/249 WD8IJC/237 WD8LLD/105 WA8ZDL/227 WD8CZA/249 K8GMV/173 KB9LN/118 KB9OG/118 KC9MF/102 KA@CDW/152 KD@F/106 N@BLD/105 N@BZA/122 N@IT/132 W@JMZ/309 W9ICZ/101 WD9IPW/106 K@WW/104 KA@CDW/154 KB@UE/100 KR@S/100 N@BLD/107 N@IT/153 W@JMZ/314 W@OSK/102

CW

DF2PW/180 DF2PI/164 DF3EC/161 DL1TU/229 EA2LY/121 EA3BEN/130 EA8RL/198 EI7CC/126 G3TXF/202 JH1XUP/125 JA2KVD/214 JA3BG/258 JA3PXH/246 JF3AUA/134 JH4UVU/182 LA7SP/153 OK1KRS/215 ON7EJ/277 ON7WW/262 OH2FS/167 OZ1CTK/280 VE1BLX/226 VE3BX/280 K1ITS/175 K1MM/293 K1RH/272 KA1NL/161 KE1F/158 WA1UVX/171 K2OB/145 WA2CBB/254 WB2FXK/166 WB2KJL/169 N3ED/253 W3KV/164 KV4F/175 N4IR/261 NE4F/201 W4BV/260 W4JD/260 W4WXZ/175 WA4OML/154 AA5C/224 K5BDX/207 K5MK/206 K5XE/200 N5BA/158 AC6V/132 K6WD/228 KA6IYE/125 N6JM/185 N6UH/198 NE6I/127 W6OUL/186 WA6IGU/201 K7ZBV/200 W7EDA/232 W7JAC/157 K8DYZ/295 KC8CJ/130 WA8SAE/260 WB8JEY/285 WB8YJF/123 K9AYK/177 K9IW/273 K9JU/230 WD9IIC/250 W@GAX/153 K@SI/175 W@JSN/178 W@VX/229

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

Repeater Jam

Some people are ornery. You run into them every day; you can't avoid them because ornery people go out of their way to get in your way.

The world of Amateur Radio has its share of ornery people, too. The ornery ham gets on the net frequency, fully aware that the net starts in five minutes, and refuses to move ("I was here first") when the net control tries to get started; later, he complains that ". . . those nets think they own the frequency."

In a pileup, the ornery ham continues sending his call sign after he has heard the DX station come back to someone else. If he can't get through, he's going to make sure that no one else gets through.

The ornery ham doesn't like repeaters "in principle" and insists on QSOing on the input of the repeater. "Hey, I'm just rag chewing on this old frequency. . . can't help it if it's the input of some repeater!"

Simplex vs. Duplex

Well, ornery hams beware! The folks from Gettysburg have passed on a new policy decision that takes a dim view of the activity of ornery hams in the repeater subbands. According to FCC, when a conflict arises between a coordinator repeater and simplex operation, ". . . good practice dictates that the simplex operation must move." The Commission's reasoning is spelled out in the following paragraphs.

1) Repeater operation is not permited on some Amateur Radio bands.

2) On those bands where repeater operation is permitted, such operation is confined to a limited portion — a subband — of the band.

3) The nature of repeater operation necessitates some form of channelization; haphazard frequency selection would result in poor spectrum utilization, and constant frequency change is impractical.

Simplex and Duplex Cooperation

Simplex stations do not have these limitations and must avoid frequencies designated for repeater operation. Cooperation in this regard is required on any band where a widely accepted band plan exists. (FCC recognizes the national acceptance of the ARRL band plans, as evidenced by the thousands of repeaters listed in the ARRL *Repeater Directory* that are in compliance with a plan.) Pick up a *Repeater Directory;* the band plans begin on page 17 of the current edition. They clearly indicate the frequencies designated for repeater operation, and those designated for simplex operation.

And if you operate simplex fm, don't operate on frequencies designated for EME, satellite and other weak-signal operations. Fm operation on these frequencies not only runs counter to well-established band planning, in some cases it is outright illegal (fm is not permitted on some frequencies above 50 MHz).

HERE AND OVER THERE

Last year, over 650 responses to the FM/RPT survey were received, including a number from overseas. Richard J. Molby, WB7NZG/DA1DB, took the time to put together a five-page typewritten letter that addressed the survey questions in detail. His answers are insightful because of his familiarity with the fm and repeater mode on both sides of the Atlantic. The following excerpts from Richard's letter should be read carefully and considered by all fmers.

1) QTH is Kircheim/Neckar, near Stuttgart in southern West Germany.

2) General class licensee.

3) Active five years in the fm and repeater mode.

4) About 75% of my operating time is on 2-meter fm, but only about 10% using repeaters. Most of the time it is not necessary to use a repeater to maintain contact with the local gang. Using 10 W and a small Yagi, most of southern Germany is within range, as are parts of France, Switzerland and Austria.

5) I only use 2 meters in the fm and repeater mode at the present time. 220 is not legal in Germany. I am presently working on equipment for 70 cm.

6) I use a crystal-controlled transceiver for mobile and portable operation; for base operations, I use a VFO to make best use of the spectrum.

7) My primary activity is experimentation (designing and building 2-meter equipment).

8) Can access five repeaters using 10 W and a ground-plane antenna.

9) I use two repeaters, but only rarely. I use simplex 90% of the time to maintain local communications.

10) I am a member of Deutscher Amateur Radio Club, which supports and coordinates all repeaters, and there are a minimal number of problems (very unlike the USA).

11) Unfortunately, autopatches are not legal in Germany because of Bundespost regulations.

12) If it were available, I would use the autopatch as little as possible.

13) I would not want to be a repeater owner, and it should not be legal for any individual to own a repeater. Only clubs should be allowed to establish repeaters — if there is a demonstrated need for one in a particular area. "Need" should not be defined as "desire." If there is a genuine need for another repeater to fill dead spots in the coverage of existing repeaters to ensure good communications during emergencies, then it should be approved. FCC should not be involved in the decision; that should be left up to an Amateur Radio coordinating council.

14) The purpose of an autopatch should be to provide an interface with nonhams, particularly for emergency operations.

15) The problems in the fm and repeater mode are many:

a) Too many frequencies are used for repeater operations.

b) Not enough space is left for simplex operations.

c) Too many hams are too lazy to use simplex instead of repeaters for local communications, thereby creating a greater "need" for more repeaters.

d) Subaudible access should not be allowed. It makes equipment unnecessarily expensive, complicated and failure-prone. Single-tone COR (1750 Hz) has been in use for years in Europe and is more than adequate for repeater control. It has the advantage that, without a tone-burst oscillator, one may whistle up the repeater.

e) There is no worldwide coordination of tone burst, channel spacing, repeater channels and offsets.

f) Overemphasis on channelized operation wastes space. Experience in Europe has shown that spacing as close as 2 to 3 kHz is possible using fm with reduced power and a little cooperation. Much local traffic here takes place at power levels of less than 1 W with directional antennas.

16) A solution: Slash the number of available repeater frequencies and encourage the use of simplex, especially on fm. Germany is not ideal vhf country, but with 10 W and a decent antenna it is usually possible to maintain communications out to at least 60 miles, and often several times that distance.

17) No doubt the biggest attraction of the fm and repeater mode is the reliability of communications using low power and small equipment. However, the repeater mode is nearly like using a telephone; gossips gather and tie up machines for hours on end. There is also a lot of talk these days that there are so few meaningful QSOs; but is that surprising with only three minutes or less to talk? My advice is to get on simplex and find out what vhf fm is all about.

*72 Stiles St., Waterbury, CT 06706

Strays

HAM RADIO HEAVEN

☐ An assorted group of hams were having an eyeball QSO, and, as often happens, the subject ranged far afield of radio — this time into metaphysics. Someone asked about the existence of the Hereafter, and speculation began on what Heaven must be like. All had their own ideas, but here are some the congregated hams agreed on.

Heaven is a place where:

- final amplifiers do not burn out no matter how hard they are pushed (in the other place, they do so even at zero power).
- there are no limitations on power, yet with QRP operation it is no problem to break a pileup on first try and get a 5-9 to boot.
- there is no QRM, QRN or QSB, and you can never get out of band.
- everyone enjoys Extra Class privileges, even if one is only a Novice.
- everyone QSLs 100%, even without IRCs or green stamps.
- it is quite simple to earn your WAU (worked all universe), and earning DXCP (100 planets) is a snap.
- batteries never die, and there are no such things as power surges, transients and lightning strikes (those do occur in the other place).
- there are no jammers (they're in the other place).

—Angelo Polvere, KA9CSO, Inverness, Illinois

AMATEUR RADIO, FAMILY STYLE

☐ The *Callbook* reveals that the following calls belong to the Clay family of Ridgefield, Connecticut: WA1NHJ (Candice), WA1NHK (Kelly), WA1NHL (Betty), WA1NHM (Judy) and WA1NHN (Edward). The family that takes exams together may QRM together. — *Kenneth Bishop, W1EWD, Middletown, Connecticut*

I would like to get in touch with . . .

☐ any amateurs who are interested in joining the Air Traffic Control Net, an international roundtable on 14.277 kHz from 1100 to 1200Z daily. Walter Endlich, PA0GJA, Brewerstraat 18, 6369 EN Simpelveld, Netherlands.

The World Above 50 MHz

Conducted By William A. Tynan,* W3XO

It's up to Us!

We who espouse the use of narrow-band techniques such as ssb, cw and even a-m on the vhf bands are quite jealous of our territory. After all, we don't ask for much. Our needs are served by roughly one-eighth of the 6- and 2-meter bands, slightly less on 1-1/4 meters and a very small fraction of the 70-cm band.

Being the most popular of the vhf bands, 2 meters certainly provides the greatest degree of competition among the various modes vying for a chunk of spectrum space. All too frequently one hears another tale about those "so and so fmers" operating right on 144.2, or some other almost-as-"sacred" frequency. Many times, the fm operator doesn't know any better. Perhaps he just bought his new, fancy, synthesized 2-meter box, and merely turned the knob to some number in the 144- to 148-MHz band. He might have looked up the band limits in the *Handbook* or some other reference and noted that the first 100 kHz is reserved exclusively for cw and similar modes, just as it is on the hf bands. If he did, he also knows that from 144.1 up is for voice, and certainly his new rig is intended for voice. After all, isn't all voice work on those vhf bands accomplished via fm?

In almost all cases the problem is solved once these new people are told that, in accordance with the ARRL band plan published in the ARRL *Repeater Directory* and elsewhere, 144.0 to 144.5 should be used only for narrow-band modes, and that many people actually do use ssb on 2 meters. Upon being so informed, they usually QSY to the upper 7/8 of the band and enjoy the newfound contacts available to them. Of course, there are exceptions who unfortunately require further convincing before they agree to go somewhere else to do their thing and let us do ours.

But there is another class of individual that one occasionally encounters operating fm below 144.5. Who are they? None other than some of the well-known calls we frequently hear on ssb. Apparently, they conclude that the first 0.5 MHz is their preserve to do with as they like, and that it isn't fm that it should be kept clear of, but "those fmers." Or perhaps they conclude that because they may have gone to, say, 144.3, no one would hear them anyway.

Although they may have picked a quiet frequency and probably won't bother anyone, think of the example that such operation sets. If many sidebanders, for whatever reason, engage in such practices very much of the time, how long will it be before those without ssb capability will come across them and conclude that fm operation in that part of the band is okay? After all, "the guy that was just on there is one of the well-known local sidebanders; maybe he's getting tired of that Donald Duck stuff."

I am sure that none of us wishes to convey that impression. If we don't appear to be using the band the way it is intended, we will be inviting an influx of fm operation and it will only be a matter of time before we have no place in the band to look for those weak signals. Fm is a great mode for local work, but it does take up considerably more space than does cw, ssb or even a-m. Couple that characteristic with the fact that there are lots of people out there that have fm, and only fm. Because of these two factors, its widespread use in the low end of the band could make it almost impossible to conduct weak-signal DX work via ssb and cw.

It's up to us who wish to preserve a small slice of the vhf bands for weak-signal, narrow-band operation to set a good example and practice what we preach. If we don't we will have nobody to blame but ourselves if, in a few years, there is nothing but fm on the vhf bands we presently love. The portions of the bands designated for cw, ssb and a-m are not that way to keep certain people out, and they do not belong to us just because we may use ssb or cw most of the time. If, for some reason, it is advantageous to switch to fm, QSY to an fm-simplex portion of the band. It doesn't take much more time and sets a good example.

In addition, let's do all we can to increase activity and spread out when the band is well occupied, rather than crowding around one frequency. Try conducting local ragchews well up in the band. A well-occupied band is much safer from intrusion. On 6 meters, there is quite a contingent of a-m operators around 50.4. Several have suggested that 2-meter a-m might be revitalized around the corresponding frequency of 144.4. There are certainly a lot of old a-m rigs gathering cobwebs in cellars and attics. They could be dragged out, dusted off and put on the air. These resurrected relics can provide a lot of fun for practically no expenditure, and they won't bother anyone on 144.4. Who knows, many users of these '50s and '60s units eventually may decide to join the ssb ranks once they hear how effective that mode is at vhf.

We can do much to help preserve what we cherish — a small slice of each vhf band in which to pursue those weak, elusive signals or merely talk about the latest in antennas or preamps with knowledgeable locals. The foregoing discussion has included a few suggestions toward this end. I am sure you can think of many others. But the principal message is: It's up to us.

ON THE BANDS

6 Meters — Late summer is supposed to be a pretty dull time for 50-MHz propagation, and the casual observer in most parts of the country would probably conclude that this year has been no exception. However, there have been some occurrences that point to some really exciting times ahead. For example, the strong and long-lived aurora of the Labor Day weekend not only provided many fine QSOs, but also provided evidence that the sun is still quite active. Another indication was the surprise opening for us in the mid-Atlantic states to Argentina on Sunday, September 5. At about 1550Z, this conductor, W3JO near Philadelphia, W2BN, AE3T, WB2TMD and several other mid-Atlantic-state stations worked LU8YYO. This opening certainly fits the pattern of enhanced north-south propagation in conjunction with geomagnetic disturbances.

From South Texas, a region better known for its north-south propagation than is this part of the country, comes word of another LU opening a few days earlier. W8AGH/5 Houston says that on September 2, at about 2200Z, he worked LUs 8YYO and 4VBY. About an hour and a half later, K5ZMS reported LU8YYO and LU3EX, with the former putting in a particularly good signal. As this is being written, another San Antonio resident, WA5IYX, reports that the first day of the September VHF QSO Party was enlivened by a three-hour opening to LU, as well as backscatter stations from Florida to Arizona. That should do something for a few contest scores!

Whether or not this early appearance of these openings into southern South America represents a good omen, only time will tell. We should know by the time this appears in mailboxes. WA5IYX, who keeps track of such things, says that propagation has been the best he has ever seen for early September.

The 6-Meter DX Standings, which appears with this column, clearly shows the outstanding conditions that we have been experiencing over the past few years. Who would have dreamed, a few years ago, that we would see many stations over the 50-country mark and numerous others with WAC to their credit? The number of updates received revising the totals listed in the May running of the box is quite large. Nevertheless, many did not submit new information, so their totals must remain as they were. Next May is the most likely time for the next publication, which means that I must have information by early March. Lead time for the column is about five weeks, and *QST* goes into the mail on about the 20th of the month preceding the cover date.

So, please drop me an s.a.s.e. for the form and get it in the mail by the end of February at the latest. Let's hope that the propagation gods provide for many higher totals by then.

Some may notice that the totals listed for them are not quite as submitted. In a few cases, they are higher by one or two countries. This is usually a result of people forgetting to list the U.S. or Canada. If they are Ws or VEs, I have assumed that they have worked these countries and given them the benefit of the doubt. In more cases, however, the listed totals are lower; this results from a number of causes. One is that many assume that some countries count as DXCC Countries when they don't. VO1, VO2 and VY1 are good examples of this. One individual even listed Prince Edward Island. Unfortunately, all of these count as Canada. Others have taken credit for two-way contacts with stations that are operating on 6 meters in direct defiance of the expressed rules of their governments. The only exception made in this situation has been the PA0s, where there did appear to be an intent on the part of the Netherlands authorities to permit operation on the band. Of course, consideration has been taken for the special permits, such as in the cases of 15FDJ and SZ2DH. A few have listed contacts made from another part of the country. One East Coaster, for example, shows a JA contact made while he was operating portable in California. Yes, Japan is difficult to work from the Eastern U.S. Even though the DXCC rule on this has been changed recently, it appears reasonable, for the purpose of truly showing what can be accomplished on 50 MHz, to stick to the old limit of 150 miles. I will entertain other thoughts on the subject, however.

Another apparent discrepancy involves the cross-band listings. As stated with the box, only those cross-band countries not worked via 6-meter two-way are counted. The crossband list is considered somewhat of

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

50-MHz DX Standings

DXCC countries based on information received as of September 18, 1982. Continental U.S. and lower-tier Canadian stations with fewer than 15 countries, except those who claim WAC, are not listed. Crossband totals listed are those not duplicated by 6-meter two-ways. Credit has not been given for contacts made with stations known not to be authorized for 50-MHz operation; otherwise, countries are those listed in latest ARRL DXCC Country List.

	1	2	3	4
JA4MBM*	74	71	0	0
KH6IAA	69	67	0	0
LU3EX*	68	60	0	0
VE1YX*	66	62	22	20
K8WKZ*	65	56	15	14
JA1VOK*	63	59	0	0
ZD8TC*	62	62	10	—
JA1RJU*	62	59	0	0
K5FF*	61	58	3	3
W2IDZ*	59	58	12	12
JA5HTP*	59	56	0	0
W6XJ	59	—	3	—
W5FF*	58	54	2	2
WD4IYS*	57	56	16	8
WA8LXJ*	57	53	18	18
JA2DDN*	57	53	0	0
VE1BNN*	57	—	5	4
WA7JTM*	56	52	1	1
W4OO*	56	51	0	0
WA5IYX*	56	48	9	8
W8CMS	55	50	11	7
N6AJ*	54	51	1	0
W3XO*	54	49	15	7
N3AHI*	54	48	13	11
K8EFS*	53	51	18	15
W7KMA*	53	50	1	1
JE1TGN*	53	49	0	0
JA2ODM*	53	48	0	0
LU9AEA	53	47	0	0
K1ZFE*	52	51	0	0
JAØAGA*	52	50	0	0
W6BJI*	52	48	2	2
WA4UAS*	52	48	0	0
K5ZNS*	50	50	2	0
WB4OSN*	50	49	8	6
PY2XB*	50	47	2	1
WB7TOV*	50	47	0	0
N6CT*	50	44	1	1
WA6JRA*	50	18	3	1
WA6BYA*	49	47	0	0
LU7DZ*	49	39	0	0
WA9AHZ*	48	46	14	12
KA1BRD*	48	46	0	0
W3JO	48	43	12	5
K5SW*	48	42	10	10
JF3KOA	47	47	0	0
WA1UQC *	47	45	16	3
K4KUZ*	47	43	0	0
W4WHK	47	39	15	6
W5UWB*	47	37	6	4
W1EJ*	46	45	14	12
WB8GEX*	46	44	14	12
NØLL*	46	44	8	7
K2QIE*	46	43	7	2
K2QWD*	46	39	13	11
WA2BPE*	46	32	14	6
K1ICM*	45	44	15	8
WB8GEW*	45	44	5	5
JA9DUR*	45	43	0	0
WB2WSV*	45	42	2	2
WA8ONK*	45	41	7	7
W3IWU*	44	42	16	16
W1QXX	44	42	14	11
JA2GHT	44	42	0	0
WA5HNK*	44	38	14	14
AE3T*	43	42	14	14
JA3EGE	43	41	0	0
KØGJX*	43	40	—	—
K4CKS*	43	39	18	13
W5DZF/4	43	22	4	0
K5CM	43	—	0	0
WB2CZB*	42	40	14	8
KG6DX	42	40	0	0
W2MPK*	42	38	12	6
KG6JDX*	42	38	0	0
KH6FLD	42	35	0	0
K1FWF*	41	40	18	10
K3QMX*	41	39	12	9
W1JR*	41	39	9	7
WA6PEV*	41	38	3	3
WB5CHW*	41	37	7	4
W5KRH*	41	37	3	3
JG3AQD*	41	37	0	0
K7ICW	41	34	1	1
WAØCSL*	41	15	6	4
VP2VGR*	41	—	11	—
WA7EPU*	40	37	1	1
WA1OUB	40	32	14	7
N5KW	40	—	0	0
WA3DMF	39	37	17	16
XE1GE	39	37	1	1
WB6BMB*	39	34	0	0
JA1NVG	38	38	0	0
K8UNV*	38	36	1	1
KS2T	38	36	0	0
N7AKB*	38	34	1	1
W1AIM*	38	33	3	0
K1SF	38	31	8	3
W5HN*	38	31	0	0
VE3ASO*	38	31	0	0
JA7QVI	37	35	0	0
K6KLY	37	33	0	0
K2YOF	37	32	15	14
K7GGJ	37	28	0	0
N9CEX*	36	35	6	6
WD2AKA	36	34	9	6
N5WM*	36	34	6	2
WAØSBZ*	36	33	3	2
KØAYN*	36	33	0	0
W6ABN*	36	32	3	3
JH3WXB	36	32	0	0
WA9ETW*	35	34	2	2
W4NVW/3	35	33	2	0
WB2PMP/4*	35	32	9	9
WB8YFE*	35	32	5	5
WD4FAB	35	31	6	4
W2VO*	35	26	0	0
KØTLM*	34	33	5	4
KA1DHO	34	31	13	6
WA1ZUB	34	30	11	7
WD2AFH	34	28	4	0
W2RTW	34	28	0	0
N5DDE*	34	25	1	1
K6JYO*	34	22	0	0
W2LT	34	20	9	0
WA7GCS	33	32	0	0
WA1CRE	33	31	4	1
WA1AYS	33	30	15	14
KA4AOK	33	30	11	6
KA1A	33	29	0	0
N6RZ	33	24	1	1
AE9M*	33	23	11	1
W2CNS*	32	30	10	5
WB8IGY	32	30	9	7
N7DB	32	32	0	0
K4GOK	32	31	13	11
AD1C*	32	31	0	0
K1ZKR	32	29	0	0
WB8BKC*	32	28	14	13
WB8KAY*	32	27	0	0
W5NKG	32	25	2	1
VP2MJ	32	21	1	1
K4LFF	32	21	0	0
N6VI	31	30	0	0
VE3DSS*	31	28	13	7
W1GXT	31	27	13	2
K6PHE	31	27	0	0
WB6NMT	31	26	2	1
VE1RC	31	26	0	0
W2BN	31	24	4	1
W4CKD	31	23	11	11
W1SC/7	31	14	2	1
LU6DLB	31	16	0	0
WB2MAI	30	29	9	7
WBØPKN*	30	29	6	5
WA5UFH*	30	28	0	0
N4CD	30	27	12	8
K6JZK	30	27	0	0
WA2EQK	30	25	6	6
W3OTC	30	25	0	0
JG3RGG*	30	22	0	0
K3ICH/4	30	22	0	0
W3BWU	29	29	8	5
K4ROM	29	27	5	5
K8RZB*	29	26	8	3
K2OVS	29	25	12	9
K5VVV*	29	25	3	0
WA8OGS*	29	25	0	0
8P6KX	29	24	8	2
KØUDZ*	29	21	3	1
WB7SLY	29	20	1	1
KØUS*	29	14	1	1
C5AEH*	29	—	13	—
N5DDS*	28	25	2	2
WA7UJH*	28	25	0	0
W9TC	28	25	—	—
K1FJM/4	28	22	7	6
N7AQM*	28	22	1	1
WA5VJB	28	20	1	1
K4VPK*	27	27	7	7
K6QXY	27	24	0	0
KQØJ*	27	22	0	0
N2ASC	26	26	3	3
WA9DYT	26	22	0	0
KØSE*	26	21	2	2
K9XY*	26	21	0	0
NP2AE	26	21	0	0
WAØNOK	26	20	2	1
KA1CDZ	26	13	15	3
WA2YWP	26	13	4	2
VE3EVW	26	6	13	7
VK2BA	25	25	1	1
K1LPS	25	22	4	0
JF3TDC	25	22	0	0
WØRGU*	25	21	3	3
VE5JQ	25	20	2	2
N8AXA*	25	19	5	4
9Y4LL	25	13	0	0
WA5QCP*	24	19	0	0
KA3AVM	24	19	0	0
JM1LCW	24	17	0	0
K9SM	24	12	5	5
WB8PAT	24	—	4	—
WA9DYV*	23	22	1	1
K6QAX	23	20	0	0
WA5OLT	23	17	5	5
WB2TMD	23	17	5	2
HC8VHF*	23	—	4	—
WBØRJR	22	19	4	2
W9NAW	22	19	2	2
KØSFH*	22	19	1	1
WB2QLP	22	18	5	4
KA1YQ	22	17	7	1
VK2DDG	22	17	3	0
PY2TTV*	22	15	0	0
KA5FLE*	22	14	0	0
JE3YIA	22	12	0	0
HC1MD/HC5	22	—	2	—
N9ANO*	21	21	0	0
WA4TJW	21	21	0	0
WB6CTQ	21	19	0	0
K6ZMW	21	18	0	0
W7HAH	21	16	0	0
K1HTV/3	21	15	17	3
9Y4JW	21	12	1	1
KA7IXS	21	7	0	0
N4MM	20	20	0	0
JG3JLC	20	19	0	0
K2JF	20	17	5	5
VE1BUF	20	15	4	3
W8QOI	20	13	2	2
KA7BTQ	20	13	0	0
ZB2BL	19	18	8	4
KJ3F	19	18	0	0
WA8LLY/6	19	17	0	0
KA1GIY	19	6	2	0
W9OEH	19	—	0	0
WØLSD	18	18	0	0
KC4KK	18	14	0	0
NØAJU	18	13	0	0
W7KNT	17	17	0	0
WB9OPD	17	16	1	0
KB7Q	17	16	0	0
VK4AYX	17	14	0	0
HK4EB	17	13	0	0
W7IDZ	16	16	0	0
KØCJ	16	15	5	2
WA4TNV/KL7	16	13	0	0
WØPKN	16	12	1	1
W8SMD	16	11	5	5
WAØOFO	16	—	0	0
KØWM	15	15	1	1
WB4WXE	15	15	0	0
NI6E	15	15	0	0
VK3AQR	15	14	0	0
VK3AVI	15	14	0	0
WA6HXM	15	13	0	0
8P6CX	15	11	2	1
KL7JAI	13	11	0	0
VK3NM	13	11	0	0
EI2W	13**	—	—	—
WAØLHK*	12	12	2	1
VP9WB	12	11	4	1
W1QXX/KP4	12	10	0	0
G4BPY	11**	11	35	30
J6LOV	11	9	2	2
JN1DQO	11	5	0	0
KL7WE	10	10	0	0
KL7JJH	10	10	0	0
KL7IKV	10	10	0	0
ZD7BW	10	0	0	0
5Z2DH	10	—	0	0
XE2BC	10	—	0	0
WB4WXE/KL7	9	8	0	0
KL7HMH	8	8	0	0
VP2VDL	6	6	0	0
AL7C	7	7	0	0
8P6MH	6	6	4	1
G4JCC	6**	4**	29	24
ZK2ZDI	2	2	0	0
SM7BAE	1	1	6	3
G5KW	—	—	35	—
SM6PU	0	0	23	10
DJ2RE	0	0	14	9
DK6JL	0	0	11	4
SV1DH	0	0	10	—
CT2EE	0	0	5	2
OZ9QV	0	0	5	1
G3VZJ	0	0	4	4
G3PLP	0	0	4	2
I5CTE	0	0	4	0
GJ3YHU	0	0	4	—
G4ANT	0	0	3	2
G3TAA	0	0	3	2
F6EMT	0	0	3	2
HA6NP	0	0	3	—
HB9QQ	0	0	2	2
G3RDQ	0	0	2	2
OE1HGW	0	0	2	1
OZ7IS	0	0	2	—

1 — 6-Meter Two-way Worked
2 — 6-Meter Two-way Confirmed
3 — Crossband (6 to 10) Worked
4 — Crossband Confirmed
*6-meter two-ways claimed with all continents
**Includes 4- to 6-meter crossbands and 4-meter two-ways

a consolation and is not intended to start a race for crossband contacts. As an example, some Ws have listed crossband QSOs with other U.S. stations. I am striving to make the box as meaningful as possible. I think that's what most 6-meter operators want from it.

Word has reached me that the U.K. is about to grant some 40 special permits for G stations to operate on 50 MHz. Indications are, however, that this will apply only during hours when television is off. If true, it is a beginning.

2 Meters — That Labor Day weekend aurora mentioned in the 6-meter section was a real winner for those who frequent this band as well. K2QR Endicott, New York is certainly one of the most dedicated 2-meter aurora chasers. Dick sends along a copy of his log, which is impressive to say the least. Altogether, beginning at 0000Z on the 6th and continuing until 0400 on the 7th, it shows a total of 52 QSOs in 22 states and Canadian provinces. He found that by tilting his EME array up about 8 degrees, auroral signals were stronger than with it aimed at the horizon. Dick attributes this to a nearby hill, but similar comments are received from time to time from other northern stations. During an EME sked that K2QR held with WB9CAS, with his array aimed at 248 degrees azimuth and 24 degrees elevation, he was able to hear that station on both aurora and via the moon, but the two signals were so mixed together that a contact was impossible.

From his new QTH of Olathe, Kansas, AEØG reports good results with the aurora. Beginning about 1130Z on the 6th, Larry worked KB9NM Wisconsin, WA8FTA Michigan, K8EUR Ohio, K2LWR New York, W5GG Texas, W5JWL Arkansas, WAØCQG Minnesota, KBØTP South Dakota, KØWLU/7 Wyoming, and two Colorado stations, WAØLSH and WØPW. Even Southern California got in on it. K6PVS says that he QSOed WA7ADK in Utah and KI7D Idaho between 1300 and 1400Z September 6. Keith also notes that he had great success during the Perseids, working nine stations in seven states. Six were new, bringing his total to 17.

From Cape Cod, W1HHE reports that, in the midst of the aurora, a strong, stable tropo duct developed the morning of September 6. Bill used it to good advantage to hookup with some 20 stations at distances of up to about 900 miles.

The Higher Bands — Aurora is becoming almost commonplace on 70 cm. During this period, on the declining side of the solar cycle, is certainly the best time to take advantage of this type of propagation. W3OZ near Frederick, Maryland is one who is in there trying. On the Labor Day weekend aurora, reported earlier in this column, Jack snagged W9ZIH Illinois and K9UIF Indiana, as well as completing a buzz contact with W2DWJ New Jersey. Jack also overheard W9ZIH work W3IP Maryland, W3IY/4 Virginia, K2UYH New Jersey and K2RIW on Long Island.

WB5LUA writes to remind those interested in 23-cm-and-higher bands that the 1982 version of the *1296 MHz Directory* is available. Al asks that anyone wishing a copy should send him information on their 1296-MHz stations, as well as what they might have on 2304 and other microwave bands. For those who are members of the Central States VHF Society, the *Directory* is free. For others, the cost is $1. WB5LUA's address is Al Ward, Rte. 7, Box 32, McKinney, TX 75069. The 1983 edition is expected to be out sometime in the spring.

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

New 10-GHz DX Record

As reported briefly in last month's column, a new DX record of over 1000 km has been set on 10 GHz. It will come as no surprise to those who have been following the progress of 10-GHz DX that Nicola Sanna, IØSNY, was involved in getting it. Over the last few years he has investigated enhanced propagation across the Adriatic Sea (off the east coast of Italy) and has held the world DX record twice on this path — once at 757 km, and once at 860 km. The Adriatic Sea is geographically interesting in that it is well sheltered by land masses and is almost completely closed, in a manner similar to a lake. These factors often lead to calm surface conditions, and, together with warm temperatures, this seems to lead to a high incidence of enhanced troposheric ducting propagation. On this occasion, Nicola decided to investigate the path across the Mediterranean between Spain and Italy. This region is not known for calm conditions, but luckily, during the first two weeks of July there was a high-pressure area over the region, leading to unusually hot and calm weather.

On July 3, at 1630Z, IØSNY/EA5, operating from a hill 470 meters above sea level near Valencia, worked IØYLI near Rome at a distance of 1101 km, for the first ever contact on 10 GHz over 1000 km (see map in Fig. 1). On July 6, at 1926Z, from a site again near Valencia a few meters above sea level, IØSNY/EA5 worked IWØBFZ near Rome at a distance of 1117 km, for a new DX record. Not content with this (!), on the 10th of July, IØSNY/EA5, from a hill to the west of Valencia, at a height of about 900 meters above sea level, worked IWØBFZ again, this time at a distance of 1166 km, for yet another record. All these contacts are believed to have been made using 30-mW Gunnplexer systems and 1-meter-diameter dishes. Subject to ratification by the RSGB, the contact between IØSNY/EA5 and IØYLI should qualify for the Microwave Associates award for the first 10-GHz contact over 1000 km (see The New Frontier, Nov. 1981).

IØSNY/EA5 poses near the site in Spain from which he set a new 10-GHz DX record.

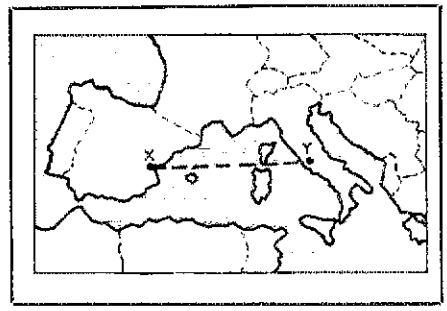


Fig. 1 — The record-setting path between IØSNY/EA5 near Valencia, Spain (X), and the sites of IØYLI and IWØBFZ near Rome (Y).

In addition to the 10-GHz work, Nicola was active on 1296 MHz. Among other DX contacts, on July 12 he worked I2KSX/8 in Calibria (southern Italy), at a distance of 1396 km, for a new European DX record on 1296 MHz, using a 4-W transmitter and a 17-element Yagi! It shows that, when conditions are right, you don't need the power. Congratulations are certainly due to all those involved with this well planned and highly successful piece of work.

INFORMATION NEEDED

Willard Zahalka, K4HOE, 204 Westover Rd., Frankfort, KY 40601, is looking for any information on modifying an APX6 for amateur use. Can anyone help?

*103 Division Ave., Millington, NJ 07946

1296-MHz DIRECTORY

The 1982 revision of the 1296-MHz *Directory* is now available from Al Ward. It is free to members of the Central States VHF Society; all others should send $1 to cover the cost of postage and handling. The address to write to is: Al Ward, Rte. 7, Box 32, McKinney, TX 75069. Al also requests that those interested in being included in a directory of 2304 MHz-and-up activity should write to him at the same address with details of their operation.

MICROWAVE SATELLITE NEWS

The problems with UoSAT-OSCAR 9 reported in this column last month seem to have been solved. Command of the spacecraft was achieved using the 150-foot Stanford University dish (see "UoSAT-OSCAR 9 Lives," p. 25). Number L5 in the series of ESA Ariane launch vehicles has failed. This is the same rocket that is scheduled to launch the Phase IIIB satellite into orbit early next year (see Happenings, this issue, for more details).

Strays

I would like to get in touch with . . .

☐ any Century-21 transceiver owners who are interested in exchanging ideas or starting a club. Edward G. Bowley, W2VLH, 86-22 Dongan Ave., Elmhurst, New York 11373.

☐ amateurs who are also serious stamp collectors. Dr. Max Horbach, PAØMAC, Haarenseweg 1, 5061 VJ Oisterwijk, Netherlands.

TIARA: ALIEN HAMS IN JA-LAND

☐ The Tokyo International ARA (TIARA) is a group of about 60 amateurs from nine countries who live in Japan. Alien amateurs residing in Japan who are citizens of the U.S., W. Germany, Finland or Ireland can operate via Japanese club licensing procedures. Many members are active in this way. Negotiations for full reciprocal licensing agreements with 12 countries are under way, so alien operating privileges may be expanded. Amateurs coming to Japan can contact Joe Speroni, AHØA, President, TIARA, P.O. Box 119, Akasaka, Minato, Toyko 107, Japan.

QSL IS A LONG TIME COMING

☐ Waiting weeks, maybe months, to receive a QSL from an overseas contact may be a bit irritating, but not uncommon. But that's nothing compared with the 22-year wait John Dunlap, K8RRQ, of Toronto, Ohio, had for a QSL from New York. It was on February 15, 1960 that K8RRQ made his contact with the New York amateur, but somehow the QSL destined for K8RRQ got filed in a "junk box." Only recently did the New York operator discover it and mail it on to K8RRQ, who received the QSL, finally, on May 3, 1982. A Novice at the time of the contact, K8RRQ says it's a good thing he didn't need it for WAS.

In Training

Conducted By Steve Pink,* KF1Y

UPGRADING: NOVICE TO GENERAL

League instructors are busy teaching classes again this fall, as in so many falls before. Most are teaching aspiring new hams and preparing them for their Novice licenses. But last year's Novices are this year's aspiring Generals, and a good instructor does not forget that his "Elmering" continues beyond his students' first license.

The transition to General class traditionally has been the major upgrading step in an amateur's career. The largest number of amateurs of any one class are Generals. Perhaps the most coveted prize earned with the General class ticket is the amateur's first high-frequency phone privileges for which the 13-wpm code test has always been the key. There probably has been more discussion of this medium-speed code test than of any other test in the amateur service. It is the test most likely to cause a "case of nerves," because so much rides on a short five-minute period and it is often the first FCC-supervised test a ham ever takes. A great deal of an instructor's time must be spent helping students pass the 13-wpm code exam. Students should strive for a code speed of at least 15 wpm to make up for that "case of nerves" so commonly felt. Instructors should give practice tests in the FCC comprehension-type format to instill confidence in the students' ability to pass the exam.

Practice sessions using code-practice cassettes and W1AW code-practice transmissions are a proven way of increasing code speed. Instructors should set goals every week for students, keeping in mind that there is a very common learning plateau at about the 10-wpm level. For many students, progress slows down around 10 wpm and the level of frustration goes up. Some people speculate that at 10 wpm one must begin to recognize sound patterns as letters or words rather than as simple dits and dahs; gaining this new skill requires some time. If the instructor foresees this learning plateau, though, he or she can help the student pass a discouraging obstacle.

The present FCC 13-wpm code test is the so-called comprehension-style exam. A typical QSO-style cw transmission is played from a cassette tape for five minutes, followed by a fill-in-the-blank test that asks for key words in the QSO. Seven out of 10 answers correct is the minimum passing grade.

Past In Training columns compared the virtues of practicing with straight or random text versus the FCC-type QSO format. The consensus voiced to the Training Desk at that time was that straight or random text is the preferred method for building code speed, but an FCC-type code test should be used at the end so that students will be practiced in the regulation format. Instructors should encourage their students to practice for frequent, short periods — for example, every day for 20 minutes to half an hour — instead of a small number of marathon sessions near the time of the FCC exams. Informal studies show that progress and success come easier with short and frequent practice periods.

The written portion of the General class examination is called Element 3, covering rules and regulations, basic radio theory and operating practice. As with all other written exams, the FCC publishes a Study Guide for Element 3 that is an outline of the topics to be covered in the test. A thorough knowlege of the topics in the FCC Study Guide ensures passing the exam. At the present time, an Element 3 exam contains 50 multiple-choice items. A number of exams exist in the FCC's present exam bank, and the FCC from time to time replaces exams and individual questions in the bank. Only the particular topics in the Study Guide remain the same. Thus, there is no guarantee that memorizing the questions and answers from past tests will prepare your student for a future exam. Mastery of the subject matter should be the objective of any course.

The Element 3 Study Guide (which can be found in the League's *Radio Amateur's License Manual* and in March 1980 *QST*) introduces a number of new technical topics and a host of Amateur Radio regulations and operating practices. Mathematical formulas, such as Ohm's Law, and formulas for series and parallel combinations of resistors, capacitors and inductors are introduced. Power supplies and filters make up most of the practical circuit study. Quite a bit of new material on signals, antennas and propagation is included. The topics in Element 3 seem to be chosen so as to lay a groundwork in radio theory for those amateurs who will go on to more specialized aspects of radio communication. As a General class instructor, then, you are helping to lay that groundwork!

The League offers training materials to both individual students and instructors who teach General classes. The already mentioned *Radio Amateur's License Manual* is the main text for anyone preparing for the Element 3 exam. Text, study questions and all of Part 97 (updated in the 78th edition) help prepare the student to upgrade his or her license. For the 13-wpm code exam, the League offers the *ARRL Code Kit*, which takes the student from 5 wpm to 13 wpm with two cassettes of code practice and an informative booklet. For the instructor of General classes, we've produced an Instructor Guide, which suggests a way of presenting material for a 10-week upgrading course, and our General slide set can add an attractive visual aspect to the course. *The Radio Amateur's Handbook* is an indispensable reference book for both instructor and student, though some students find studying from a reference handbook to be difficult. For them, we offer the "junior Handbook," *Understanding Amateur Radio*, a very readable presentation of theory and practical applications at the General class level.

If you have any suggestions for helping others to upgrade, drop a note to the Training Branch. We're always eager for new ideas. QST

*ARRL Training Program Manager

50 Years Ago

November 1932

☐ The Federal Radio Commission now issues operator's licenses for three-year periods; station licenses continue to be for one year.

☐ The cover photo shows the rig described by George Grammer, W1DF, in "Building a Crystal-Controlled Transmitter." The inexpensive sender uses a '47 pentode oscillator and a '46 high-μ doubler; a follow-up article promises a power amplifier.

☐ "Efficiency in the Power Amplifier" is discussed by Fred Schnell, W9UZ. He tells what he did to boost the power output-to-input ratio in his push-pull '04As monster from 0.25 to 0.5.

☐ The "Sure-Fire Condenser Microphone," described by Howard Anderson, W1BVS, is built from the base of an old Atwater-Kent horn loudspeaker, a 4-1/2 inch diameter cylindrical metal housing and a few more miscellaneous parts. A '30 preamplifier is housed in the case.

☐ "The Single-Signal Receiver at Work" is a symposium of Bob Parmenter's results at Hq. station W1MK, and a description by Don Lusk, W3ZF-W3CGI, of the modified layout he used in his version of the Jim Lamb milestone.

☐ Grid modulation and 'phone break-in (with and without relays) are hot subjects in the "For the Experimenter" section, rating two items each.

☐ The "Third All-Section Sweepstakes Contest" for U.S., Canadian and Cuban hams requires the transmission of at least one message (complete with correct ARRL *full* preamble, signature and 10-word minimum text) for a count of one. An exchange of messages is a 2-count. Another feature of the nine-day no-time-limit event is that the high scorer in each section will receive a bronze charm.

☐ Wallie Gee, W6EGH, set a new "fastest WAC" record when he worked (7 Mc.) VK3CP, CR7AC, VS6AB, (14 Mc.) G5BJ, LU4ML and W6FAL between 6:25 and 9:32 A.M. on September 18. VK3LP held the previous record of 4-1/2 hours.

25 Years Ago

November 1957

☐ Lots of interest in the IGY and upcoming earth satellites. W. H. Pickering, director of Jet Propulsion Labs at Cal Tech, tells about "Project Moonbeam," in which radio amateurs and others are invited to monitor an orbiting beacon and data transmitter. "Artificial Earth Satellites," by V. Vakhnin, is translated and reprinted from the USSR publication *Radio*. V. R. Simas and W. B. Moriarty, of the Naval Research Lab, write about "Tape Recording the Mark II Minitrack Signals" for later transfer as visual presentations. BUT — the USSR launched "Sputnik" on October 4, sending signals on 20 and 40 Mc., and they caught almost everybody off guard.

☐ Call letter license plates are now available in 40 U.S. states, two Canadian provinces and the Canal Zone.

☐ The "Compact AB_1 Kilowatt," described by Ray Rinaudo, W6KEV, features the new 4CX1000A external-anode tetrode. No tuned grid circuit is used, just a resistor. Drive requirement is 15 watts with 100 ohms, 30 for 50 ohms. Efficiency is about equal to that obtained with AB_2 or B operation.

☐ The 24th ARRL Sweepstakes will run on two weekends in November, with no entry to exceed 40 hours total time. The "exchange" resembles a message preamble, with the RST report substituting for the normal "check," and your ARRL section for the normal "origin." C.w. scores are multiplied by 1.25 and 'phone by 1.5 if transmitter input at all times is below 150 watts. Certificates are awarded to high-scoring 'phone and c.w. stations in each section.

☐ It takes 13 pages for *QST* staffers Ellen White and Phil Simmons to record the results of the 23rd ARRL International DX Competition. VE1PQ, legendary Juan Lobo y Lobo (signing XF1A) and some upstart signing W4KFC were high scorers for their countries in North America.

☐ YL News columnist Eleanor Wilson, W1QON, reports that the Second International Convention of the YLRL (over Labor Day weekend in Chicago, with the Ninth ARRL National) saw 90 YLs from 23 states and two countries.

☐ The lead photo in Ed Tilton's "World Above 50 Mc." shows a new antenna built near Collierville, Tennessee. The work of W4HHK and W4GYS, the 50-Mc. 24-element broadside array, is mounted on two adjacent 100-foot towers. It was built especially for IGY experimentation; the beam can be switched.

☐ For serious 2-meter DXers, Walter Morrison, W2CXY, lightheartedly describes his preparations for and experiences during August in "Project Perseids — 1957." — *Byron Goodman, W1DX* QST

Hamfest Calendar

Conducted By Marjorie C. Tenney,* WB1FSN

[Note: Sponsors of large gatherings should check with League Headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.]

Arkansas: The Arkansas DX Assn. will hold its annual DX meeting and banquet Saturday, Dec. 4, at the Ramada Inn, Fort Smith. Mixer and hospitality suite Friday evening at the Inn for early arrivals. ADXA annual business meeting and election of officers (1983) Saturday A.M., followed by DX forum. Afternoon activities include Texas/Arkansas football party. ADXA's annual DX and awards banquet, with a DX speaker of note, in the evening. For further information, write to or call Harold Wilson, KB5RF, 3507 Lochlane, North Little Rock, AR 72116, tel. 501-753-8625.

Connecticut: The Southcentral Connecticut ARA's (SCARA) third annual Electronics Flea Market will be held on Sunday, Nov. 7, indoors at the North Haven Recreation Center, Linsley St., North Haven. Admission is $1.25, free for children under 12 with an adult. Seller's spaces $6; best spaces assigned first. Some free tables for those reserving early; after these are gone, space will be available for selling from the floor or from your own table. Food available. Sellers may set up at 8 A.M.; others admitted from 9 to 3. For reservations, send check or money order payable to "SCARA" to Ed Goldberg, WA1ZZO, 433 Ellsworth Ave., New Haven, CT 06511. Include s.a.s.e. for confirmation.

†**Florida:** The Broward Hamfest, sponsored by the Broward ARC, will be held in Building 19, Port Everglades, Ft. Lauderdale, on Dec. 4-5, from 9 to 5 both days. Tickets are $4 in advance, $5 at the door for both days. Flea market, vendor booths, ARRL Forum, prizes. Talk-in on 146.31/91. For info and reservations, contact Earl Goldberg, W4OAS, 5940 S.W. 16th Ct., Plantation, FL 33317, tel. 305-791-9706.

Georgia: The Alford Memorial RC will host the 10th annual Stone Mountain Famvention at Stone Mountain Park, Nov. 6-7, from 9 A.M. to ? on Saturday and from 9 A.M. to 3 P.M. on Sunday. Camping and motel facilities available inside park grounds. Highlights include seminars, dealer displays, boneyard, FCC exams, prizes and the Saturday night HOTDOG HAMJAM — a combination weiner roast and pickin' and grinnin' session featuring the Ringo Rangers. Admission fee of $3 covers everything. Talk-in on 16/76 and 52 simplex. Contact Faye, N4HLE, 490 Village Green Ct., Lilburn, GA 30247, tel. 404-921-7588, or Jim, KE4BI, tel. 404-447-6937.

†**Hawaii:** The Honolulu ARC hamfest will be held on Dec. 11-12, at the Honolulu Airport Holiday Inn, Honolulu. Doors open from 10 A.M. to 5 P.M. on Saturday, with a banquet starting at 7 P.M. Sunday hours are 10 A.M. to 1 P.M. Talks, ARRL Forum, flea market, vendors' booths, prizes. For further information, contact Jim Wakefield, AH6CO, 647 Kunawai La., No. 201, Honolulu, HI 96817, tel. 808-524-0050.

Iowa: The Sooland Repeater Assn. will hold its 7th annual auction at the KD Stockyards Station in Sioux City on Sunday, Nov. 7. The dock opens at 8 A.M.; auction starts at 11 A.M. Prizes. This is a large auction; plan to attend. For info, call KØTFT, tel. 712-239-3053. Talk-in on 37/97, 31/91 and 52.

†**Indiana:** The 10th annual Fort Wayne Hamfest will be held Nov. 14. Sponsored by the Allen County ARTS, Inc. (AC-ARTS), it will be held at the Allen County Memorial Coliseum. Admission: $3 at the door, $2.50 advance, children under 11 free. Regular tables $6; premium tables $20. Parking fee charged by Coliseum is $1. Doors open to general public at 8 A.M.; vendor set up starts at 5 A.M. For further ticket or table information, write to Becky Skinner, KA9GWE, 9720 Pinto La. Fort Wayne, IN 46804.

Massachusetts: The Hampden County Radio Assn. will hold its annual auction on Friday, Nov. 5, at the Granger School, intersection of Rtes. 57 and 187, Feeding Hills. Doors open at 7 P.M., and auction begins at 8 P.M. For more information, contact Dick Manner, N8BQU at 413-783-9380.

Massachusetts: The Honeywell 1200 RC, sponsor of the 147.72/12 repeater, and the Waltham ARA, sponsor of the 146.04/64 repeater, will hold their annual Amateur Radio and electronics auction on Saturday, Nov. 20, at the Honeywell Plant, 300 Concord Rd., Billerica, Exit 27 off Rte. 3. Snack bar and bargain parts store. Doors open at 10 A.M. Free admission and parking. Talk-in on both repeaters. For more information, contact Doug Purdy, N1BUB, 3 Visco Rd., Burlington, MA 01803.

Michigan: The 17th annual Hazel Park ARC Swap and Shop will be held Sunday, Dec. 4, at Hazel Park High School, Hazel Park. The school is located on Hughes St., at 9-1/2 Mile Rd., 1 mile east of I-75. Tickets are $1.50 in advance, $2 at the door. Tables are $1 per ft. Doors open at 8 A.M. Plenty of food, parking and prizes. Talk-in on 52. For tickets, table reservations and information, send s.a.s.e. to Hazel Park ARC, P.O. Box 368, Hazel Park, MI 48030, or call 313-398-3189.

Minnesota: The Annual Handi-Ham Winter Hamfest will be held Saturday, Dec. 4, at the Eagles Club in Faribault, starting with registration at 9 A.M. There will be a Handi-Ham equipment auction, dinner at noon, program and prizes. Talk-in on 19/79. For more information, contact Don Franz, WØFIT, 1114 Frank Ave., Albert Lea, MN 56007.

Missouri: The PHD Fall Auction and Swap Meet moves to the old Airport, Kansas City, same location as the ARRL Missouri State Convention in April of each year. Doors open at 9 A.M. on Saturday, Nov. 6; auction starts at 12:30 P.M. Tables are $5 each at the door; 250 available. You may swap, sell, trade or auction. Charge on auction, 10%. Admission free. For further information, contact Chuck Miller, WAØKUH, tel. 816-781-7313.

†**New York:** "Ham Central," 1982 edition, will be sponsored by Radio Central ARC at Temple Isaiah, 1404 Stony Brook Rd., Stony Brook, L.I., Sunday, Nov. 28 (Thanksgiving weekend). Doors open at 7:30 A.M. for dealers, and 8:30 A.M. for general admission. Table space (9 ft) is $5; general admission $2, with women and kids under 12 free. Antennas by Art (W2LH) and Madeline (W2EEO) Greenberg; lecture and slide show on the "Father of Radio," Nikola Tesla, by Peggy McKinnon Clark. Slide show on Little Gull Island DXpedition by Frank Kiefer, K2PWG. Prizes, food and drinks. An all-inside hamfest just before the holidays, with dealers and plenty of free parking. Near Smithhaven Mall for easy shopping. Talk-in on 144.550/145.150 and 52. For information and reservations, contact Scotty Policastro, KA2EQW, 80 7th St., Bohemia, NY 11716, tel. 516-589-2557, or Bob Yarmus, K2RGZ, 3 Haven Ct., Lake Grove, NY 11755, tel. 516-981-2709.

†**North Carolina:** The second annual Greensboro Hamfest, sponsored by the Greensboro ARC, is to be held Nov. 27-28 at the National Guard Armory, Greensboro, from 9 to 5 on Saturday and from 9 to 3 on Sunday. Tables and tailgating available. Admission is $4 ($3 if pre-registered by Nov. 12). Please send s.a.s.e. for pre-registration. Talk-in on 145.25, 19/79 and 52 simplex. For more details, contact Russ Brandt, KE4KL, 1301 Dayton St., Greensboro, NC 27407.

†**Ohio:** The Massillon ARC, W8NP, presents "Auctionfest 82," to be held Nov. 21 at the Nazir Grotto Hall, conveniently located at 6th and Dueber Ave. S.W., Canton. Doors open at 7 A.M. for set up, 8 A.M. for others; auction starts at 11 A.M. Advance tickets $2.50; $3 at the door. Prizes. Talk-in on 52. For advance tickets or tables, contact Steve Nevel, WD8MIJ, 1864 Massachusetts Ave. S.E., Massillon, OH 44646.

†ARRL Hamfest
*Convention/Travel Coordinator, ARRL

Coming Conventions

February 5-6, 1983
Southeastern Division, Miami, Florida

February 26-27, 1983
Ohio State, Sharonville (Cincinnati)

March 26-27, 1983
Georgia State, Columbus

ARRL NATIONAL CONVENTIONS

October 7-9, 1983
Houston, Texas

July 20-22, 1984
New York, New York

September 27-29, 1985
Louisville, Kentucky

Strays

"WRITE" APPROACH AT THE WRONG TIME

☐ Earlier this year, in a continuing-education class I was taking to get my Novice ticket, the instructor, Al Haddad, N2AMS, was demonstrating the best way to copy code.

"You might find it easier to write rather than print when you copy cw," N2AMS said. "Any questions?"

At that point, an 8-year-old girl, who was studying for the Novice license along with her father, raised her hand.

"Yes," said N2AMS. "What's your question?"

"I haven't learned to write yet!" — *John J. Dempsey, KA2PJN, Orchard Park, New York*

'TAINT' THE CAPTAIN'S RIG

☐ Who ever says something is "ghigantic"? It's "giant," so say "jigahertz." Also, a meter is always a meter, in parts or multiples, so don't say "kill-ahmcter" (ugh!), but "kill-oh-meeter."

Nano is like nanny, pico is like peek. NBS tells these right ways to speak of units, large or small. It's high time to quit the common, uninformed errors we hear. Show you know. — *Temple Nieter, W9YLD, Evanston, Illinois*

QST congratulates . . .

☐ Dave Bell, W6AQ, of Hollywood, California, on being elected to the Northern California DX Foundation Board of Directors.

☐ the Northern California DX Club on receiving the Placa IDXC from the Iberia DX Club of Madrid, Spain, for its "continuous contribution to DX."

☐ Donald Bishop, NØEA, of Aurora, Colorado, on being named as Chief Executive Officer of Vir James P.C. of Denver, Colorado.

☐ Frank C. Baxter, Jr., K2ZLA, of Latham, New York, on becoming Vice President of Engineering at the General Electric Cablevision Corporation in Schenectady, New York.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

N1BPF, Edward R. Donovan, Methuen, MA
*WA1GBZ, Ellsworth Philbrick, Jr., Milford, CT
W1JSX, Winston E. DuBois, Rindge, NH
W1MNK, Edward T. Maguire, Manchester, MA
WA1PDB, John W. Day, Gloucester, MA
W1RX, Squire Bateman, Reading, MA
W1VXC, June R. Burkett, Rumford, RI
WA1YUF, Peter DeSimone, Johnston, RI
W1YZ, John E. Sanborn, Dennisport, MA

K2AXU, Edward A. Kampmeyer, Ocean City, NJ
W2CTQ, Frederic C. Carpenter, Belfast, NY
WA2DSU, Eugene R. Finn, Woodbridge, NJ
WA2FLI, Victor W. Anderson, Neptune, NJ
KA2GAQ, Valentine C. Kern, West Islip, NY
W2GSE, Peter G. Caviglia, Bronx, NY
KA2IOX, Andre J. Heussi, Plattsburgh, NY
K2JRA, Thomas E. Perrine, N. Plainfield, NJ
K2JXL, Harold Thorn, Woodland Hills, CA
WB2MMU, Erwin S. Cooper, Chittenango, NY
KA2OMB, Eugene F. Ulrich, Bethpage, NY
WA2TUK, Bernard Durkee, Ft. Edward, NY
W2UJZ, Frederick G. Roesch, West Seneca, NY
W2ZNC, Milton N. Lieberman, North Lauderdale, FL

K3AG, Otto J. Goohs, Pittsburgh, PA
W3AUA, Walter Davis, Monessen, PA
W3CJT, James A. "Bill" Sutherland, Suitland, MD
WA3DNN, Finis O. Boyce, Bridgeville, PA
W3DQZ, Philip R. "Buddy" deCourcelle, Wilmington, DE
W3EH, Reginald K. Harris, Rockville, MD
KA3EHI, William Mason, Philadelphia, PA
K3ELJ, Gene B. Hasbrouck, Corry, PA
WB3HCM, William T. Markland, Pocomoke City, MD
W3HTS, Charles M. Dibbell, Allentown, PA
K3ISZ, Walter D. Clark, Pittsburgh, PA
WB3JGQ, Robert C. Mears, Pittsburgh, PA
W3KA, Ralph B. Ladd, Silver Spring, MD
W3KGD, Richard D. Althaus, Silver Spring, MD
W3RXY, Alfred N. Hendershot, Bangor, PA
WA3ZMS, Wayne R. Sphar, Ocala, FL

W4AQM, Charles W. Roberts, Miami, FL
K4BI, James E. Martin, Valdosta, GA
N4BIT, Albert J. Lankford, Montgomery, AL
W4BMF, Raymond J. Green, Port Charlotte, FL
K4BQO, Edgar J. Love, St. Petersburg, FL
WB4CCN, Arthur H. Bond, Jr., Casselberry, FL
W4CI, John J. Fogarty, Tampa, FL
K4CIE, Bertie B. Padgett, Andalusia, AL
KD4DP, Stanley J. Horbarenko, Citrus Springs, FL
W4FHE, Paul S. Leach, Bluemont, VA
W4FSW, Herbert F. Arnold, Clanton, AL
K4GFL, Thomas L. Sheets, Dyersburg, TN
WA4JMY, O. Mark Hillman, Daytona Beach, FL
W4JRB, Dave Horton, Silver Springs, FL
W4KJS, Charles E. Beard, Winston Salem, NC
W4RNX, William V. Jacoway, Fort Payne, AL
W4SHC, Clarence J. Esarey, Louisville, KY
W4SIZ, Dwight W. "Charlie," Lake Panasoffkee, FL
W4TD, Edward B. Manley, Melrose, FL
W4TM, Lloyd K. Rush, Jackson, TN
WB4USQ, Oscar L. Eldridge, Enterprise, AL

W5ADU, Thomas E. Hampton, Baton Rouge, AL
W5AOZ, William A. Simo, New Orleans, LA
K5AWR, John M. Clardy, Dallas, TX
WD5CPZ, Sidney E. Purser, Austin, TX
*K5DM, Carroll E. Smith, Richardson, TX
KA5DRX, Betty G. Couch, Guthrie, OK
W5IHS, Roland J. Balusek, Eagle Lake, TX
K5IUW, Charles Pimm, Brady, TX
WD5IXC, Travis O. Cameron, San Antonio, TX
WD5IYE, J. David Short, Fort Worth, TX
W5KHF, Ben B. Dibrell, Ardmore, OK
W5KLL, Thomas A. Chase, San Antonio, TX
W5KME, Truman D. Enete, Saint Francesville, LA
W5NGV, Harold Buckspan, Austin, TX
W5OLC, Charles R. Sanford, Sr., Sulphur Springs, TX
WA5VIL/N5DVT, Clyde L. Johnson, Yukon, OK
K5ZBN, Frederick K. Hankinson, Arlington, TX
W5ZHM, Arthur J. McCleery, Kennedale, TX

K6AAB, Lyman G. Swendson, N. Hollywood, CA
K6AFD, C. J. Macumber, Pico-Rivera, CA
W6BJR, Edgar T. Howes, Pasadena, CA
WD6CCT, Bert E. Stone, Hollywood, CA
WD6DLA, Quido H. Ciardi, Tullahoma, TN
W6FVM, Jesse L. Swift, Cloverdale, CA
KA6IFK, Frank G. Denison, Santa Maria, CA
W6IGY, Howard Harvey, Anaheim, CA
WA6ILE, Ronald W. Rast, Orangevale, CA
WA6INV, Clell Passmore, San Loranzo, CA
KA6KIK, Walt Strzalkowski, Brea, CA
WA6LBO, Donald W. Hussey, Sierra Vista, AZ
W6LDX, Theodore A. Still, Ventura, CA
*K6LZQ, Clarance L. Touw, Graeagle, CA
WB6RBP, Loren O. Merriman, Bakersfield, CA
KA6RMN, Howard L. Bromwell, Redding, CA
K6RO, Robert E. Doherty, Los Angeles, CA
K6SEQ, Nicholas A. Hurtig, Fresno, CA
WA6WJT, Irwin L. Horwitz, Wrightwood, CA
W6ZLO, Glen D. Berwick, Pacific Grove, CA

W7AE, Leonard L. McFord, Phoenix, AZ
W7AJO, Joe M. Demic, St. David, AZ
W7DYQ, James P. Campbell, Freeland, WA
W7EXX, Robert G. Scott, Lyons, OR
WA7PWG, Leroy J. Atkinson, Las Vegas, NV

N8BB, Robert G. Black, Marshall, MI
W8DEV, Ulysses C. Grugel, Euclid, OH
WA8DQJ, Burleson Grimes, Christianburg, OH
W8FGD, John R. Garrison, Sun City, AZ
W8HMI, Frank R. Smith, Alexandria, VA
W8LEZ, Harold E. Collins, Lowell, MI
K8MLS, Stephen L. Eller, Ellenton, FL
W8MMH, James R. Jones, Akron, OH
*K8PCF, Norman N. Hemenway, Parkersburg, WV
WB8RAI, Perrie V. Boureau, West Bloomfield, MI
W8VHQ, John W. Schmock, Ludington, MI

W9ELY, William G. Raatz, Van Dyne, WI
WA9HID, John Bell, Aurora, IL
W9IPW, George W. Swan, Brighton, IL
K9LBF, Robert C. Brandon, Muncie, IN
W9LBW, Oliver L. Jones, Portage, WI
WB9LNQ, Joseph P. Kuchera, Kenosha, WI
W9RJM, Wilson Mc Fadden, Des Plaines, IL
W9WIN, Hector E. Hickman, Martinsville, IN
*W9WS, Herman R. Schmitt, Logansport, IN

WDØGOU, Ray E. Newbille, Colorado Springs, CO
*WØHKC, Charles E. Nickson, Kansas City, MO
KØLEA, Joseph L. Rebol, Pueblo, CO
KAØLOB, Palmer G. Keil, Thompson, IA
KAØMJV, Robert Littrell, Carthage, MO
WBØMMN, Johnnie J. Hammons, Springfield, MO
**KØMOA, Edgar W. Freeman, Yankton, SD
WBØOOM, Richard T. Lindsey, Parsons, KS
WØRVO, Robert C. Molitor, Saint Cloud, MN
WØUZA, Edwin H. Oshier, Hill City, SD
WØVTK, Alva C. Suedekum, Sarcoxie, MO

VE2AMP, Melvin A. Pearce, Montreal, PQ
VE3AWB, Ross Huffman, Hamilton, ON
VE3HOI, Henry E. "Ted" Dubois, Newmarket, ON

*Life Member
**Charter Life Member

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

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.

Special Events

Conducted By Mark J. Wilson,* AA2Z

Burlington, Wisconsin: KA9ADJ will operate from 1400-2400Z *Nov. 6-7* to commemorate the 53rd anniversary of the Burlington Liars Club, founded in 1929. Frequencies: phone — 3.984 7.245 14.285. Certificate for large s.a.s.e. and contact number to: I. Welker, KA9ADJ, 35000 Oak Knoll Rd., Burlington, WI 53105.

Houston, Texas: Johnson Space Center ARC operates W5RRR during Space Shuttle missions, providing special QSL cards and retransmitting live air-to-ground communications between the Orbiter and Mission Control in Houston. The next mission is scheduled for *Nov. 11*, for five days. Frequencies: phone — 3.940 7.265 14.280 21.365 28.600. There may be some color SSTV operation, including video from NASA, on the usual frequencies (mostly 20 meters). QSL for s.a.s.e. to: JSC Ham Club, RFD 1, NASA, Houston, TX 77058.

Kennedy Space Center, Florida: Cape Kennedy ARC will operate NF4B from *Nov. 11 to 18*, during the next Space Shuttle mission. Operation will commence just after orbit is achieved Nov. 11, and will continue from 1400-2400Z each day for the mission's duration. Full-color liftoff photo certificate available for large s.a.s.e. (2 units First Class postage) to: CKAARC, P.O. Box 21065, Kennedy Space Center, FL 32815.

Washington, District of Columbia: ABC-TV Washington Engineering Group will operate KB7ZZ/3 in celebration of its first year of operation from the network's new Washington News Bureau from 1400-2400Z *Nov. 13*. Frequencies: phone — 7.245 14.285; cw — 7.125 at 45 minutes past each hour. Special QSL for s.a.s.e. to: S. Malis, KA4ORL, 2520 Heathcliff Lane, Reston, VA 20091.

Glades Co., Florida: Fort Myers ARC will operate W4LX during their Gladespedition on *Nov. 13*. Operation in General class phone and cw bands. Some Novice operation also planned. QSL via: D. Fox, KA8CXQ, P.O. Box 051131, Tice, FL 33905.

Gaylord, Michigan: Tri-County Wireless Group will operate N8COY from 1400Z Nov. 13 until 0600Z *Nov. 14* from the 45th parallel, halfway between the Equator and the North Pole. Frequencies: phone — 3.925 7.250 14.300 21.375 28.550. Certificate for QSL and s.a.s.e. to N8COY.

Sandusky, Ohio: Sandusky (OH) Radio Experimental League will operate W8LBZ from 1800Z *Nov. 13* until 1800Z *Nov. 14* in celebration of the club's 50th anniversary. Frequencies: phone — 3.910 7.265 14.280 21.360 28.600; cw — 40 kHz from low end; Novice — 7.125 28.150. Special QSL/certificate for QSL to: W8LBZ, 2909 West Perkins Ave., Sandusky, OH 44870.

Tulsa, Oklahoma: Tulsa ARC will operate W5FU from 1400Z *Nov. 20* until 0600Z *Nov. 21* in celebration of the 75th anniversary of Oklahoma's statehood. Frequencies: phone — 25 kHz up from lower General class band edges. Certificate for large s.a.s.e. to: TARC, 1010 S.Main, Tulsa, OK 74119.

Trinidad and Tobago: Trinidad and Tobago ARS will sponsor the 9Y4 QSO Party from 0000Z *Nov. 20* until 2359Z *Nov. 21* to celebrate 20 years of independence, 5 years as a republic and 50 years of Amateur Radio. 160-10 meters, phone and cw. Exchange signal report and serial number. Certificate for working five or more 9Y4/9Y50 stations. Send log data by Dec. 21 (include IRCs for certificate) to: TTARS, P.O. Box 1167, Port of Spain, Trinidad, West Indies.

Bethlehem, Connecticut: W1FHP and Santa's Helpers will operate from Christmastown from *Nov. 28* until *Jan. 3 (1983)*. Operation 25 kHz from lower General class band edges, 40-10 meters. QSL available. Award also available for working five towns named Bethlehem throughout the world. QSL to W1FHP *Callbook* address.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding publication date. For example, your information would have to reach Hq. by Dec. 15 to make the February issue.

*Assistant Communications Manager, ARRL

Rules, ARRL 160-Meter Contest

The rules for this year's 160-Meter Contest are identical to last year's. Please remember that W/VE stations are prohibited from transmitting in the 1825 to 1830 kHz DX Window.

Official entry forms are available from ARRL Hq. for an s.a.s.e. If you want enough log sheets for more than 300 QSOs, please include two units of First Class postage. Good hunting!

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 3 until 1600 UTC December 5. 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: W8LRL 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) **Adherence to Band Plan:** W/VE stations may transmit only in the segments 1800-1825 and 1830-1850 kHz in conformance to the ARRL band plan.
7) **Reporting:**

(A) Official forms are recommended (available for an s.a.s.e. or one IRC from ARRL Hq.).

(B) Logs must 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 4, 1983).
8) **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.
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 or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: Excess duplicates and callsign/exchange errors. See January 1982 *QST*, page 92, for complete details.

Rules, ARRL 10-Meter Contest

Will Old Sol allow us another outstanding 10-Meter Contest this year? Why not make plans now to tune into the 28-MHz band the weekend of Dec. 11-12 and find out if this year's contest will be as exciting as the last few were? Even if things aren't fantastic, there will still be plenty of people to work.

One note that we can't seem to stress enough: You *must* include the full exchange (signal report and serial number or state) for each QSO you claim for contest credit. Logs not containing full exchanges for all QSOs will be classified as checklogs, which are ineligible for awards. Please bear this in mind as you prepare your entry!

Official entry forms are available from ARRL Hq. for an s.a.s.e. If you need log sheets for more than 200 QSOs, please include extra postage (one First Class unit for each additional five sheets ordered).

Rules

1) **Object:** For amateurs worldwide to exchange QSO information with as many stations as possible on 28 MHz.
2) **Contest Period:** Second full weekend of December (December 11-12, 1982). 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: K9HMB 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 DL8PC in Ohio must send DL8PC/W8).

(E) One operator may not use more than one call sign from any given location during the contest period.

(F) All entrants may transmit only one signal on the air at any given time.
7) **Reporting:**

(A) Official forms are recommended (available for an s.a.s.e. or two IRCs from ARRL Hq.).

(B) Logs must indicate time in UTC, mode, call and exchange for each QSO. 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).

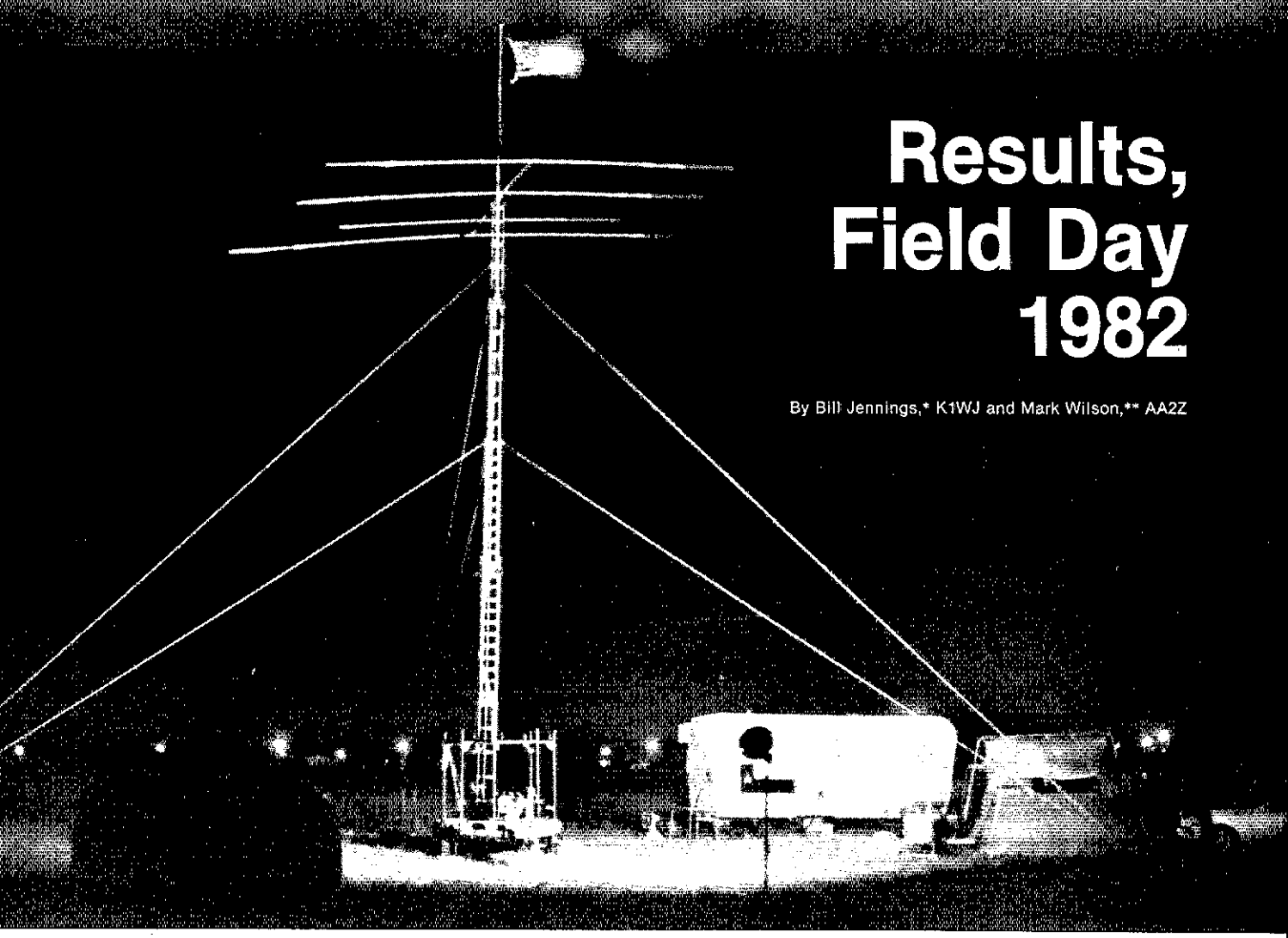
(C) Postmark your entry within 30 days after the contest (January 12, 1983).
8) **Awards:** A certificate will be awarded to the highest scoring single-operator station (in each category) from each ARRL section and DXCC country. Top multioperator entries in each ARRL Division and each continent will 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 or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: Excess duplicates and call sign/exchange errors. See January 1982 *QST*, page 92, for complete details.

Results, Field Day 1982

By Bill Jennings,* K1WJ and Mark Wilson,** AA2Z



Nighttime at the site of the Armadillo Gang FD operation. (KC5UN 5A)

Field Day gives us, as radio amateurs, a time to honor tradition and a time to look forward to enhancing the communications art through innovation and our own efforts. If we look back at the reports of Field Days past, we find enough changes to signal advances in the technical end of Amateur Radio, but not enough differences in the "human factor" of Field Day to make those past FDs all that different from the latest running of FD on the weekend of June 26-27, 1982.

This year marked the 46th time in 50 possible years that there has been an ARRL Field Day. The only thing that kept this from being the "golden anniversary" (50th) Field Day were four years of a little unpleasantness called World War II.

In checking the report of the first ARRL Field Day in the September 1933 issue of *QST*, we can see just how far we have come in nearly 50 years. F. E. Handy reports on Field Day number one:

> The first Field Day was pronounced an unqualified success, according to about 50 accounts of station participation received. The gang who took part are looking forward to more similar occasions for the practical testing of portable (potential emergency) equipment, combined with a good time for all.
>
> Portables were operated from all conceivable locations and on almost all Amateur frequency bands. . . .In addition to power limitations, participants reported insect and weather hazards. . . the results shown in the reports indicate the effort successful, both from the viewpoint that practical building and testing of emergency communication equipment was furthered and from the standpoint that an enjoyable operating activity was made possible. . . .Is your portable equipment independent of interruptions of power? Are you ready for the next tests?

Sound familiar?

Now check the reports of Field Day 1982. Sure, the technology has changed. The 1933 state-of-the-art FD station was a "pair of 46s on 7 and 14 Mc." powered by "B-bats, motor-car B power packs, dynamotors, diesel driven generators and filtered spark-coil step-up devices." A typical 1982 portable station might consist of a solid-state all-band transceiver small enough to carry in one hand, powered by a couple of lantern-sized batteries and a couple of solar-cell panels to recharge them.

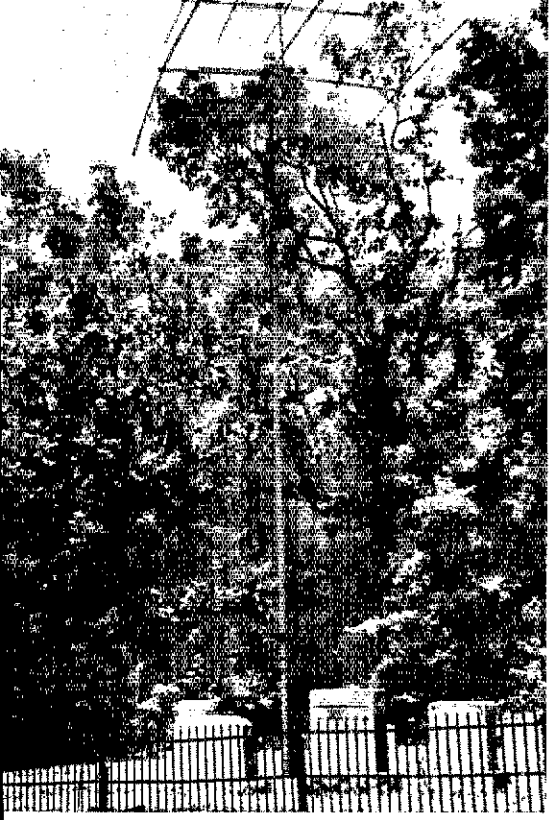
What hasn't changed in all of these 46 Field Days is the purpose of FD and the attitude of the FD operators. Field Day is still, always has been and always will be, first and foremost, an exercise to test our preparedness to deal with any situation during an emergency in which good solid communications are needed. That is the very justification for the creation and maintenance of the Amateur Radio *Service*. Of course, the competitive aspects of FD, as well as the good times to be had in taking part in a FD operation, are no lesser enticements to join in the fray on that fourth weekend in June.

FD '82 was a tad bigger than its forefather of 1933, which saw reports of 50 active stations with nearly 100 participants. This year 1735 reports were received, documenting the activity of 29,890 operators.

The same inventiveness and stick-to-it spirit that got those FD pioneers of 1933 through FD number 1 in fine style saw the Field Day operators of 1982 survive and, in fact, enjoy the 24/27 hours of the latest outing.

The usual obstacles were overcome and, in some cases, turned to the FD participants' advantage. There were the usual bouts with Murphy: broken rigs, fallen antennas, failing generators and forgotten station accessories. Natural forces also played a big part in Field Day. We had to put up with a solar flare on Saturday afternoon and the usual gauntlet of freak rainstorms, hail, and biting, stinging and annoying insects/flora/fauna — your typical

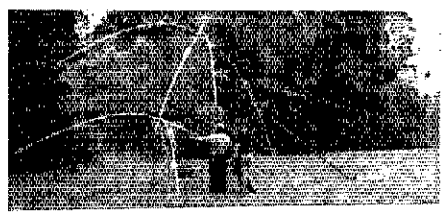
*Communications Assistant, ARRL
**Assistant Communications Manager, ARRL



Field Day is a grave undertaking for the North Augusta-Belvedere RA. (K4FR 2A)

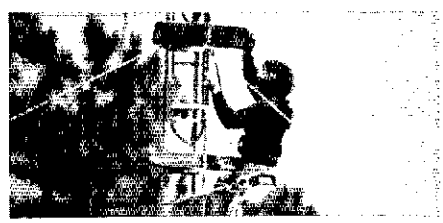
Table 1
Entries per Field Day Class

Class	Entries	Class	Entries
1A	209	1C	39
2A	473	2C	2
3A	300	4C	1
4A	175	1D	81
5A	98	2D	8
6A	36	3D	9
7A	25	4D	3
8A	13	5D	1
9A	2	1E	42
10A	2	2E	4
11A	2	3E	5
13A	1	4E	2
17A	1	15E	1
21A	1	check logs	27
1B	129	late/incomplete	15
2B	29		

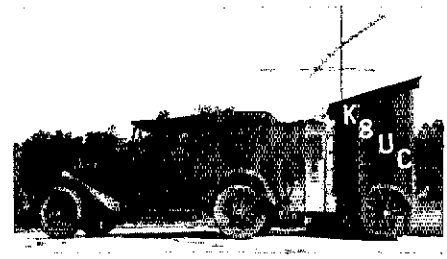


Members of the Scranton/Pocono ARK administer last rites to their 20-meter quad. At least it was a good try. (K3CSG 4A)

Crime Prevention is one feature of Field Day that we've never thought of before — it does keep a lot of amateurs off the street for a weekend, though. The van was lent to the Ottawa ARC by the Ottawa Police. (VE3RC 4A)

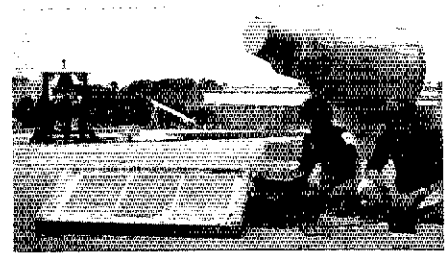


KØNA tries to unjam the telescoping tower at the Arapahoe RC FD operation. (KØNA 2A-Battery)



The Parkersburg ARK has the perfect operating position to take care of those big runs on Field Day. (K8UC 4A)

A banner Field Day for the Green Fox ARC.



Solar power for the Goddard ARC came from using three spare solar panels from the International Sun Earth Explorer spacecraft. The site used was the visitor's center at the Goddard Space Flight Center — that's it in a capsule. (WA3NAN 2A)

Field Day occurrences. And when the smoke had cleared, according to most accounts by the news media that were received at Hq. as proof of the FD publicity bonus, Amateur Radio and Amateur Radio operators were lookin' pretty good in the public eye. Well done!

The W1AW FD message this year contained a surprise bonus. It said that by contacting W1AW during the FD period (yes, it really was W1AW in class 25A to the tune of nearly 13,000 QSOs) and so indicating on your FD Summary Sheet, 100 bonus points would be added to your FD score. It was surprising to note that only about 60% of those class A and B stations that were eligible for this bonus bothered to apply for it. It pays to copy the W1AW Field Day Message.

The following is a fictional composite of some of the Field Day stories we received this year.

January 6, 1982: Harry Hambone, WAØXYZ, the new activities chairman of the Valley ARC, stands up at the club's first meeting of the year and announces that it's time for the group to start thinking about what the club should do for Field Day. "I know it's early," he says, "but if we want to have a successful effort like we have had for the past 13 Field Days we've got to start planning early." Harry isn't making any definite plans yet, but he asks his fellow members to think about what they can do to help the club's effort. He says that, starting at the next meeting, he'll ask for specific commitments.

February 3, 1982: Snow from this morning's storm still blankets the roads, but about half of Valley ARC's 83 members, including Harry, make it to the meeting. After the regular agenda items, talk turns to Field Day. Harry's first piece of business is to ask the club what class they should plan to enter. He has a copy of the May 1981 *QST* with the Field Day rules for last year to help refresh everyone's memory of how the Field Day classes are determined. For years the club had entered in the 3A class, but last year they added another transmitter and went 4A. The ensuing discussion examines the merits of both classes, and the conclusion is that 4A was one transmitter too many because of a lack of operators. The group decides that 3A is "golden."

With the basic question settled, Harry asks for volunteers to handle the following areas: power, equipment, antennas, food, the Novice/Technician station, traffic (for the bonus points), OSCAR and the natural-power station. Hank, AAØXX, whose call shows up in the *QST* BPL and PSHR listings each month, volunteers to copy the W1AW FD Message and draft a message for relay to the SCM. This will be good for an extra 200 bonus points. Howard, KØZZZ, says he can build a solar-cell array that will power a QRP rig if someone can supply the rig. Someone can; another 100 bonus points accounted for. Henry, KBØZYX, the club's newest Novice, volunteers to set up the Novice/Tech station if at least one other person will help out. Hubert, KBØXXX, and Hobart, KBØZZZ, raise their hands and volunteer to get together with Henry to iron out the details.

Hazel, ARØX, offers to prepare a press release for the *Valley Gazette*. Hiram, NØZZZ, says he'll try to round up some generators for the club to use. By the end of the meeting, Harry still needs volunteers to arrange for rigs, antennas, food and OSCAR. Still, he's happy that the club has enough interested people to fill half of the subcommittees. A few phone calls and he'll have the rest of the volunteers at the next meeting. The last order of business is a vote on where to hold the FD operation. The consensus is that Memorial Park was a great site and that they should try to reserve it again this year. Harry makes a mental note to fire off a letter to the town council.

March 3, 1982: Harry stands up in front of the club and reviews what happened at the February meeting. He explains that Field Day is a group effort and that people are needed to

round up rigs, antennas and food. As it turns out, the food is the easiest problem to solve, as Harley, KDØXX, suggests that everyone bring something different and have a "pot luck" supper this year. He'll coordinate so that they don't end up with 23 pork and bean casseroles. Before he starts pressuring people into bringing rigs and antennas, Harry explains his course of action. They'll set up one station for use on cw on all bands. Another will be dedicated to phone operation on 80 and 40. The third will operate 20, 15 and 10-meter phone. The natural-power QSOs will be made at the cw station, and the traffic will be handled at the 80 and 40 phone station. The way Harry sees it, they need three transceivers, two triband Yagis and some wire antennas. He'll bring his rig and an 80/40 dipole for the 80/40 phone station. Hollis, WDØXXX, says he plans to move his tribander from a roof mount to a new tower this coming summer, so he'll postpone the new antenna raising until after Field Day. Hilda, NØXYZ, says she'll bring her rig again this year on the condition that Horatio, AL4K/Ø, doesn't plug it into the 220-V line as he did last year. Horatio promises not to, and at the same time offers his trap dipole, so the cw station is complete. All Harry needs now is another antenna and rig for the 20-10 meter phone station. A few more phone calls . . .

April 7, 1982: Harry is pleased to announce that the town council voted to allow the FD operation at Memorial Park. The mayor also noted that he will proclaim the week before Field Day as Amateur Radio Week. Some of Harry's buddies have volunteered enough equipment for the third station. The Novices unveil their plans for a 200-foot wire vertical supported by a helium-filled weather balloon. Hiram reports that he still needs one more generator because Homer, WAØXZZ, refuses to bring his again. Seems someone ran it out of oil last year and the engine seized. Harry says the club will rent one from We Rent Anything, if need be. Still no volunteer for the OSCAR station.

May 5, 1982: Harry brings in the May *QST* with the Field Day rules. He asks the club secretary to send an s.a.s.e. to Hq. for a Field Day package. "For 60 cents," he explains, "we can be sure we get the right forms, so ARRL Hq. can report our score accurately. Remember the year the FD Chairman didn't send for the right forms and left out some info? After all our hard work, our entry ended up listed with the incomplete entries." Howard reports all is well with the solar-cell array, and that they've tried it out. Everything works fine. The Novices can't get the helium balloon, so they've opted for an all-band, G5RV-type antenna. Another club member has arranged to borrow two 35-foot push-up masts from a local contractor to support the tribanders. Homer will bring his generator after all. The food is all squared away; looks as though a fine repast is scheduled. Harry can't believe it; more than a month before Field Day and all is taken care of except the OSCAR station.

June 2, 1982: Everything is in a "go" condition. The bulk of the club meeting is devoted to reviewing the club's game plan and taking care of last-minute problems. There is still nobody willing to attempt OSCAR, but all of the other bonus points are accounted for. Should be another successful FD operation. Harry's parting words are, "Pray for good weather."

June 26, 1982: It's 7 A.M. The sun peeks over the horizon basking Memorial Park in a subdued glow as Harry and 28 members of Valley ARC set up for the most enjoyable ham radio weekend of the year.

Administrative Stuff

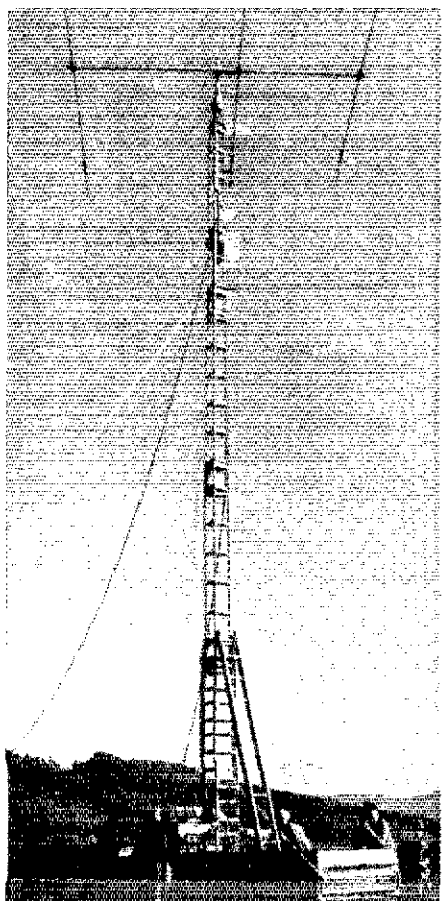
We hate to have to keep repeating ourselves, but it seems that this must be said year after year. With all the time and effort that your group puts into its Field Day effort, it makes sense to spend some time to submit your Field Day entry correctly. Homemade FD entry forms seem to be the major culprit in incomplete and indecipherable FD entries. Really, is it too much to spend 60 cents and a few moments of time to send a self-addressed, stamped envelope to ARRL Hq. for official forms? The official forms even come with instructions on how they are to be filled out. Put a responsible person in charge of sending in your FD entry. Even a correctly filled out entry is useless if it is received after the deadline. Watch those mailing deadlines. The Field Day Rules, which appear every May in *QST*, tell all there is to know on how to play Field Day. It's worth the time to read the rules *before* FD rolls around.

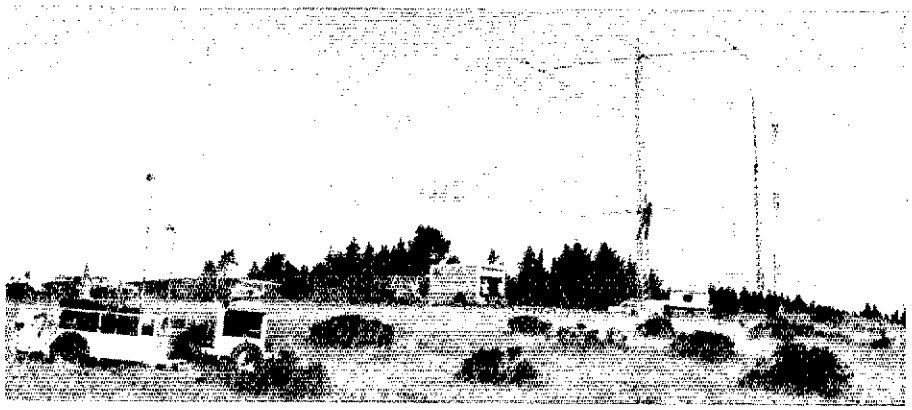
Thanks for all those FB Field Day photos. Obviously, we get more than we can use in the FD report. We do use as many as possible in other articles and publications, and are grateful for all the photos we receive.

We owe a special thanks to Brandy Kenney, ARRL Contest Aide, who worked very hard to ready the FD scores for this listing.

That just about wraps up the report on FD '82. We think it's pretty hard not to get involved in a Field Day operation. If you've been out at FD before, you know what we're talking about. If you have yet to participate in Field Day, why not start your own Field Day tradition with an outing on FD '83. You'll be glad you did.

A truck-mounted tower used on FD by the Loveland Repeater Assn. (WØOSK/Ø 2A)





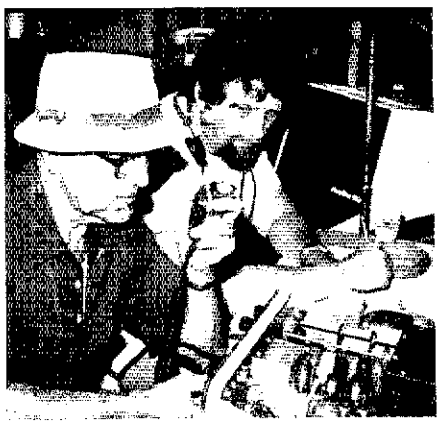
The Foothills ARS brought out an impressive array of antenna hardware to do battle in the 4A category from their site near San Francisco. (K6YA 4A)

The OQUIRRH group had quite a view in looking down from 9300-foot ASL Peak into the Bingham Open-Pit Copper Mine. (N7ARE 1A-Battery)

The old snow bucket gets a workout even in summer with the Ottawa Valley Mobile RC. (VE3RAM 2A-Battery)

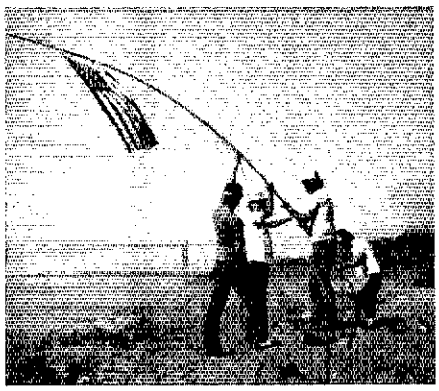
FIELD DAY 1983
JUNE 25-26

Some Field Day nostalgia from the Chehalem Valley ARC. (K7FM 2A-Battery)



The Beacon ARC has participated in every Field Day since the club was formed in 1937. W3CNP is doing 20-meter ssb, while W3MRM keeps the dupe sheet on the computer.

How's this for "natural power"? Communications were strung a little thin at the Surely Temple Solar Society. (WB8QKR 1A-Battery)



The operators at AE6H/6 (4A) (see cover) raise the antenna mast atop 781-foot Mount Livermore at the start of their mini-expedition. All five members of the Redwood Empire DX Assn. took part.

Gourmet chef Souly, VE2FFS, keeps the troops happy at the Montreal ARC FD site. (VE2BG 2A)

The natural-power bonus station at the Monsanto ARA. (W8DYY 4A)

The University of Pennsylvania ARC and the Holmesburg ARC joined forces on Field Day on the grounds of the Pennsylvania State Hospital in Philadelphia. (N3KZ 2A)

SOAPBOX

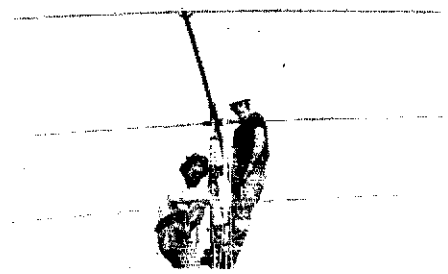
The name of the N7ZZ 2A Field Day group (7313 points) is: The Southwest Washington and Northwest Oregon Conspiracy dedicated to burying the Decaying Corpse of the Roasted Turkey Gut Group Fortified by the Loose Individuals DX Society in Coalition with the Rubber Circle Contest Cheaters Club and further dedicated to winning Field Day bets no matter what (N7ZZ). We had an endless stream of deluges for the entire week before Field Day. Our site absorbed all the moisture it could, until the water table moved above ground level. All our campers and RVs had to be pulled out later with a Jeep and winch . . . our generator and its propane tanks sank almost out of sight . . . walking to and from the stations in the ankle-deep quagmire was a nightmare, but every operator made it on schedule. If there had been a *real* emergency, the conditions we'd be operating under couldn't be much worse than what we experienced during FD '82 (AJ4L, 5A). We set up near a church graveyard. The only problem we had was during a 20-minute period Saturday, when all receivers went dead. We suspect that the spirits came to inspect the installation, found all well, and allowed us to proceed (K4FR, 2A). We set up on the Ottawa River. The site was chosen so as to have a water reflecting plane/ground plane. On 40 meters, we used two antennas: a half-wave coaxial vertical and an over-the-water Half-Delta Loop (VE3CZ). We started setup at 1800Z Saturday and hoped to be operating in a matter of minutes, but Murphy slowed us down at the start. Found Jim, K8JOS, trying to talk to a bullfrog about 4 A.M. (Hi!) Sure had a lot of fun (K8JK, 2A). We had a great time again this year, even though conditions were not as good as in past years. At one point, stations reported that the bottom fell out of everything! Must've been a solar flare. We improved our effort this year with planned meals, and we had the use of a boom truck for a "tower." The mild temperature made for comfortable operating. Lost one generator, but had a spare ready (W6PIY, 2A). The highlight of FD was working ZL2BMC on 75-m phone with 10 W and a low dipole. For the second year, we ran on total wind power. It not only ran perfectly, but also generated more power than we could use in the 10-W category (K7FM). Our newly designed log sheets made it necessary to invite only operators who could write small. The new logs were a good idea, however, since we kept the filled-sheets-per-hour quota the same as last year (K1GQ/2, 1A). We had one less rig, but made 90% as many QSOs as last year. Many people sent faster than we could receive, making some contacts unusable (N2DM, 2A Batt.). Not every station in California is a kilowatt! This was our first FD; we'll have to get serious next year (K6EWM, 1B-2). Been a ham for 11 years, and this is the first time I went out. My Heath HW-7 got a lot more contacts than I expected. It didn't rain, and

the tent kept away hordes of mosquitoes. Many thanks to my father-in-law, Floyd Quick, for letting me set up on his farm (VE3FME/3). Worked 48 states . . . Neighbors didn't even complain about the generator noise this year (KA6BIM). The goals for FD were to enjoy, operate, diversify, involve our membership and build confidence in our Novice operators. We covered all the bonus points, operated almost all bands, and experimented with low-power generators, solar power and OSCAR (KX4W, 4A).

FEEDBACK

Please turn to Nov. 1981 *QST*, pages 88-99, for the following corrections. The Canadian postal strike delayed the following entries: In 2A — Windsor ARC, VE3OW/3, 752 B- 3708; in 3A — Oakville ARC, VE3HB, 514 B-28-1042; in 1C — VE3DQF/3 (2 oprs.), 181 B- -720.

In 1A-Battery, WØVM should have been credited with another 100 bonus points, bringing their score to 2650. The 1A entry of the Ozark Contesters, W5TNT, was destroyed by the U.S. Postal Service. Their line score of 1270 B-5-4432 puts them fifth overall in that category. Table I should have class 21A listed with one entry and 20 operators.



KIØQ and WAØLHE are working on one of two 100-foot towers at Iowa State University Agronomy Research Farms, site of the Story Co. ARC 1982 FD effort. (KØNN 2A)

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. The listings show club or group name, call(s) used, total number of QSOs, letter indicating highest power level used (A is less than 10 W; B is less than 200 W; C is more than 200 W), number of participants (if known) and total score including bonus points. Scores are listed from highest to lowest in each class.

Class B stations are those portable manned by one or two operators. These may have one or two transmitters in simultaneous operation. Class 1B stations manned by one operator are listed first, followed by those with two ops, followed by class 2B stations. When there are two operators, the other operator's call is listed in parentheses, if it is known. Numbers following the calls indicate QSOs, power and final score.

Class C stations are mobiles. They are listed by call (number of operators), QSOs, power and final score.

Class D stations are home stations using commercial power. Line scores are the same as for class C.

Class E stations are home stations using emergency power. Line scores are the same as for class C.

An asterisk (*) following the call sign in classes A and B indicates that the group did not begin setup until after 1800 UTC on Saturday.

Club/Non-Club Portable

1A-Battery

Guano Reef Bashful Perverts
N4BP* 1170 A- 3-9585
Club Radio Amateur Sorel Tracy
VE2CBS 672 A-25-7440
Jack And His Gang
N5AF* 685 A- 6-7350
The Aggie Effort
K5MW 798 A- 5-7120
Mara-Juana FD Party
W1MJ* 668 A- 8-6995
Hamburg Helpers
KBIF 684 A- 3-6940
Massillon ARC
W8NP* 620 A-13-6065
Morrice Minnis Barthelow & Goldman
WB6ITM/6 * 517 A- 5-5305
RCA ARC
N9RJ 741 A-20-4375
USAF MARS Hawaii
KH6BM 638 A-15-4060
Clallam Co. ARA
W7FEL 366 A- -4060
Virgin Islands ARC
KV4IE* 599 A-15-4055
Arrowhead RAC
WØGKP* 478 A- 8-3930
Beacon Radio Amateurs
W3AA* 372 A- 6-3645
Elgin ARS
W9IKN 313 A- 5-3630
S.D.A.R.C.
N6IN/3 444 A- 5-3590
QUARTS
KBSYH/8 391 A- 5-3520
The Principia College ARC
WØVM 297 A-17-3470
Glen Gates ARC
W9MO/9 268 A- 4-3275
East Alabama ARC
KE4T 464 A-11-3165
Brewton AR Union
N4PV* 968 B-11-3090
Three Mousekeeteers ARC
VE7ZAP 287 A- 4-3040
Pacific Northwest Alpine International QRP Assn.
W7EI* 273 A- 3-2940
Hieda's Crunchers
KH6NO 723 B- 5-2834
Valley ARC
WØPI 647 B- 7-2582
Calabogie Bug'ers
VE3JRT 217 A- 7-2370
OQUIRRH Sunshine Hill Independent Team
N7ARE* 328 A- 3-2270
Surely Temple Solar Society
WB8QKR 221 A-10-2150
Gunnison Valley ARC
WØGYV* 786 B- 6-2126
Worldradio Staff ARC
N6WR* 651 B- 6-1974
University ARC
KB7M* 594 B-18-1764
DBARS
W6HCP 263 A-14-1760
Huron ARC
WØNOZ 622 B-11-1752
South Florida Hamsters
WA4IQA* 719 B-11-1638
Non-Club Group
KA1VH 545 B- 6-1490
Alexandria RC
W4HFH* 85 A- 9-1370
Washington Co. ARC
AA9E 377 B- 6-1354
Non-Club Group
AC9B 251 A- 3-1325
Marshfield ARS
KB9SS* 500 B-15-1300
Hillsdale Co. RAA
WB8FFO 98 A-15-1265
Michigan QRP Club
W8LCU 104 A- 4-1240
Northern Panhandle ARC
WBZQ 236 B-18-1072
The Alternative
WA8WCU 109 A- 3- 975
Midway ARC
WØKY 305 B- 8- 862
Limestone ARC
K4KJD* 108 A- 6- 760
Houston Echo Society
K5PGS 108 B- 4- 750
Indiana University ARC
K9IU/9* 249 B- 5- 712
Megahertz Manor Maniacs
WØYBV 217 B- 4- 534
The Utah Liquor Commission
KC7O 208 B- 4- 516
Hiawatha Valley ARC
KFØT 37 A- 4- 455
Knickerbocker ARC
WA2OEG* 56 B- 3- 412
DWI
NV4H/4* 49 B-12- 203

1A

Buffalo Area DX Club
W2RR/2* 1765 B- 55-5852
Father Leon's Group
W8WPC* 1879 B- 3-5794
Central Indiana Contesters
KJ9D 1530 B- 5-5288
Thibodaux ARC
W5YL* 1354 B-20-4750
Bozo and the Lids
W9TG 1008 A- 3-4432
Callaway AR League
WØDD 920 B-15-4290
RA Contest Operators Operating In Natural Surroundings
K4ZM 921 B- 8-4284
Adjuntas Radiotelegraphers RC
KP4F1* 914 B- 6-4152
Hotbrook Allstar Wireless Gang
KIDW/1 883 B-12-3994
Cho-Ko-Ton Lodge RC
K1GQ/2 1087 B- 3-3990
Idaho Contest Conspiracy Group
K7TM/7 764 B- 5-3746
Idaho Mavericks
W7RH/7* 1049 B- 8-3656
Soothing Libations Consumer Corp.
K5BS 993 B-10-3626
The Hill & Swamp Country Bunch
N5BST 1296 B-14-3614
Yuma Arizona Hot FD Team
K6LL 1198 B- 3-3512
York Co. ARS
K4YTZ/4* 952 B-12-3418
Delta DX Assn.
W5RU* 820 B-14-3196
Captain America's Legal Manoeuvres
KB5CA 930 B- 3-3106
Owensboro Kentucky ARC
K4HY/4 763 B- 8-2972
Nittany ARC
W3YA/3* 757 B- 5-2888
Lake Superior DX Assn.
KØET* 695 B- 5-2806
The Ozarks ARS
KØFA 842 B-25-2796
Pikes Pique ARC
W6JI* 675 B-11-2736
Athens Co. ARA
WB8DOD 879 B-20-2704
Old Pueblo RC
W7GV 725 B-12-2680
Winona ARC
WØNE/Ø* 849 B-15-2666
Paradox Plus Two
K2LYV 594 B- 4-2658
Chigger Mountain Scratchers
WA3YVR 1182 B-13-2574
Miami Co. ARC
W8FW* 967 B-15-2544
Dr. Loomis Memorial Junior Mechanics League
N4FM* 912 B- 8-2446
Lebanon ARK
KØDEW 629 B-12-2416
Baltic AR Fanatics
AE3G 575 B- 4-2400
Sussex ARA
K3JL 581 B-10-2398
Holiday Renegades
NY4O 679 B-12-2398
Collins ARC
K5CQ* 977 B-10-2366
Muskogee ARC
W5EJK 873 B-24-2356
Ogden ARC-1
KN7U 460 B- 9-2340
OMARC,NRA
KQ2V* 606 B-10-2322
HUM Group
KJ8Y* 505 B- 3-2320
Baltimore ARC
W3FT 569 B-15-2262
Hollywood Hills Repeater Group
N6FM* 985 B-19-2256
807 FD Group
WB8UCW/8* 801 B- 8-2246
Denton Co. ARC
WSNGU 918 B-12-2220
Tri-City Rptr. and Ottawa ARC
W8YEK/8* 677 B-19-2192
End-Of-The-Line ARC
KKØI 600 B- 4-2176
Independence ARC
KØPUX/Ø 677 B-15-2172
Sleepy Hollow Four
N4BWX* 462 B- 4-2108
North Coast Contest Group
WB8BTO 776 B- 4-2104
Adams Co. Ohio Peach Mtn. Group
W8ON/8 481 B- 3-2074
ARC of Central Wisconsin
N9BBN 712 B- 9-2054
Northland ARA
KØMAT 493 A-20-2008
West Nebraska ARC
WØAFG* 751 B-20-1996
Chateauguay ARC
VE2CAR/2 552 B- 7-1980
Ogden ARC-2
KC7KW 734 B-15-1968
Ramsey Co. ARC
WDØFFQ* 655 B- 8-1910
Very Fine Operators
N6KG/6* 445 B- 5-1840
STOP DEARS
KØBP* 709 B- 8-1830
Western Colorado Joint Venture
NØZA* 499 B- 9-1830
Texins ARC
K5OJI/5* 696 B-11-1824
Maui ARC
KH6RS 675 B-12-1784
Telephone RA Pioneer Society
N8ADI 576 B-10-1762
The Motley Crew ARC
KK9H 682 B-10-1758
LO-INYO ARS
W6TD 483 B- 3-1754
See Reverse Side
N8BYV 577 B-12-1722
Univ. of Missouri-Rolla ARC
WØEE 856 B- 5-1712
Temple Univ. ARC
WA3IVT* 477 B- 5-1708
Raiders Of The Lost ARC
N5HD 508 B- 7-1704
O.M.I.K. ARC, Chicago
K9EVC* 790 B- 6-1680
Minneapolis RC
WØCKF* 424 B- 9-1660
IBM RC-SanJose
AA62/6 384 B-22-1656
Northeast MS. ARC
K5DGL 587 B-15-1636
Megadata ARC
KK2E 429 B- 6-1606
Non-Club Group
KU6X 694 B- 4-1604
Patio Pounders
K2RN 453 B- 3-1574
Midland ARC
W5BAJ/5 627 B- 6-1552
Greater New Orleans ARC
W5UKF* 425 B-13-1542
Central KY. Contest Group
KC4JX 1241 C- 9-1526
Hopkins Co. ARC
NU4O 445 B-10-1520
Bountiful ARC
W7UL 1203 C- 8-1503
Bruce ARC
VE3TIV 547 B- 5-1494
Non-Club Group
AF2J/1 337 B- 3-1480
Lookout Mountain ARC
KØJV/Ø* 355 B- 3-1472
Red River Valley ARC
K5DEW 439 B-10-1466
Stockton ARC
WAØYBG 356 B-15-1462
Rip Van Winkle ARS
W2FSL 311 B-40-1444
Lubbock ARC
K5LIB* 518 B-25-1438
SRO/CFMC
WØEJ* 457 B-45-1418
Van Isle ARC
VE7VCC 530 B-23-1382
Acadia Naval Radio Amateurs
K1NAN 482 B- 9-1378
Lake Nancy Amateurs
KG2H 411 B-12-1378
ARC of Carrollton
KC5E 490 B-25-1364
Volunteer Wireless Society
KB4E 420 B-12-1358
Rainbow Canyons ARC
K7JH 1149 C- 6-1349
Sabine Valley ARA
N5ANN/5 596 B-17-1330
First State ARC
K3QBD 422 B- 9-1316
Non-Club Group
N6YJ 1205 C- 3-1305
McDonnell Douglas Astronautics West ARC
W6VLD/6 502 B- 8-1292
Plateau ARA
WA8YTM 338 B- 7-1276
Mason County RC
K8DXF 475 B-17-1250
Hastings ARC
WØWWV 353 B-15-1234
Terrace and Kitimat
VE7DRW* 264 B- 8-1234
Alamogordo ARC
K5LRW 395 B- 4-1226
Southwest Ohio ARC
KC8QH 1026 C-12-1226
Lima Area ARC
WBEQ* 346 B-21-1202
Sacramento ARC
W6AK 549 B- 5-1198
Severn School ARC
WA3WRC 269 B- 6-1172
Eastern Nevada ARS
WB7WIS 369 B-10-1120
Gaston Co. ARS
KA4U* 477 B-11-1054
Gibobrian
VE3DFS/3 473 B- 3-1046
Univ. of Texas ARC
W5EHM 405 B- 3-1016
WRECS
W8CBR 356 B- -1000
SPARK
WBØJBY 349 B- 5- 998
AIL ARC
K2ICK 321 B- 5- 996
Lockheed Employees ARC
W6LS* 247 B-18- 984
Key Beepers ARC of Sedro Woolley High School
KC7EZ 365 B- 5- 970
Barron Co. Wis. ARES
WØMP 258 B- 3- 968
Theodore Roosevelt ARC
KØND* 410 B-14- 962
Non-Club Group
WB9VPD 277 B- 5- 962
Non-Club Group
K8ED/8 329 B- 8- 944
Emerald RS
WA7FQD* 257 B-12- 924
Treaty City ARA
W8UMD* 359 B-10- 922
Kankakee Co. RACES
KB9N* 354 B-15- 922
ZQZ FD Group
WB6ZQZ 336 B- 5- 888
Mid-State ARS
N4FS* 337 B- 5- 874
Friends of FD
WA7BTZ* 239 B- 5- 858
Ringgold High School ARC
W4ABZ 687 C- 5- 857
North Florida Novice Hand-Its
KA4MDU 162 B- 3- 848
Hiawatha ARC
KØNL/Ø* 248 B-12- 796
Lake Martin ARC
WA4OQD 242 B-13- 784
Hamden RC
WA1HRC 206 B- 5- 706
Ellis Co. ARC
WD5DDH* 252 B-12- 704
Kennydale Key Klicks
W7JIE 191 B- 4- 682
Honey Lake Hams
KA9AOI 291 B- 4- 682
Handsome Devils
KC9RO 361 C- 3- 669
Last Mountain RC
VE5LM* 228 B-10- 664
Baytown Civil Defence
K5SCR 225 B- 8- 658
Albert Lea Spiderweb ARA
WØFIT/Ø 234 B- 6- 648
Prairie Valley ARA
NØDHP* 211 B- 9- 622
Non-Club Group
K2AOE/8* 197 B- 4- 602
Covington ARC
KZ4S 139 B- 8- 578
MIA ARC
W5CFX* 165 B-25- 530
Mississippi Baptist Hams Assn.
WA5UDQ/5 108 B- 5- 516
Lake Region ARC
KØQIK 245 B-15- 490
Pendoreille ARC
W7IFO* 182 B- 6- 464
Non-Club Group
N7BHB 150 B- 6- 406
Ham Operators Serving Every RS
K7DB* 100 B- 3- 332
Society For Preservation of AR in Kodiak
AL7DD 217 C- - 317
Douglas Co. Ga. ARA
K4PI 160 C- 6- 260
Stratford Road Gang
K9MWM/9* 50 B- 5- 200

1A-Commercial

Winnipeg DX Club
VE4AA/4 666 B- 6-1542
Hanscom AFB MARS Team
W1BXI 346 B- 5- 692
Southport Island FD, Marching and Chowder Society
W1GGA/1 343 C- 3- 548
Principia College ARC
K9BO 216 B-12- 432
Loudon Co. ARC
W4WV/4* 81 B- 3- 324
Warrick ARC
W9MR* 190 C- 4- 190
North Seattle ARC
W7DA* 13 B- 5- 126

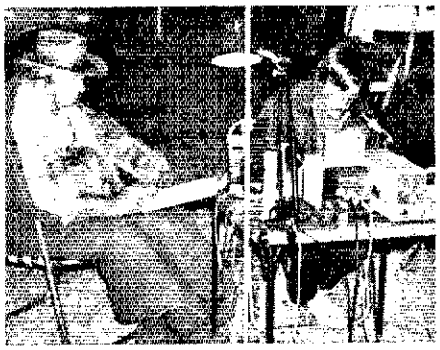
2A-Battery

Conn. Wireless Assn.
W1RM* (+KA1EAD)
1482 A-10-14,000
Arapahoe RC
KØNA/Ø* 1669 A-15-13,420
Oak Ridge ARC
K4PJI* 1209 A-15-10,580
Bicentenial ARC
K9EA* (+KH6JTE)
1201 A-30-9960
Northern Ohio ARS 1
K8KRG* (+KA8OGM)
867 A-110-8645
Tri-State ARS
W9OG (+KA9KRE)
750 A-52-8200
Barnesville ARC
W8FYF* (+N8EAP)
976 A-20-7470
Meridan ARC
N1AN 741 A-25-7225
Tektronix Employees RAC
K7AUQ 801 A- 8-7115
Walton RA
W2LZ* 663 A-10-7030
Best of Mt. Baldy
N6UU (+N6GUX)
817 A-36-6755
Fellowship ARC
ND4E 864 A-20-5955
Chester County Caboose Crew
W3FM* 683 A- 4-5760
Harper Air Hawks
WB9JVX*(+KA9LMY)
534 A- 9-5555
Sticky and the QRP Sheet Eater Boys
N2RI 625 A- 3-5175
Splitrock ARA
K2RF 1399 A-18-4880
Walker Co. AC
KQ4DX 589 A-15-4380
Kerr Lake Campers
N4SW 1674 B-10-4198
Sandy River ARC
W1KX (+KA1GPQ)
1164 B- 9-3966
Fort Armstrong Wireless Assn.
W3SFA/3 (+KA3ITE)
388 A-22-3870
Free State ARC
K3IVO* 523 A-10-3605
Thumb ARC
W8AX/8 332 A-12-3505
Univ. of Mass. ARA
W1PUO (+KA1IPO)
319 A- 8-3500
Lockport ARA
W2RIJI (+N2BIC)
393 A-20-3140
Confederacy of Idiots
K5TMS 359 A- 4-3050
Extra Efforts
KG9Z* 304 A- 6-3045
Great River ARC
WØHJ/Ø*(+KAØMRN)
482 A-10-2835
Nanaimo ARA
VE7NA/7 826 B-20-2754
Pine State ARC
K1CZ* (+KA1ISC)
520 B-10-2508
Puerto Rico ARC
KP4ID (+WP4BXS)
562 B-21-2428

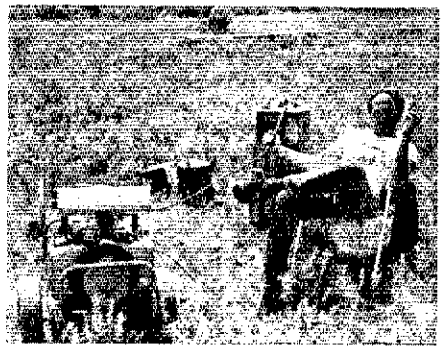
Elmore Co. ARC
KB7XT 356 A- 3-2180
Stark RTTY Group ARC
WB8RVM 556 B-12-2104
Smyth Co. Amateurs
NM4L 714 B- 6-1880
RA of Greater Elbridge
N2DM/2* 402 B- 9-1804
Clay Co. Ham RC
N8BMX 553 B-15-1770
Va. Tech. ARA
K4KDJ 448 B-11-1724
Chehalem Valley ARC
K7FM* 252 A- 5-1700
Triode ARC
K4AIH* 534 B-14-1680
Pecos Valley ARC
K5WK (+KA5LMU)
418 B- 9-1672
Hendricks Co. Ham Club
AE9R* 569 B-15-1646
Kern Valley ARC
W6DLW* 298 B- 6-1492
Coon Valley ARC
W@AJA/@ 473 B-18-1430
Club De Radio Amateur Outaouais
VE2CRO* 234 A-15-1309
Motorola ARC of Arizona
KB7IQ 389 B-24-1282
Parkwood ARC
K5@V 445 B- 4-1200
Elma RA Beverage Consumers Group
KC2P* 399 B- 5-1106
Mammouth Cave ARC
KD4SS* 199 B- 9-1040
Ottawa Valley Mobile RC
VE3RAM 303 B-12- 938
Cuesta Experimenters
WA6RKE* 117 B- 3- 734
South Bay ARC
WB6MYD* 102 A- 5- 710
Barage Co. RC
N8BNC* 189 B- 4- 678
Mensa AG Special Event Station
K3QQ/2 62 A- 5- 620
58 Group
VE7LAW/7 203 B-12- 406
The Frogs
KB@GY 43 B- 3- 298

2A

Richardson Wireless Klub
K5RWK 2975 B-53-8954
Heart of America RC
W@RR (+KA@NLW)
2875 B-28-3550
West Virginia DX Assn.
W8NR 2116 B- 9-7764
Flyweight DX Group
W4JD* 2401 B-20-7660
The ARC of the Ohio State Univ.
W8LIT* 2198 B- 9-7374
See The Snapbox Comments
N7ZZ 2707 B- 6-7314
Desert DX Corps
AA7A 2004 B- 5-6882
Ohio Valley ARA
W4FU/8 2137 B-16-6718
The Five-Nine Michigan Good Luck in the Contest RC
N8UM 2123 B- 7-6486
Rockwell ARC
W8TFZ* (+KA8HFO)
1788 B-12-6360
Radio Amateur Tech. Society
W9RW 2218 B-12-6296
Mobile ARC
NO4T (+KA4PSG)
1973 B-30-6278
Lake Area ARC
KJ8U 1992 B-47-6214
Ski Country ARC
K@CL (+KA@MUB)
1825 B-25-6142
Mecklenberg ARC
W4BFB* 1876 B-35-6074
W/K ARC of Greater Milwaukee
N9AW (+KA9GAZ)
1771 B-17-6066
N.J.R.A.C.
K9SA/9 (+WD9IEV)
1691 B-20-5978
Red Ant Annihilators
N6KN* (+KA6NZY)
1898 B-14-5960
Dayton ARA
W8BI* (+KA8OQH)
1887 B-37-5952
Overlook Mtn. ARC
K2HA (+KA2MZF)
1662 B-26-5844
Jet Propulsion Laboratory RC
W6VIO (+KA6SMQ)
1856 B-26-5840
Montrose ARC
KJ@G* (+KA@LPT)
1742 B-24-5794
Mercer County ARC
W3LIF 1698 B-16-5786
Opequon RS
N8II /8 (+WB2DIN)
1693 B- 6-5786
The Western Illinois ARC
W9AWI: (+KA9AUD)
1678 B-30-5782
Central Kansas ARC
K@WA/@ (+KA@LIN)
1757 B-18-5782
North Ark. ARS
K5LG (+KA5MHX)
1670 B-15-5660
Grand Rapids ARA
W8DC (+KA8KUQ)
1701 B-47-5656
Northern Berkshire ARC
K1FFK (+KA1HFT)
1741 B-18-5634
The Ditty-Dum-Dum-Ditties
W@IZ*
1739 B-10-5508
Amateur Radio Transmitting Society
W4CN (+KA4TEP)
2755 B-60-5452
The FORCE
W@AIH/9* 1546 B- 7-5412
Livonia ARC
K8UNS 1653 B-42-5398
Gallatin ARC
W7ED 1658 B-20-5356
Kanawha ARC
W8GK (+KA8BMH)
1550 B-30-5324
Radio Amateur Megacycle Society
W9DY* 1273 B-10-5306
Olathe ARC
K@KS (+N@CHP)
1317 B-14-5284
Rankin Co. ARC
KB5DX 2278 B-21-5278
Rodney's Rangers
KD5T 2529 B-14-5248
St. Louis Police ARC
W@FF (+KA@KWL)
1591 B-12-5230
Tex-Mex DX Club
W5VX (+KA5MED)
1788 B- 6-5226
San Angelo ARC
W5QX* (+KA5KHY)
1676 B-32-5214
GOBS
K8JK* (+N8EBA)
1360 B-25-5210
Broken Arrow ARC
W5DRZ 1624 B-15-5180
Brandon ARS
K4TN* (+KB4AEV)
1397 B-18-5124
Muncie Area ARC
K9NN/9 (+KA9MMT)
1419 B-34-5122
West Valley ARA
W6PIY (+KA6UUS)
1544 B-30-5086
Seyler County ARC
K4XU (+KA4TWU)
1386 B-15-5074
Medina 2 Meter Group
K8IV/8 (+KA8DSP)
1491 B-34-5066
Edison Radio Amateur's Assn.
W8ICN (+KA8PNS)
1487 B-17-5050
Stateline RC of NY & NJ
K2LSA 935 B-15-5040
Puttstown Area Repeater Team
N3WW (+KA3IEB)
1504 B-21-4992
Putnam Emergency and Amateur Repeater League
K2AV (+N2CSX)
1410 B-18-4966
Denver Labs ARC
W@RG 1602 B-12-4964
Syosset High School AR & TV Club
WA2JAS* (+KA2KPK)
1480 B-14-4960
Farout ARC
WB8SMC/8 (+N8BFC)
1426 B-26-4912
Northwest Ark. ARC
N5XR 1315 B-23-4904
Cape Fear ARS
K4MN (+KA4NJV)
1468 B-40-4878
Kingsport ARC/Bays Mountain RC
W4TRC (+KA4ZZC)
1481 B-29-4860
Brazosport ARC
N5FN (+KA5MBH)
1354 B-36-4812
Tri City ARC
W1BML (+KA1IHR)
1391 B-27-4788
Central SC DX Assn.
AA4V (+KA4WIW)
1496 B-16-4782
Utah ARC
W7SP (+N7AOM)
1365 B-47-4770
Dallas ARC
W5FC (+KA5MWC)
1385 B-22-4706
RAC of Knoxville
W4BBB* (+KA4WOY)
1342 B-21-4690
Shenandoah Valley ARC
W4RKC 1203 B-13-4682
Non-Club Group
N6RZ 1371 B- -4608
Hoosier Lakes RC
K9RD/9 1540 B-27-4584
ARINC ARS
W32H/3 (+KA3IEN)
1293 B-20-4582
Bluegrass ARC
N4AR 1271 B-23-4566
Sussex Co. ARC
N2WM (TN2DMW)
1102 B-28-4532
Mid-Mo ARC and NOVII
N@SS (+WB@TPN)
1193 B-20-4510
Big Bend ARC
K5FD 1569 B-12-4478
Oxford Co. ARC
VE3OH/3 1440 B-10-4476
ARA/Tonawanda's
W9SEX 1154 B-15-4474
Tucson IBM ARC
K7KZ 1261 B-14-4444
Keesler ARC
K5TYP* (+KA5MWD)
1600 B-12-4432
Ole Virginia Hams
N4VS 1142 B-20-4376
West Texas ARC
W5NW (+KA5NCE)
1431 B-25-4334
Tampa ARC
W4DUG/4 (+WD4REX)
1196 B-25-4332
East Bay Amateur Wireless Assn.
N1RI 1337 B-18-4308
Quad City ARC
N9DK (+N9DHF)
1270 B-25-4298
Fair Lawn ARC
N2WT 2073 B-16-4294
Amerson ARC
W4FX (+N4BAO)
1097 B-16-4260
Associater RA of Southern New England
W1AQ (+KA1FWF)
1192 B-20-4258
Canton ARC
W8AL 1178 B-26-4254
Tuscaloose ARC
W4XI 1512 B-25-4234
Ten Four Gud Buddies
NM4A (+N4GSG)
1337 B- 8-4218
Sterling Heights Independent Team
W8NNR (+KA8JBK)
1083 B- 8-4194
Litton ARC
W6OC 1826 B-13-4164
Randallstown ARC
K3QL/3 1233 B- 8-4150
Mountaineer ARA
W8SP* (+WD8EOG)
1071 B-14-4148
Story Co. ARC
K@NN* (+KA@JEI)
1240 B-20-4116
Burlington ARC
W1FB* 1555 B-38-4088
84-24 Signal Corp
N4QH (+KA4PZW)
1396 B-15-4038
Central Missouri RA
AI@O (+KA@NZA)
1045 B-18-4034
Calhoun Co. ARA
NN4R (+KA4ILP)
1616 B-31-3978
Yellowstone RC
K7EFA* (+KA7HUV)
1485 B-16-3950
Southern Ill. ARS
AA9D (+KA9NFO)
1138 B-30-3934
Central Wis. RA
W9NN (+KA9ACE)
1250 B-16-3898
South Lyon Area ARC
N8AR* (+KA8DCX)
1166 B-17-3872
Goddard ARC
WA3NAN (+KA3HDO)
1004 B-17-3854
Ham Assn. of Mesquite
KV5I (+N5AIB)
1243 B-28-3850
Jefferson Co. ARC
W5SSV (+N5ERM)
1027 B-25-3804
High Tech FD Group
NK6K (+N6FOR)
1113 B-12-3804
Heligate ARC
W7PX 1253 B-20-3738
New Providence ARC
K2JV (+WB2MHE)
882 B-15-3734
Lake Co. RACES
KC9DI (+KA9MHZ)
1063 B-28-3730
Viking ARS
WA@CJU/@ 943 B- 9-3718
Anoka Co. RC
W@EG (+KA@NXS)
1087 B-10-3712
Morris Co. ARES/RACES
W2UH (+KA2OWA)
1002 B-40-3692
Northeast Georgia ARC
AA4U* (+WB4GYE)
922 B-12-3686
West Carleton ARC
VE3JOR 1048 B-12-3674
Wellesley ARS
W1TKZ 1137 B-10-3654
Neenah-Menasha ARC
W9OP* 1213 B-13-3650
Independence FM RA
W@IEV 1116 B-17-3650
Central Washington ARC
W7GB/7 (+KA7MVT)
995 B- 8-3632
Metropolitan ARC
AD5M (+N5ARW)
1045 B-24-3628
Red Stick DX Assn.
N5KC 979 B- 6-3578
Maryland Mobileers ARC
K3WD 1180 B-15-3564
Calumet AR Emergency Service
W9EWC 895 B-10-3544
Twin City Hams
W5EA (+KA5NNF)
1247 B-24-3524
PENNARC
WA3RCA 1329 B- 9-3518
HDL RC
K3TC 1013 B- 7-3482
Western Ky DX Assn.
WA4SAC 1180 B- -3476
Ford AR League
K8UTT (+WD8ECM)
798 B-15-3472
Desert Radio Rats
KI7W 975 B-11-3464
Rochester (NY) DX Assn.
W2TZ/2 1096 B-12-3454
Outaouais Contest Operators Assn.
VE3CZ/3* 1080 B-16-3450
Sheboygan Co. ARC
KE9A 1157 B-14-3408
Northern Virginia RC
W4PAY* 951- B-10-3404
Milacron ARC
W8RSN* 936 B-17-3402
Candlewood ARA
W1QI (+KA1GRM)
974 B-35-3382
Bismarck ARK
W@ZRT (+N@CYK)
1003 B-22-3370
Indian River ARC
K4YS (+KA4YLS)
1163 B-28-3368
West Park Radiops
W8VM/8 972 B-18-3360
Morton ARC
W9EEB 985 B-26-3360
Decatur ARC
W4ATD (+N4GVN)
886 B-27-3262
Penn State ARC
K3CR (+WN3VAW)
885 B-12-3248
Greater Bridgeport ARC
W1VW (+N1CAQ)
919 B-15-3244
Broward ARC 919
W4AB (+N4EZC)
1037 B-40-3234
Sun City RAC
K5WPH (+N5ERG)
868 B-39-3232
Goose River ARC
W@PU 1088 B-11-3228
Da Shed-House Gang
N4TY 906 B-37-3202
Cornell Univ. and Tompkins Co. ARCs
W2CXM 867 B-18-3195
Piano ARK
KI5R 1235 B-75-3186
Mountain ARC
W@JAW (+KA@KWH)
1068 B- -3186
Non-Club Group
K4RO 943 B- 4-3174
West Alabama ARS
KC4GS 1306 B-60-3159
Northeast Missouri ARC
W@CBL* 829 B-18-3158
Los Alamos ARC
W5PDO* 1019 B-25-3146
Delaware Contesters
AE3J 851 B- 4-3152
Carmine A1 Group
K5QL/5 1233 B- 8-4150
Carbon AR
K3II 839 B-17-3140
Bastrop ARC
KE5B 922 B-13-3108
Johnson City RA
K4SE 968 B-16-3100
Milford ARC
N8AS 936 B-23-3100
Gwinnett ARS
N4TM (+N4CUJ)
789 B-20-3094
Fauquier ARA
K4MZ (+WL7ALV)
871 B- 8-3080
West Georgia ARS
N4UZ 1196 B- -3070
Buffalo Grove High School ARC
KN9F* (+KA9KIM)
892 B-17-3070
Green Hills Field Dayers
W3MN 650 B-12-3054
Hubert's Heroes
KB5PJ 965 B- 3-3044
North Augusta-Belvedere RA
K4FR 764 B-14-3040
Sand Hills ARC
W@MI (+KA@NCG)
996 B-24-3036
Garden City ARC
W8WI (+KA8POZ)
858 B-20-3032
Southern Counties ARA
K2BR (+N2CTS)
900 B-47-3014
Iowa-Illinois ARC
W@LAC* (+KA9JNG)
812 B-30-3004
San Gabriel Valley/Aerojet Electrosystems ARCs
W6RY (+KA6NDN)
747 B-60-2964
Faulkner Co. ARC
W5LL/5* 1066 B-16-2954
Middlesex ARC
WIHEB 899 B-20-2944
KSU/Manhattan ARC
W@IQQ/@* 1040 B-15-2934
Delaware ARA
K8SL (+N8DRT)
848 B-25-2928
Merrymeeting ARA's Fife,Drum, Bugle 'n Brew Crew
N1MA (+KA1FKO)
1136 B-20-2924
Fort Pierce RC
W4AKH (+N4GGY)
844 B-22-2902
Robbinsdale ARC
K@LTC 1816 C-12-2894
COFARS
K6FI (+KA6ULM)
950 B-11-2888
Wilderness Ham Operators
K@SG (+KA@OGL)
850 B-19-2888
Tuscola Co. (MI) ARC
K8DU 802 B- 9-2884
Steubenville-Weirton ARC
WB8RSK* 1037 B-20-2882
Pentagon ARC
K4AF* 910 B-25-2872
Wallingford ARS
W1SY/1 986 B-17-2854
Bell System of IN ARC
AK9U 897 B-14-2850
Eastern Ohio AWA
K8IP (+KA8AAV)
739 B-16-2846
Forsyth ARC
W4NC* (+N4GGK)
893 B-20-2808
Three Rivers ARC
WB@RCW* 625 B-25-2800
Montreal ARC
VE2BG 875 B-17-2794
Lakes Area ARC
W2WUE/9 (+KA9IAL)
790 B-21-2792
Univ. of Penna ARC/Holmesburg ARC
N3KZ* 883 B-15-2790
L'Association RA de la Mauricie
VE2MO* 776 B-12-2790
Wisconsin Valley RA
W9SM* 793 B-23-2778
Putnam ARA
K8LZ (+KA8OGF)
841 B-20-2765
Titusville ARC
K4ZS/4 1098 B-22-2756
Racine Megacycle Club
W9UDU (+WB9ZIO)
866 B-30-2754
Irvington ARC
K2GQ (+KA2NWE)
844 B-20-2750
Turtle Mtn. ARC
VE4LB 737 B-11-2746
Non-Club Group
N9KC 806 B- 6-2738
Parsons (KS) ARC
WB@RCZ* 711 B-12-2718
Gadsden ARC
K4JMC (+N4FOD)
654 B-20-2676
Bell Labs and Western Electric CRES ARC
WB2PF 893 B-15-2666
Towers Mtn. Remote Assn.
WA7SKJ* 1115 B- 7-2660
South East ARC
K8EMY (+KA8KFR)
657 B-22-2656
Crawford Co. ARC
WA9DDS 924 B- 6-2648
McDonnell Douglas ARC-St. Louis
WA@CGV 954 B-15-2628
Non-Club Group
KA@D 807 B- 7-2626
Ottumwa AC
N@SM/@ 855 B-10-2624
ARS of Tennessee Tech.
WA4UCE/4 (+KA5EST)
634 B- 9-2592
Straits Area ARC
W8GQN 653 B-19-2590
Saline Co. ARC
K5NE 741 B- -2584
Lower Yellowstone ARC
KC7AA* (+KA7EWH)
770 B-29-2582
LAMARS
W9HOQ 812 B-35-2548
Dufferin ARC
VE3FS 707 B-10-2536
Pioneer ARC
VE3NA 812 B-10-2534
Carroll Co. ARC
K3PZN 654 B-15-2520
Madison Co. ARC
WD8NAR 792 B-10-2516
Missouri Valley ARC
W@NH/@* 828 B-43-2504
Club Radio Amateur du Quebec
VE2CQ 576 B-38-2504
Special K FO Group
KJ7K 1012 B-10-2502
Humboldt ARC
K@GP (+KA@HEY)
692 B-10-2502
Huber Heights ARC
N8TD (+WD8KYY)
686 B-18-2496
Non-Club Group
N4YX 946 B- 4-2486
Arrowsmith ARC
VE7EMO 699 B-22-2468
New River Valley ARC
KX4V 754 B-15-2456
West Volusia ARS
N4DOI 691 B- -2444
Central Oregon RAC
K7BY 998 B- 7-2396
Great Bay RA
WB1CAG (+KA1HYU)
655 B-27-2378
Gt. Falls Area ARC
KK7OD* 597 B-28-2376
Arlington RC
K5SLD/5 912 B-21-2374
C.R.A.S.O.I.
VE2CEV 541 B- -2364
Northland ARC
KM9N 855 B-13-2356
Hwy Cities ARA
NI4U 701 B-28-2350
Brightleaf ARC
W4AMC (+KA4VJA)
628 B-25-2328
Clark Co. ARC
W9WWI/9 (+KA9FLR)
669 B-63-2306
Columbia ARC
KJ4X 856 B-19-2302
Findlay RC
W8FT (+KA8NSO)
650 B-38-2278
Cabarrus ARS
W4PNY* 759 B-18-2268
Lehigh Valley ARC
W3OH* 716 B-15-2246
Lancaster ARC
K4WJK* 648 B-10-2242
Fresno ARC
W6TO (+KA6SUH)
576 B-40-2228
Granite State ARA
K1RD (+KA1CKD)
473 B-10-2196
St. Clair ARC
K9GXU (+KA9KAY)
720 B- -2196
Satellite ARC
W6ABA/6 786 B-13-2196
CFB Trenton ARC
VE3YTR 716 B-12-2194
Wantagh ARC
KI2M (+KA2UPO)
780 B-16-2184
Farmington ARC
W8NBN* 958 B-20-2182
Indpls Power & Light ARC
K9FIC 716 B-14-2160
Niagara Peninsula DX Group
VE3NDX* 929 B- 4-2158
Copper Country RAA
W8CDZ/8 (+KA8OTY)
584 B-18-2148
Duke City AR Group
KC5H 921 B-10-2142
Valley AR Information and Activities Council
W5DX/5* 435 B-40-2122
On 2 Repeater Group
N6TKA 961 B-14-2122
Wichita ARC
W@EJF 539 B-14-2102
West Feliciana ARC
N5CI/5 628 B- 8-2088
Knox Co. ARC
W9GFD 563 B-40-2080
Three Rivers ARC
W@BRN/@ 753 B-18-2058
Flambeau ARC
AG9Q (+KA9NOT)
582 B-15-2024
Rowan ARS
W4EXU 471 B-10-2020
Holland ARC
KB8AA 629 B-16-2018
Saurland Mtn. ARC
KT2S (+KA2JYW)
667 B- 9-2016
Chippewa ARC
K@VEV* 520 B- 7-2012
Eastern Shore ARC
KV4P (+KA4ZID)
673 B-12-2008
Algoma ARC
VE3SQO* 561 B-12-2008
Tower ARC
K2IZZ 452 B- 6-1996
Beaumont ARC
W5RIN (+N5CMM)
341 B-30-1992
Northland Emergency Radio Disaster Service
K@AJ 776 B-15-1972
Smokey Valley ARC
W@CR (+N@DOT)
651 B-19-1960
Big Island ARC
KH6AF 576 B-16-1950
Explorer Post 373
W9EUS 843 B-15-1946
Non-Club Group
KB9S* 1122 C- 8-1943
ARC of Savannah
W4HBB (+KA4LNJ)
593 B-16-1934
Transcanada Pipelines RC
VE4GAS 471 B- 6-1914
Piqua ARC
W8SWS 510 B- -1900
Stoughton (MA) Civil Defense
W1WSN (+KA1EKE)
466 B- 6-1898
Port Lavaca ARC
W5KTC 480 B-11-1890
Great Plaines ARC
KC@CP (+KA@INC)
541 B-15-1882
ABC RC
KB9AA (+N9DFW)
578 B-13-1872
Cowichan Valley ARC
VE7CVA* 667 B-20-1864
Loveland Repeater Assn.
W@OSK/@ 554 B-18-1826
Wecoma ARC
W@IE 633 B-20-1814
Hillsborough ARS
WA4GJJ 501 B-15-1804
Borderline ARC
N7CQT 415 B- 8-1804
Gulf Coast ARC
KE4O 423 B-20-1796
Hiawatha ARC
KJ8V 381 B- 8-1792
Huron Co. ARC
KT8P 556 B- 7-1788
Clearwater ARS/Metro Repeater Society
KO4J 491 B-16-1778
Lake Huron ARC
W8JC (+KA8QDL)
566 B-10-1770
York RC
W9PCS 538 B-12-1768
Lake Success RC
W2YKQ 578 B- -1748
Lake County ARC
W9LJ/9 5699 B-25-1730
Issaquah ARC
AF7N* (+KA7CSI)
915 B-22-1722



K6LJG (left) and KA6SFQ got stuck with the night shift for the Tulare Co. ARC. (WA6BAI 3A)



KA1OB occupies the "seat of power" for the Northern Berkshire ARC. (K1FFK 2A)

The Field Day *Chairman* for the Lebanon Valley Society of Radio Amateurs is WB3CFG. (W3GJX 3A)

Grand Island ARS
W@CUO/@(+KA@FEY)
458 B-14-1688
Detroit ARA
WBZZ/8* 686 B- 9-1672
Southwest Missouri ARC
W@EBE* 470 B-25-1762
Clarksville Amateur Trans. Soc.
KF4L 474 B-20-1668
Central Carolina ARS
K4JUO (+KA4VTP)
505 B-10-1642
Salem ARC
W7SAA 584 B-30-1640
Athens ARC
W5CR (+N5ERF)
391 B-20-1634
Humboldt ARC
N4EH* 1008 C-20-1630
Jackson Co. ARC
W6WA 596 B-18-1622
Fulton ARC
W2CXV (+KA2EJO)
526 B-14-1608
Collier Co. ARC
WB4ZEU* 471 B-17-1604
Oswegatchie Valley ARC
WA2NAN (+KA2EGR)
534 B-11-1600
Auburn ARA
K2HFB* 484 B-44-1590
Tippecanoe ARA
W9REG (+KA9IHB)
467 B-25-1586
Sociables
N9AHL 513 B- 4-1582
Goshen ARC
K9TSM* 564 B-18-1566
Rideau ARC
VE3HPC 364 B-17-1562
Conneaut AR Emergency Service
K8BAR 1011 C-10-1559
Benicia ARC
KE6IA* 371 B- 9-1542
W. Mass. Independent Radio Group
WB1OBY 518 B- 5-1540
St. John's Co. Repeater Assn.
K4ZED 479 B-10-1540
Lewisville Texas Instruments ARC
AA9C (+N5EWH)
398 B- 1538
Vermilion Co. ARA
W9MJL (+KA9KAM)
361 B-12-1538
Allegany Highlanders ARC
KC2CK 339 B-10-1532
Lakes Area ARC
N5BJ 480 B-10-1528
Denver RC
W@TX* 463 B-15-1526
Tamiami ARC
N4EHO (+KA4YYC)
411 B-25-1522
Saunders Co. ARC
WH@ICY* (+KA@MOK)
539 B- 5-1516
Ticonderoga ARC
KA2BSS (+KA2MWH)
408 B-15-1502
North Kitsap ARC
AK7H (+KA7ARK)
413 B-15-1490
Gould ARC West
K6OR* 388 B-12-1486
Chehalis Valley ARS
WA7UHD* (+KA7KTT)
349 B-43-1480
Catalpa ARS
WBCQ (+KA8PNH)
340 B-20-1478
Mobridge Area ARC
W@YMB (+KA@MEI)
368 B-10-1462
Fox ARC
N@ND 488 B- 7-1460
Chipola ARC
KB4L (+N4AXJ)
427 B-15-1458
7213 Group
K5AWK 366 B-15-1452
Santa Clara ARA
W6UJW* 385 B-55-1436
Ft. Madison ARC
W@IHC* (+KA@KOR)
480 B- 8-1430
Point Mugu ARC
WD6BZS (+N7DZS)
429 B- 7-1424
El Paso ARC
W5ES 546 B- -1422
Grande Ronde Radio Amateurs
KL7NT (+KA7EIP)
366 B-25-1408
Austin Area ARC
W@AZR* 503 B-18-1406
Smithtown (NY) RACES
W2NNJ/2 1027 C-15-1401
East Bay ARC
W6CUS 246 B-33-1390
Kaptin and Crew
K1DII* 371 B-17-1388
Upper Valley ARC
AA8Q* 499 B-16-1380

KC8AU Field Day Group
KC8AU 555 B- 9-1330
Minot ARA
K@AJW* 315 B-10-1328
Hermiston ARC
WA7ZWD* (+KA7EOR)
484 B-12-1320
Dublin Ga. ARC
WA4HZX* (+KB4ACE)
303 B-26-1290
WB8NSL + Help
WB8NSL/8 703 C- 7-1289
Northern Ky. ARC
K4CO* 461 B-10-1276
Mountain RC
WA1JXL/1 373 B- 3-1266
North Peninsula Electronics Club
W6PMK/6* 330 B- 6-1252
The Blue Mtn. Repeater Assn.
VE3CAB/3 421 B-16-1242
Kenton ARC
W8VMV* 389 B-11-1234
Hurst ARC
N5FL 319 B-15-1232
Southwest Iowa ARC
K@ZO (+KA@MHJ)
393 B-27-1222
Chelmsford ARA
W1LUS (+KA1IFY)
371 B-15-1220
Hamilton Co. ARA
K@KWO/@ 509 B-14-1218
St. Cloud ARC
W@SV 466 B-10-1208
Sweetwater Co. ARC
WB7AMP* (+KA7JWY)
416 B-15-1202
Non-Club Group
KI4I* 385 B- 4-1196
Univ. of Saskatewan ARC
CJ5US 199 B- 7-1188
Tri-Counties Ham RC
W8KPX 445 B-10-1186
Regina ARA
VE5NN* 434 B-18-1184
Shoreline ARC
WB1BCG 175 B-15-1176
Great Bend ARC
WD@FEN 411 B- 6-1170
Mesabi Wireless Assn.
K@MK 372 B-15-1152
Flint Hills ARC
W@HT 363 B- 6-1148
Catalina ARC
N7WS/7 379 B-12-1146
Clover Leaf Farms ARC
WD4IIO 172 B- 8-1138
Southside ARA
K4VWK* 309 B- 5-1136
Chas. E. Newton Jr. ARC
K4HYB* (+KA4UNW)
340 B-12-1134
Truro ARC
VE1AO 337 B-12-1134
Moose Horn ARC
KL7IEJ* 227 B-24-1122
RALAC
NC6C* 379 B- 8-1118
Cumberland ARC
K3IEC (+KA3CEU)
398 B- 7-1116
North Suburban Wireless Assn. and North Star Highbanders
K@VPM/@ 427 B-10-1116
(sra-Boise Education Group
W87PFQ 399 B- 8-1090
Irving ARC
W5CKF 378 B-32-1084
Centralina ARC
NO4N 301 B-11-1080
McKean Co. ARC
W3VV (+KA3BEJ)
322 B-10-1074
Western Carolina ARS II
AF4L* 572 B-16-1073
Delta ARC
VE7SUN 194 B- 9-1070
Amateur Electronic Experimenter Assn.
AK3V* (+KA3IA2)
384 C-18-1064
North Iowa ARC
W@JUI 265 B-18-1042
Bellbrook ARC
KI8O 363 B-14-1026
West-Cum ARC
VE1WRC 261 B-11-1026
Lake ARA
K4FC* (+KA4DKM)
359 B-30-1020
Waldo Co. ARA
K1RZ 305 B- 8- 992
Michigan James Gang
KB8VL 396 B- 5- 992
Jackson ARC
W4TM 161 B-15- 958
MSOE ARC
W9HHX* 364 B- 9- 934
Shuswap ARC
VE7OK* 244 B-11- 926
Barrie ARC
VE3GCB 325 B-32- 918
TRW ARC
WA8WSO 215 B- 5- 908

Eaton Co. ARC
K8PTZ/8 455 B- 8- 904
National Trail ARC
K9UXZ* (+KA9HVQ)
208 B- 5- 893
Non-Club Group
VE2CRG* 172 B-10- 878
Non-Club Group
K2SF 312 B- 7- 824
Monsanto ARA
WB@BBN* 457 C-15- 788
Delta Co. ARS
K8ZAS* 188 B-10- 786
Cranford ARS
WB2CLW 287 B-10- 774
Yellowhead ARC
VE6YAC 220 B-17- 748
Sydney ARC
VE1CR/1 219 B- 5- 746
Hewlett-Packard ARC
K3QM 191 B- 5- 744
Bethel Middle School All Novice FD Group
KA1IAO 55 B- 6- 720
Hialapai ARC
WA7LAZ* 159 B- 6- 718
Radio Amateur Mobile Society
W6HIR* 247 B- 6- 694
The RV Comm. Squad
K7IWX 180 B- 8- 560
Adventure Radio Group
KG7W 98 B- 3- 488
Yukon ARA
VY1DX 327 C-14- 471
Twin Bridges AR Group
WA9ZSH/5 70 B-16- 468
Polytechnic Institute of NY ARC
K2KT* 103 B- 8- 454
Bluff Amateur
WD@AXV 15 C-11- 328
Matanuska ARA
KL7JFU 101 B- 6- 302
Wheat Straw ARC
WA5IPE/5* 64 B- 4- 128

2A-Commercial

Boiled Owls of New York
W2AO/2 2377 C-12-3346
Rutherford Co. ARES
N4BBB (+N4FJI)
996 B-12-2192
Miss. State Univ. ARC
W5YO 629 B-15-1904
New ULM ARC
N@BMA (+KA@NYB)
444 B-21-1646
Tristate ARA
W8VA 507 B- 8-1378
West L.A. ATV Club
KO6E* 390 B- 3-1061
Milledgeville ARC
WB4IOJ* 415 B-15- 842
Big Rapids Area ARC
WD8OEO 175 B- 5- 462
Lawton-Fort Sill ARC
W5KS 142 B-43- 398

3A-Battery

See Attached Sheet
K7MX (+KA7MSH)
5562 A- A-17,510
Bellflower ARA
WA6SFM* 899 A- 4-6885
Fusion ARC
W2PU/2 648 A- 6-6880
Field Day AR Telegraph Society
WA6EUZ* 645 A- 4-6850
Williamsburg Area ARC
K4RC (+KA4VGF)
1808 B-50-6596
Oregon Tualatin Valley ARC
KC7U (+KA7MDC)
1749 B-125-5412
Lower Columbia ARA
W7OG 573 A- -4395
Alliance ARC
KD8P (+KA8LKQ)
567 A-12-4300
Tamaqua Area ARA
W3VA 1205 B-20-4286
Assoc. Amateur Wireless Society
N9IW/@ 414 A- 4-4200
Elkhart Red Cross ARC
AD9V 1173 B-10-4100
Sowinski-Rumiński Radio Group and Fish
WB8HKK 528 A- 8-3905
Pearl ARC
VE3PRC 917 B-20-3558
Milford ARC
W8YDK 749 B-30-2406
Santa Cruz Co. ARC
K6BJ/6 (+KA6QNX)
756 B- -2282
Field Day's Finest
N9DD 229 A- 8-1690

The Kennedy Family
W8ZCG 197 B- 4-1594

3A

Texas DX Society
K5OX (+W6SLV/L)
4196 B-25-13,848
Mad River RC/Shenango Valley AR FD Group/NOARS
K3LR (+WB3IGH)
3893 B-12-12,018
Columbia ARA
K3EF* (+KA3EWW)
3126 B-35-10,058
Billerica ARS
K1AR 2998 B-26-8940
Platinum Coast RS
AF4Z* (+KA4FKN)
2779 B-25-8840
Central Fla. DX Assn.
N4SA* 2283 B-10-8452
Poughkeepsie
N2YL (+KA2MED)
2473 B-35-7854
Norwood ARC
K1JMR/1 (+KA1FUF)
2156 B-25-7788
SPARK
N4DJ (+KA4MKF)
2103 B-30-7447
Ashtabula Co. ARC
W8CY (+KA8OTI)
1934 B-16-7224
'We Thought It Was A Contest' FD Group
K8MN 2359 B-27-7024
St. Charles ARC
K@HM (+KA@LZN)
2250 B-36-6914
Chehaw ARS
K4HAV (+KA4UGE)
1856 B-40-6778
Schaumburg ARC
K4LW (+KA9MWF)
1989 B-29-6676
St. Louis ARC
N@IS 2188 B-18-6448
Shreveport ARA
K5TL (+N5EWT)
1770 B-32-6406
Michigan Mavericks
KO8T (+N8DMT)
1956 B-25-6350
Aurora RA
N@CC (+KA@NPU)
2050 B-42-6168
Jackson ARC
W5PFC (+N5DYE)
2318 B-25-6126
Pikes Peak RA
N@ST (+KA@GFA)
1838 B-30-6104
Purdue ARC
W9YB 1769 B- 7-6068
Ridge Runners
W9UCW (+KA9FLK)
1637 B-12-6062
Springhill (LA) ARC
N5II (+N5ACL)
2089 B-14-6034
Mississippi Coast ARA
N5WE (+KA5MNQ)
2238 B-51-6034
Johnson City RAC
W@LRH (+KA@GQA)
1596 B-50-6014
Portsmouth ARC
W4POX (+KA4ZBK)
1814 B-35-5984
Davenport RAC
W@DC (+KA@IFG)
1774 B-35-5672
Eastern Mich. ARC
K8EPV (+KA8PSR)
1691 B-31-5610
Kettle Moraine Radio Amateurs
W9HE/9 1582 B-25-5586
Gopher Creek ARC
VE4GF 1435 B-20-5578
Motor City RC
W8MRM (+KA8MIU)
1504 B-50-5450
Delaware-Lehigh ARC
W3DK* (+KA3JLA)
1774 B-22-5398
Acton Boxboro ARC
AB1X (+KA1HFG)
1435 B-30-5256
Fullerton RC
W6ULI 1939 B-22-5216
Chatham Co. Group
KX4G (+KB4AFY)
1984 B-18-5202
Virginia Beach ARC
N4HQ (KA4UOF)
1282 B-50-5138
Rock River ARC
KF9B (+KA9HHC)
1725 B-25-5100
Centerville ARS
K8XY 1574 B-25-4998

Nor. Cal. DX Club
We7I (+KA6SEH)
1760 B-14-4968
Laurel ARC
W9NRU (+KA5IMT)
1762 B-36-4924
Boulder ARC
W@DK (+KA@NUZ)
1231 B-30-4906
Virginia ARA
KG4W* (+N4EAY)
1383 B-30-4786
Cherryland ARC
K8XX (+KA8OGC)
1487 B-27-4760
Old Barney ARC
N2OO (+WB2JPY)
1735 B-20-4676
North Shore Repeater Assn.
W1CE (+WA1ZVA)
1471 B-22-4642
Conyers AR Group
N4CI (+KA4OVX)
1358 B-43-4538
Valley ARA
W4XD (+KA4WSI)
1426 B-18-4530
Magilla's Gorillas
KB2MG 1458 B-12-4502
Goz's Gang
K2SA 1208 B-14-4476
William Penn RC
W3FPC/3 1269 B- 6-4466
Austin ARC
W5KA 1534 B-70-4464
Cara/Desert Rats DX
AA7D (+KA7LEX)
1184 B-23-4456
Kaw Valley ARC
W@CET (+KA@BBP)
1525 B-35-4412
Sharon ARA
KT1NQ (+KA1HPD)
1358 B-50-4358
Aroostook ARA
KA1B (+KA1E1N)
1422 B-44-4358
Jones Co. ARC
W@GN 1295 B-12-4340
Southern Michigan ARS and Calhoun Co. Repeater Assn.
W8DF/8 (+KA8PSX)
1267 B-50-4330
Garland ARC
K5QHD* (+N5EDI)
1682 B-35-4320
Club Vallee du Richelieu
VE2CVR 1029 B-12-4202
South Georgia ARC
W4FGH (+KA4GMN)
1313 B-20-4196
Enfield AR Group
N1SR/1 (+KA1ILW)
1285 B-24-4174
Greater Fairfield ARA
WB1CQO (+KA1IIL)
1118 B-50-4162
Lincoln Trail ARC
NN4H (+KA4TPE)
1188 B-24-4152
Band Ot-Dahs
K2MP 1234 B-14-4138
General Dynamics RC
AK5R (+KA5JAM)
1451 B-90-4124
Des Moines RAA
W@AK* 1345 B-15-4074
West Allis RAC
W9FK 1229 B-15-4060
Argonne ARC
W9QVE (+KA9IQ2)
922 B-25-4028
Surrey ARC
VE7SAR/7*1275 B-15-3994
Chattanooga ARC
W4AM/4* (+KD4INY)
1515 B-54-3934
Great So. Bay ARC
K2TV (+KA2NIE)
1018 B-30-4926
Tulare Co. ARC
WA6BAI (+KA6RFT)
1329 B-25-3906
Bartlesville ARC
W5NS/5 (+WB5SZQ)
981 B-60-3816
North Shore ARC
VE3NSR 1157 B-37-3810
U of M RC
W8UM 1122 B-20-3806
Texoma ARC
K5GQD* 1134 B-35-3766
Westchester Emergency Communications Assn.
N2SF (+KA2OVU)
932 B-24-3754
Laurel ARC
KD3S 989 B-15-3648
CVARC
W2VXC/2 (+KA2MLQ)
1148 B-25-3620
Santa Clarita-San Fernando ARC
W6SD 1159 B-30-3620
Rochester ARC
W@MXW 1050 B-52-3612

Falls ARC
K9RHH (+KA9ICC)
1198 B-28-3600
Livingston ARS
KB5UB 1415 B-70-3584
Coconino Co. ARC- Arizona
N7FU 1064 B-12-3562
Shockton ARC
W6SF 912 B-100-45.48
Blackstone Valley ARC
W1DDD 1198 B-20-3532
Central Arkansas DX Club
AF5M 1375 B- 7-3504
San Mateo RC
W6LMN 996 B-42-1504
Blossomland ARA
W8MAI (+KA8MAN)
3488 B-15-3488
North Hills ARC
KJ6IJ/3 (+KA3IHJ)
114] B-24-4484
Framingham ARA
W1FV 983 B-18-3478
Waterton ARS
W@NT/@ (+KA@KMV)
1211 B-20-3470
Massasoit ARA
AE1P 971 B-10-3398
Otsego Co. ARA
W2TKE (+KA2NQA)
975 B-20-3396
Hot Springs ARC
WA5BRF 1081 B-10-3354
Bullitt ARS
NW4J (+KA4MIS)
922 B-30-3310
Green Co. Chapter 10/10 Net
W5NNL (+KA5NIG)
944 B-12-3274
Chippewa Hills ARC
KA8T 923 B- 7-3218
Berry's Mtn. ARC
W3TS (+KA3BVJ)
720 B- 9-3202
Huntington Co. AR
K9ZLU 981 B-12-3180
Fulton Co. ARC
W9JOO 922 B- 8-3168
Independent ARC
W@NU 1002 B-15-3164
Echo RA
K9BTB (+WD9AEH)
1008 B-30-3162
Bethel ARK 1008 B-30-3162
KD8M 786 B-18-3102
Telephone Employees ARA
K2RB 879 B-16-3050
Detroit Metropolitan RC
W8UMI 959 B-10-3038
Adirondack ARC
KE2Q* (+KA2MST
765 B-20-3020
Falmouth ARA
W1HQH (+KA1IWH)
788 B-20-3016
Emerson Electric ARC
W@PEV* 849 B- 9-3014
Central New York Hsts
WA2RXB 795 B- 4-2994
Caravan Club
WA5VKY* 874 B-20-2976
Albany ARA
K2CT 889 B- 3-2944
Allen Co. AR Tech. Soc.
K9CLR/9 1080 B-20-2920
Genesee Radio Amateurs
K2OS* (+KA2DQA)
983 B-32-2890
Rome RC
W2OFQ (+KA2FTU)
723 B-17-2778
Sub Sig ARC
K1WEW (+KA1FOF)
885 B-15-2776
Chemung Co. ARES
W2ZJ/8 660 B-26-2768
Rosario ARK
W3PM* 704 B-12-2748
Smoky Mtn. ARC
W4OLB/4* (+KA4RIJI)
758 B-20-2744
Oakville ARC
VE3HB/3 851 B-19-2736
Foxboro Co. ARC
W1XA (+KA1HOS)
807 B-20-2712
Chicago Citizen's Radio League/
Lakeview ARC
W9SE 943 B-16-2698
Paso Robles (CA) ARC
W6LKF 674 B-11-2666
RASON
KJ1N 919 B-18-2634
Lice-Mackinac ARES Team
WB8GBR 861 B-12-2590
Escondido ARS
N6WB 1123 B-30-2559
Morgan Co. Repeater Assn.
K9KJD* (+KA9NLY)
652 B-12-2542
Shelby County ARC
KC4AF (+KA4ZXL)
785 B-16-2518
Tahoe ARA
N6MY 830 B-70-2500
Tri County RC
KW4Y/4* 619 B-39-2482
Ausable Valley ARC
W8GP 960 B-15-2476
Las Vegas RAC
KG7Q* 759 B-18-2472
West Seattle ARC
W7AW 704 B-16-2472
Central Pennsylvania DX Club
K4JLD/3* 819 B-20-2448
North Coast DX Group
KI8X 780 B- 2448
Kendall ARS
W5BE (+KA5OAM)
677 B-14-2446
South Platte ARS
W@XK 998 B-11-2440
Chautauqua Co. AM FM Assn.
K2HE (+KA2ONY)
907 B-27-2414
Bay Area ARS
W3JW (+KA3HKB)
818 B-14-2412
Poway ARS
AA6EL 770 B-30-2386
Foothills ARC
W3LWW 689 B-30-2372
Central Ky. ARC
NA4O (+WD4DIH)
551 B-12-2350
Midland ARC
WD8SDX* 766 B-20-2346
Calgary ARA
VE6NG 674 B-31-2330
PHD ARA
WA@UGU/@ 688 B-31-2326
VA Amateur Comm. Assn.
N4AFJ (+KA4UFA)
756 B-20-2324
Coastside ARC
WA6TOW* 802 B- 8-2268
ARC of El Cajon
WA6BGS 877 B-15-2266
Clemson Repeater Assn.
KB@Y 584 B-17-2260
Pike Co. ARC
W9CZH* 536 B-18-2254
General Electric Evendale ARS
K8LUC 573 B-35-2242
Tioga ARS
K9LJP* (+KA9FGI)
762 B-31-2238
Winnipeg ARC
VE4BB 648 B-30-2216
Queen City Emergency Net
WA8VVL/8 980 C-45-2198
Hannibal,Mo. ARC
W@KEM (+KA@N6M)
585 B-12-2196
EDD-ARC
WB6DNR* (+KA6UFY)
53] B-15-2186
Kingston ARC
VE3KAR* 652 B- 8-2180
Radio Assn of Western N.Y.
W2PE/2 739 B-11-2176
Gabilan ARC
NJ6L 658 B-25-2176
Colonial Wireless
AK1V* (+N1ATT)
646 B-17-2170
Old Post ARS
W9EOC (+KA9NOK)
796 B-31-2162
Green Mountain Wireless Soc.
N1VT (+WB1HIH)
1348 C-25-2142
Non-Club Group
K2IYO 628 B- 2132
Pennroyal ARS
KE4LZ (+KA5EXT)
753 B-20-2120
Dade RC
W4NVU 590 B-20-2108
Tonto ARA
N7XA 666 B-16-2090
Black Mt. Liberation Organiza-
tion
NQ4C 453 B- 4-2082
Ryan's Retards
WA9WGI (+KA9KUK)
789 B- 6-2080
Brazos Valley ARC
N5HF 994 B-12-2040
Henry Co. ARC
K8TII 516 B-20-2032
South Huron ARC
VE3LRO 490 B-11-2032
Stanford Linear Accelerator ARC
W6CB* (+KA6QWA)
663 B- 9-2020
Shiawassee ARA
W8QQQ 795 B-12-2016
Culpeper ARA
AF4B* (+N4DBL)
434 B-17-1998
Caltech ARC
W6UE 482 B- 6-1982
Platt Co. ARC
K9IYP* (+KA9MZJ)
695 B-18-1982
Fayette ARA
KB8GQ/8 (+KA8OUM)
657 B-14-1970
Jefferson Co. RAC
K2PNA* 548 B-12-1918
Volunteer ARC
NY4N/4 507 B- 6-1910
Manning's Marauders
VE3AOD/3 670 B- 3-1906
Atchison ARC
W@BEV 371 B-22-1902
North Fulton AR League
KD4W 534 B-11-1894
Naval Research Lab ARC
W3NKF 655 B-10-1890
Iredell Co. ARS
W4EQ 505 B- 8-1864
Madison ARC
W9EFU* 671 B-20-1852
Watertown ARC
KE9C 514 B-15-1848
Casper ARC
W7YNB* 501 B-25-1796
Parkland RC
VE5PRC* 495 B-10-1794
High Plains ARC
KC7AR (+N7OSV)
634 B-14-1770
John Ross ARC
N4EAI 609 B-13-1756
Mankato Area RC
W@WCL (+KA@MIV)
547 B-25-1736
Tri County ARC
KB@SB (+N@AUY)
572 B-12-1716
Silverado ARS
WE6O* 444 B- 8-1698
New Bern ARC
WD4JMS* (+KA2DJY)
528 B-25-1664
Harmonic Hill Radio League
W2AAD* 681 B- 1662
Manatee ARC
K4GG 675 B-40-1650
Meteor ARS
KC4LY 502 B- 9-1594
Macon ARC
W4BKM 490 B-40-1576
Southern Appalachian Wireless
Society
KC4MU 500 B-10-1566
Over The Hill Gang
WJ7EJ 455 B-11-1560
Non-Club Group
N4AU 395 B- 6-1556
Nerd Net
WB8BGX* 623 B-10-1546
Valley ARC
W1NPL* 847 B-24-1544
Larkfield ARC
WA2PNU* 469 B-18-1532
Golden Empire ARS
W6RHC 533 B-10-1530
Keowee-Toxaway ARC
N54O* (+WA4WXA)
431 B-13-1508
Columbus ARC
WB9SMC 442 B-22-1500
Sequatchie Vally ARA
KD4XX* 389 B- 5-1482
Mt. Magazine FD Group
KU5L 954 C-11-1477
Society For The Preservation
of Kerr Click,Spiater & Tvl
AA3E 584 B-10-1468
Northern Alberta RC
VE6NC 455 B-12-1464
Bishop ARC
NJ6V (+KA6HII)
489 B-20-1458
Highlands Co. ARC
KC4PJ 526 B-13-1456
Hoop Hole Ridgerunners
KC8AT 538 B- 4-1454
West Morris Wireless Society
KS2M (+KA2OLM)
495 B-20-1442
Mt. Vernon (OH) ARC
KBEEN 405 B-10-1432
Border ARC
W5LFG* 375 B-13-1428
Non-Club Group
W9AMJ 397 B- 8-1416
Lebanon Valley Society of
Radio Amateurs
W3EIA 434 B-10-1394
Portage Co. ARC
N8BWA* 344 B- 9-1388
Chippewa ARC
W8BAA 406 B-27-1384
Grant County ARC
W9EBN* 398 B- 6-1378
Onslow ARC
WD4FVO (+KA4SFF)
465 B-14-1374
Pawnee ARC
KB@VY 347 B-12-1356
Chattahochee Valley ARC
K4DXZ 583 B-20-1344
Greensboro-Guilford ARES
N4XB 519 B-15-1342
Tubaro RC
W@GMW/2* 445 B-12-1332
Ebonaire ARS
KQ2J* (+KA2MBH)
503 B-16-1316
Wareham ARC
K1RSZ (+KA1GQI)
280 B-15-1310
Jamestown ARC
W@FX* 343 B-12-1296
Codex Chapter, Motorola ARC
N1CC 365 B- 9-1280
Moose Lake ARC
W@MFR* 348 B- 6-1262
Hub City ARC
KO@S (+KA@KFX)
522 C-18-1227
Lockheed Employees Recreation
Assn. ARC
WA6GFY 313 B-10-1222
Adams Co. ARC
W9FRU 409 B-15-1220
Green Fox ARC
KB9WC (+KA9KMT)
283 B-14-1182
Meridian ARC
K5BFN 429 B-10-1170
Yoakum Co. Emergency Train-
ing Net
KA5JGF (+KA5JGL)
208 B-12-1164
Waupaca ARC
KA9CPA 266 B-17-1134
Blue Valley ARC
WA@HOU 410 B-19-1132
De Forest ARC
WA8VVC (+KB4AUP)
241 B-14-1120
Communicators RC
K9ENM* 357 B-10-1114
Calaveras ARS
K6ODP* 216 B-12-1092
The Kings Co. Repeater Assn.
K2GJ (+KA2OPL)
296 B- 1074
Wythe ARC
N4DEK 267 B- 7-1032
Sun Parlour ARC
VE3SPR 299 B-12-1026
Indian Foothills ARC
WB@WMM 201 B- 7-1002
Paducah ARA
KS4V (+KB4AMA)
238 B-33- 978
Elmwood Park ARC
K9YHB/9 128 B-27- 958
Peace River Valley ARC
KE4DA (+KA4OKY)
155 B-12- 950
South Towns ARS
WB2ELW* 621 B-20- 935
Pingville ARC
W@RPK 241 B- 8- 926
Ongee ARS
VE6OG 184 B-10- 908
Juneau ARC
KL7SPG* 185 B-12- 838
Dougherty Family
KN8I* 108 B- 4- 816
Hill Hoppers ARC
W9WKT 147 B- 3- 780
Pymatuning ARC
W3LNA* (+WB3INU)
167 B- 9- 760
Worthington ARC
N@AWR* (+KA@LRO)
165 B- 6- 738
Aerospace ARC
N6NS* 99 B- 6- 736
Sierra Foothills ARC
KC6EP 376 B- 9- 732
Sitka ARC
KL7FFR 149 B-10- 718
Niagara RC
W2QYV 143 B-40-698
Ventura Co. ARC
K6ME* 300 B-17- 690
Prince Georges Wireless Assn.
K3CEZ/3 (+KA3HXE)
118 B- 686
Hinsdale Central High School ARC
N9CUN 168 B- 6- 682
Half Moon Area RC
W6OPW 139 B-10- 678
Memphis Radio Relay Club
WB4EXI* 104 B-16- 518
Hyland Communications Assn.
WA1LGQ 92 B-10- 512
Clark Co. ARA
W8OG 60 B-10- 508
Livingston ARK
KW8G* 239 B-11- 502
Wood Co. ARC
K8TIH* 105 B-15- 408
Wenoca ARC
WB4KIF/4* 41 B- 4- 396
Bald Peak Boys
WB7DZH* 163 B- 3- 326
Co. College of Morris ARC
K2MBZ 156 B- 5- 312
Arlington CD Agency
N1AVP 63 B-19- 163

3A-Commercial

RA of WNY
W2PE/2 739 B-11-2176
Portsmouth ARC
KB8QW (+KA8OAM)
704 B-10-1860
Big Thicket ARC
KX5C* (+KA5IHP)
665 B-17-1542
Harlan Co. ARC
ND4Y 576 B- 7 1484
East River ARC
W8MOP 287 B-10-1196
Mich-A-Con ARC
N8LT (+KA8GUQ)
368 B-10-1192
Black River ARC
W8JUU 472 B-14-1030
Alexander Graham Bell Pioneer
Repeater Assn.
KB3B* 444 B- 5- 932

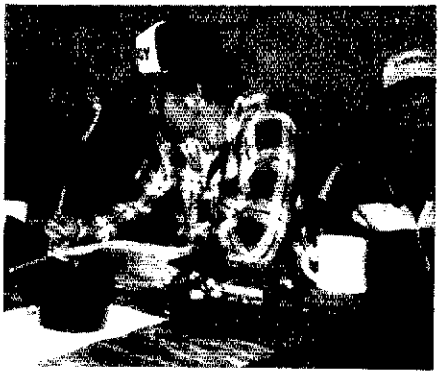
4A-Battery

Northern Ohio ARS 2
WB8JBM* (+KA8IYN)
1603 A-110-15,005
Anne Arundel RC
W3VPR (+KA3GFE)
1768 A-35-13,800
Roanoke Valley ARC
W4CA 1612 B-40-4732
B.R.A. & P.A.W.A.
K1ME (+WB1CBP)
1639 B-20-4486
Bloomington ARC
K9DIY (+KA9IPQ)
563 A-14-4415
Pilot Knob ARC
KQFT (+KA@DJR)
1029 B-20-3792
Sierra ARC
KD6FD (+KA6SSB)
1448 A-17-2830
Naval Postgraduate School ARS
K6LY (+KA6DGU)
515 B-65-2188
Stephen F. Austin Univ. ARC
W5HAJ* (+KA5MSU)
200 A-12-2110
Lincoln Co. ARC
KJ7PQ 931 B- 8-1976

4A

Palo Alto ARA
K6YT (+KA6RNY)
4897 B-23-13,784
Foothills ARS
K6YA (+KA6UTL)
4445 B-40-12,402
Fort Wayne RC
W9TE (+KA9LLJ)
3695 B-75-11,449
Natchaug ARA
W1TR 4156 B-20-11,418
United ARC
K6AA 3510 B- 10,454
Cherryville Repeater Assn.
W2GD (+KA2UEE)
2581 B-28-9528
Alamance ARC
K4EG (+KA4VOH)
3190 B-24-9218
Hamfesters ARC
W9AA (+KA9KBF)
2806 B-40-8790
Northwest ARC
W9LM (+KA9UET)
2534 B-36-8392
Pilgrim Amateur Wireless Assn.
K1BL 2972 B-33-8288
Ottawa ARC
VE3RC 2482 B-30-8034
Reading RC
W3BN (+KA3DSX)
2383 B-30-8008
Manchester RC
W1KKS 2517 B-10-7740
Cow Chip Hill Gang
W9LR 2643 B-17-7016
Carthage ARS
W9LF* 1891 B-14-6994
Utica (NY) ARC
K2IQ 2216 B-23-6698
Providence RA
W1OP* (+KA1AWX)
2335 B-15-6672
C.B.A.N.O.G.
VE2KH 1951 B-33-6522
Arizona ARC
W7IO/7 (+N7ECE)
2192 B-60-6416
Resevoir ARA
W8ON (+KA8ICL)
2137 B-30-6400
Metuchen ARC
K2YNT 2148 B-20-6292
Columbus ARC
K4KS 1821 B-25-6292
Motorola ARC
WA4LZR (+KA4ZLS)
1857 B-20-6198
Inter-County ARC
W2DMM* 2013-B-15-6072
Harvard FM Repeater
W1XH 1815 B-40-6068
Radio Central ARC
K2KI (+KA2KVT)
1876 B-47-6006
Lincoln ARC
K9KKV 2164 B- 5912
Ampex Employees ARC
K6QEZ 1373 B-12-5778
Montgomery ARC
N3BE (+KA3IKL)
1948 B-42-5746
Kilocycle Club of Fort Worth
W5TI (+N5DLL)
1600 B-25-5696
Monroe Co. Radio Comm. Assn.
WA8MTX/8* (+KA8LAU)
1810 B-50-5694
Lakeland Community College ARC
WA8SBC (+KA8NTP)
1332 B-12-5660
Ozaukee RC
W9LO 1576 B-19-5650
Ft. Smith Area ARC
W5ANR (+KA5JXN)
1990 B-30-5412
Tri State Dx Assn.
W4BS (+WD4SMW)
1542 B-25-5404
Beaches ARS
W4DU (+N4GCA)
1623 B-37-5356
Central Illinois ARC
W9AML 1929 B-38-5260
Hughes El Segundo Employees
Assn. ARC
W6DL/6 (+KA6SKW)
1731 B-24-5180
Lake Geauga ARC
N8BC (+KA8MLC)
1645 B-22-5040
Lynchburg ARC
K4HEX (+N4EDS)
1384 B-35-5002
Saginaw Valley ARA
K8DAC/8 1361 B- 4968
Santa Barbara ARC
K6IZJ/6 (+KA6OFZ)
1470 B-75-4966
Polk Co. Civil Defense Com-
munications Society
W4TJM 1475 B-17-4870
Joliet ARS
W9OFR/9 (+KA9KEW)
1430 B-41-4732
Belleville AR Foundation
K9BGL/9 2105 B- 4-4728
Irwin Area ARA
WB3JSI 1462 B-25-4702
Van Wert ARC
W8FY/8 (+KA8NSG)
1532 B-42-4697
Amherst ARC
W1UN (+WB1ECB)
1281 B-20-4686
Anaheim ARA
K6SYU (+KA6BMZ)
1426 B-34-4564
Confederate Signal Corps
W4VTA 1913 B-65-4636
Pasadena RC
W6KA (+WD6CKN)
1616 B-25-4470
Steel City ARC
W3KWH/3 1376 B-20-4310
Riverside Co. ARA
W6IJ (+N6IHY)
1445 B-20-4304
Bedford Co. ARS
K3NQT (+K3SCM)
1203 B-20-4214
Algonquin ARC
W1BK 1175 B-18-4138
Southern Maryland ARC
KF3T/3 (+KA3IPH)
1550 B-40-4102
R.F. Hill ARC
W3AI 1203 B- 4080
Harrisburg RAC
W3UU (+KA3ESA)
1051 B-50-3974
Redwood Empire DX Assn.
AE6H/6* 1489 B- 3962
Rappahannock Valley RC
K4TS* 1073 B-21-3940
Sonoma Co. Radio Amateurs
W6LFJ (+KA6SSM)
1174 B-35-3908
Suburban RC
W@DCW 1321 B-50-3860
Chesapeake Bay RA
KD3B* (+KA3IQL)
921 B-24-3798
Parkersburg ARK
K8UC (+WD8QZB)
1133 B-18-3742
Suffolk Co. RC
WP2UQ 1092 B-14-3714
Everglades ARC
WA5VI (+N4GUI)
970 B-20-3652
A.R.E.A.
KE9I* 1119 B-17-3562
Scarborough ARC
VE3WE 1036 B-26-3550
Southern Calif. Amateur Trans.
Soc.
WB6LRU 1310 B-22-3470
Monsanto ARA
W8DYY* (+W8RJY)
916 B-35-3342
Parma RC
K8UZW/8 (+KA8LEX)
869 B-35-3328
Marshall RC
W@BMJ (+KA@NQJ)
1229 B-36-3316
Sioux Falls ARC
W@ZWY (+KA@KPY)
835 B-21-3230
Dial RC
W8BLV (+KA8PTL)
986 B-12-3228
Rio Hondo ARC
W6GNS (+KA6PYA)
1014 B-47-3222
Yuba-Sutter ARC
AJ6M (+KA6UDO)
1198 B-10-3116
OMIK-Cincinnati Chapter
KT8F (+KA8NMO)
869 B-27-3115
Welland Co. ARC
VE3WCA/3 868 B-18-3106
Mt. Vernon ARC
KX4W (+KA4KPC)
764 B-25-3096
S.L.U.R.P.
KC8PS 1090 B-13-3036
Provin Mtn. ARA
KJ7DU 1014 B-12-2986
Vintage Radio Group
N6VY (+KA6RAQ)
978 B- 8-2960
C.Q.R.C. of Torrington
K1BCI 1005 B-30-2936
Carver/Scott Co. ARES with
Hennepin Tech Center South
Campus ARS
KG@N (+KA@MEJ)
872 B-26-2918
Litchfield/Paynesville ARC
KC@T* 597 B- 4-2898
San Francisco ARC
W6PW/6 717 B-20-2838
Delco ARA
AK3M (+KA3EIP)
760 B-39-2835
Port City ARC
W1WQM (+KA1IVM)
737 B-15-2836
Sturdy Memorial Hospital ARC
K1ZZJ (+KA1UQJ)
740 B-18-2816
Paul Bunyan Wireless Assn.
AF@I* (+KA@NKI)
1056 B-12-2802
Antietam ARA
W3CWC 521 B-12-2772
Enid ARC
W5HTK 702 B-12-2714
Quannongowitt RA
W1EKT 554 B-40-2682
Amador Co. ARC
N6KD 943 B-18-2618
Chernhill RAC
VE3RAT 1026 B-20-2580
Scranton/Pocono ARK
K3CSG 835 B-15-2568
Pueblo Ham Club
KR@K 978 B-22-2556
Rogue Valley ARC
AK7I (+KA7GNO)
927 B-15-2524
3rd Region NAVMARCORPS
E.TX
W5USN/5 903 B-12-2505
HM CW Club
KI@E (+KA@LXH)
632 B-16-2492
CFB Gagetown ARC
VE1JO 731 B-14-2490
Tri-Town RAC
W@VI 943 B-18-2486
Eastern Ozark ARC
W@QK* (+KA@NNE)
591 B-20-2480
Chicago ARC
W@CAF/9 622 B-15-2450
Iroquois Fed ARS
WB9TAH (+KA9EPO)
703 B-12-2450

A leisurely approach to FD operating is taken by members of the GOBS FD Club. (K8JK 2A)



Dick, Ken and Steve with the "good ol' gang" with The Clallam Co. ARA. (W7FEL 1A-Battery)

K7WA braved the showers on Whidbey Island with FD partner K7ZF. Jim says at least the rain kept the bugs away. Every cloud has a silver lining? (K7WA 1B-Battery)

Miami Co. ARC
K9ZEV/9 604 B-12-2408
Cape Ann ARA
W1RK (+KA1JAH) 534 B-15-2402
Marin ARC
W6SG 821 B-24-2368
RA of Greater Syracuse
W2AE 839 B-25-2358
Boeing Employees ARs of Wichita
AEØA/Ø 501 B- 9-2332
Porter Co. ARC
N9RD (+KA9FAW) 864 B-35-2296
SOBARS
K6QHQ 531 B-16-2272
B
K4SEX 869 B-50-2238
Okaw Valley ARC
W9KXQ 667 B-20-2204
Hams of Western Labrador
VO2WL* 773 B- 5-2186
Playground ARC
W4ZBB 600 B-10-2134
PARA
W9ZK 695 B-12-2092
Bay Area ARC
N8AYF 574 B-10-2090
Fall River ARC
W1ACT (+KA1IHI) 640 B-10-2008
Staten Island AR Communicators
WA2OGV 597 B-10-1998
Spokane Radio Amateurs
W7NBR (+KA7FVH) 573 B-10-1964
Raritan Bay Radio Amateurs
K2GE 741 B-19-1958
Hazel Park ARC
W8JXU 564 B- -1946
Northwoods ARC
AA9Y (+KA9NAI) 628 B-65-1946
Placentia Neighborhood Radio Watch
WB6DCC 620 B-23-1940
Pleasants Co. ARC
W8OI (+KA8NOC) 372 B-10-1908
Ogdensburg ARC
K2JPM 455 B-27-1898
Fairfield AR Tuners
AE8L 601 B-25-1874
North Platte ARC
WØCXH* (+KAØNOV) 486 B-23-1814
Lake Cumberland ARA
N4AI 619 B-15-1810
Coosa Valley ARC
N4SJ* 606 B- 9-1800
Branch Co. ARC
WD8KAF 449 B-19-1780
Red Rose Repeater Assn.
AI3L 514 B-20-1736
Walton Hills ARC
KO8L 438 B- 8-1698
Grays Harbor ARC
W7ZA* 473 B-15-1688
Bellevue AC
WØWVV 515 B-12-1678
South Central Indiana ARC
N9BUC (+KA9MZV) 481 B-13-1640
Hou-Texins ARC
WB5LIN 556 B-12-1612
AR Explorer Post 1159
W4WRJ (+KA4TUZ) 541 B-13-1600
Williams Co. ARC
, W8JDM 519 B-15-1530
Susquehanna Valley ARC
K3ARR 473 B-12-1522
Milwaukee RAC
WØRH (+KA9LXP) 404 B-20-1512
Lewis-Clark ARC
W7VJD* (+KA7MVQ) 463 B-12-1492
Owatonna-Steele Co. ARC
WØFEI 368 B-12-1486
Metro ARC
VE3MRC* 694 B- -1445
Oroville ARS
W6AF* 427 B-28-1440
Ascension ARC
WB5KKM (+KA5KAO) 432 B-23-1380
Cascade RC
WZEK 451 B-11-1362
Mobile Sixers RC
W3AWA/3 390 B-15-1324
Nassau Co. ARC
WB2WWP 352 B-30-1316
San Juan Co. ARES
K/IRO 658 C-14-1300
Illiana Repeater System
KC9V 268 B-11-1252
Beardstown ARK
KD9P (+KA9JJD) 407 B-15-1164
Eagle Rock ARC
KA7DOU 328 B- 4-1158
Durango ARC
WBØBLM* 272 B-11-1138
Gladwin Area ARC
WD8IOI 308 B-15-1116
Siemon Park ARC
VE1PEI 534 C-32- 997
High Plains ARC
WØGGP* 111 B-14- 834

4A-Commercial

Scottsdale ARC
K7TR* (+N7DQQ) 1443 B-64-4620
Orange Park ARC
K4SP 1348 B- -3610
Hogtown Renegade AR Contest Society
KB4HF (+KA4TSB) 1345 B-11-3002
Northern Chataugua ARC
W2SB/2 768 B- 7-1546
High Frequency Ionospheric Propagation Research Institute-Radio Technology Division
WØCIV* 434 B- 5-1412
Somerset Co. ARC
AK3J 548 B-20-1256
Non-Club Group
W9UVM* 189 B- 5- 478

5A-Battery

Nashua Area RC
W1YR/1 (+KA1ITQ) 1998 A-70-14,955
Northeast Iowa ARA
WØMG* (+KAØIUF) 1311 A-35-11,015

5A

Western ARA
N6ME (+KA6JDT) 3650 B-60-11,458
Albuquerque DX Assn.
N5RR (+KA5NJP) 3494 B-23-11,276
Birmingham ARC
W4CUE (+KA4AJA) 3555 B- 7-11,154
Lake Monroe ARS
AJ4L (+KA4VNS) 3299 B-44-10,218
South Orange ARA
K6MJ* (+WD6BSB) 2955 B-42-8912
Datapoint Amateurs & Technicians Assn.
K5CB (+KA5GAX) 2728 B-30-7840
Eastern Connecticut ARA
K1MUJ 2288 B-22-7738
Adams Co. ARS
W3EKT 2685 B-27-7700
Garden State ARA
W2GSA (+KA2ONR) 2193 B-35-6996
Lake County ARA
K8BL (+WD8LTM) 2207 B-15-6990
Bolingbrook ARS
W9JI/9 (+KA9NQH) 1641 B-25-6908
Chicago Suburban RA
K9BY* (+KA9MHB) 2385 B-55-6870
TRW ARC
W6TRW 2222 B-30-6840
Fox River Radio League
W9CEQ (+KA9LFU) 2541 B-40-6730
RCA Astro Electronics ARC
W3KM 1636 B-12-6330
Grumman ARA
WA2LQO/2 1536 B-50-5872
Metroplex ACA
N2NY 1658 B-50-5824
Dupage ARC
WØDUP (+WD9FDW) 2031 B-34-5814
AK-SAR-BEN-ARC
WØEQU (+KAØLQC) 2098 B-50-5686
Stu Rockafellow ARS
W8NJH (+WB8SAE) 1752 B-45-5426
McHenry Co. Wireless Assn.
KB9K 1862 B-30-5368
Fort Myers ARC
W4LX 1581 B-25-5326
Hartford Co. ARA
W1NEM 2047 B-40-5064
The Armadillo Gang
KC5UN 1917 B-22-5046
Toledo RAC
W8JI (+KA8BNQ) 1580 B-14-4912
Tioga Co. ARCs
K2QR/2 1322 B-20-4862
Double Cheese No Onion
W8MRE 1487 B- 8-4860
Windsor ARC
VE3OW/3 1453 B-15-4580
Middle Tennessee ARS
W4UOT 1237 B-30-4532
Hazelton ARC
W3SJI (+N3CME) 1091 B-50-4500
Tri-County ARA & FLTAC ARC
N6GA (+KA6QEZ) 1083 B-17-4494
Monongalia Wireless Assn.
K8WV/8 1070 B-30-4448
Teays ARC
K8ABJ 1272 B-25-4358
Elk Grove ARC
KB9L 1566 B-27-4226
Willmar Area Emergency ARC
WØSW (+NØDFO) 1435 B-20-4164
Orange County ARC
W6ZE/6 (+KA6QVO) 1582 B-22-4100
Farinon AR Transmitters
N6SJ 1078 B-11-4020
Simi Settlers ARC
K6FM (+KA6FDG) 1203 B-26-3910
Panhandle ARC
W5WX/5* 1037 B-29-3666
Kalamazoo ARC
W8VY 1175 B-30-3632
OH-KY-IN ARS
K8SCH (+KA8OQM) 1899 C-64-3581
Greater Lawrence ARF
W1FW 996 B-35-3524
Tulsa Repeater Organization
W5OK 1216 B-33-3500
Stonewall Jackson ARA
W8HB 890 B-24-3444
Western Carolina ARC
W4MOE* 701 B-14-3122
Concord Brass Pounders
W1QC 708 B-12-3098
McMinnville ARC
KA7EOG 1097 B-10-3096
Nutley ARS
W2GLQ* 880 B-25-3088
Morganton ARC
K4VLY* 781 B-22-3082
Hampden Co. RA
W1NY 656 B-30-3076
Shore Points ARC
N2AAC 803 B-22-2884
Indian Hills RC
W8CS 771 B-22-2868
Charlotte ARS
K4IA 643 B-25-2862
Binghamton ARA
W2OW 957 B-15-2814
Corning Area Amateurs
W2GJ/2* (+KA2BLL) 647 B-15-2792
East Whittier ARC
W6VH* 818 B-18-2770
Guelph ARC
VE3ZM 802 B-15-2684
Kitchener-Waterloo ARC
VE3IC/3 593 B-25-2652
Sterling/Rockfalls ARS
W9MEP (+KA9DUS) 961 B-25-2642
Chelsea Communications Club
AJ8X 858 B-12-2634
Muscatine ARC
KEØY (+WAØKGH) 668 B-15-2608
Shasta Cascade ARS
KR6M 731 B-25-2556
North Shores ARC
K6HAI 774 B-28-2548
Southern Sierra ARS
K6RLC 521 B-10-1512
Glasgow Site ARC
K3NI 498 B- 6-2496
Independent Repeater Assn.
KB8WV 869 B- 8-2472
Sheridan AR League
W7GUX (+KA7NHP) 532 B-12-2454
Mountain ARC
AJ3Y (+KA3JOY) 528 B-25-2428
Sabine Parish ARC
K5ABA* (+KA5LVJ) 481 A-25-2396
Alameda Co. RC
W6HOR (+KA6LVA) 701 B-16-2396
Jayhawk ARC
WØLB* 492 B-14-2356
Brantford ARC
VE3BA 827 B-15-2354
Peoria ARC
W9UVI 1011 B-25-2332
Sooland Repeater Assn.
KØAAR/Ø 1486 B-25-2292
Cascades ARS
WB8CSQ/8 599 B-25-2240
Panoramaland ARC
K7DU/7 492 B-12-2168
Island Co. ARC
W7PN 467 B-12-2136
Seneca RC
W8ID/8 559 B-18-2134
Umpqua Valley ARC
KI7M 554 B-18-2130
Turlock ARC
W6BXN 670 B-35-2072
Montachusett ARA
W1GZ 611 B-16-2042
Ashland Area ARC
N8DS 496 B-22-1910
Mike and Key Club
W3CIC (+KA3HUK) 372 B- -1808
Gratiot ARA
W8AWE (+KA8PEM) 483 B-13-1720
Hayward RC
K6EAG/6* (+KA6TNV) 414 B-25-1692
Jefferson Barracks ARC
KØZFK (+KAØIUY) 484 B-16-1680
Quinte ARC
VE3CJJ/3 427 B-21-1644
Nittany ARC
K3HKK* 450 B- 9-1604
Spokane Dial Twisters ARC
K7LRD 407 B-16-1472
Clary Hill Raiders
W1VJ 497 B-25-1468
Houston ARC
W5DPA 368 B-10-1330
Libby AR Klub
W7KZB* 226 B-13-1286
Tri-City RAC
WØVQN 250 B-25-1214
Palestine ARC
W5ORW 58 B- 8- 766
Downey ARC
W6TOI 229 C- - 729

5A-Commercial

FARCOM
W2FWG 575 B-26-1656

6A

Huntsville ARC
K4BFT (+KB4ADT) 4454 B-33-13,240
Lanse Creuse ARC
W8LC (+KA8PIZ) 3311 B-48-10,742
Cary ARC
N4NC/4 3301 B-35-10,610
W. Palm Beach ARC
W4HAW (+KA4RGW) 3323 B-100-9184
Sterling Park ARC
KZ4K/4 2492 B-21-8336
Northrop RC
W6CN (+KA6JFL) 2770 B-40-8014
Warminster ARC
K3KT (+KA3ETE) 2559 B-65-7998
Orlando ARC
W4PLB (+KA4ZOA) 2509 B-65-7912
Hoodview ARC
WB7QIW (+KA7OSF) 2546 B-42-7752
NBS-BRASS
K3AA (+KA3ICE) 2407 B-22-7586
Triple States RAC
K8AN (+KA8MKS) 2199 B-40-7470
Corpus Christi ARC
W5MS (+KA5LJJ) 2256 B-50-7416
Capeway RC
KIBU (+N1BGT) 2070 B-25-7410
Delaware Valley RA
W2ZQ/2 2067 B-48-6992
Rockford ARA
W9AXD 2327 B-38-6750
AVCO ARA
K1BJ 1467 B-10-5532
Two Rivers ARC
W3OC (+KA3JKO) 1424 B-35-4864
Niagara Penninsula ARC
VE3VM/3 4447 B-60-4676
Del. ARC
W3SL 1338 B-15-4504
Whitewater Valley ARC
K9KY (+KA9EEA) 1431 B-22-4424
Whitman ARC
WA1NPO (+KA1IMI) 1008 B-35-3928
Rockcreek ARA
W3RCN 1411 B-21-3914
Stamford ARA
KIGF (+N1AWJ) 1068 B-20-3898
Mid-Michigan ARC
KI8W 1044 B-25-3680
Silver Creek ARA
WD8PNF (+KA8LYN) 1039 B-25-3606
TMRA
WsHHF 911 B-30-3440
G.I.A.R.A.
K8ALB 845 B-27-3080
Tri-County ARA
W2LI* 954 B-20-2754
Black Diamond ARC
KC8X 1056 B-25-2720
Beaver Valley ARA
W3SGJ (+KA3COX) 721 B-27-2714
Barry ARA
KM8U* 600 B-12-2524
Sangamon Valley RC
W9DUA (+KA9MJZ) 796 B-25-2284
Marion ARC
W8BS (+KA8KGA) 949 B-75-2048
WACOM
AD3T 570 B-31-1840
South Side ARC
WD8HSP 478 B- -1764
Cumberland Valley ARC
W3ACH 336 B-20-1656

7A-Battery

Conejo Valley ARC
AD6T (+KA6UPE) 1764 A-37-13,120

7A

Penn Wireless Assn.
W3SK/3 (+KA3IGF) 4186 B-40-13,598
North Florida ARS
W4IZ (+KA4YMX) 3692 B-55-11,332
Mike & Key ARC
K7LED 2826 B-30-8580
Bergen ARA
K2IM/2 2645 B-45-8166
Mt. Diablo ARC
W6CX 2341 B-20-7180
Long Island Mobile ARC
W2VL/2 (+N2BAR) 1918 B-48-6372
RA of Erie
W3GV 1845 B-32-5858
San Antonio ARC
W5SC 1892 B-35-5732
North Hills RC
K6IS 1611 B-45-5356
The Cuyahoga Falls ARC
W8VPV (+KA8GYN) 1698 B-35-5332
West Branch ARA
W3AVK (+KA3IGL) 1398 B-45-4532
Central Michigan ARC
W8MAA 1025 B-41-4212
Middlesex ARS
N1AO (+KA1IZU) 1146 B-20-4016
Murgas ARC
K3YIL* (+KA3IEE) 1194 B-39-3804
Butler Co. ARA
W3UDX 1108 B-27-3766
ARALB
W6RO 1410 B-42-3650
South Texas ARS
AF5D 1115 B-24-3278
Clark Co. ARC
W7AIA/7 831 B-75-3038
Valley RC of Eugene
W7PXL 795 B-20-2764
Vienna Wireless Society
K4HTA 966 B-12-2760
South Waterloo ARC
VE3SWA 655 B-30-2752
Klamath Basin ARA
W7VW (+KA7NUC) 712 B-25-2502
Beloit ARC
W9IDL (+KA9CHZ) 858 B-15-2466
ARC of Augusta
W4DV/4 667 B-43-2464

8A

Woodbridge Wireless
W4IY (+KA4WDY) 2646 B-64-9604
Mahoning Valley ARA
W8QLY 2736 B-85-9522
Crystal RC
W2DMC (+KA2NNM) 3868 B-27-8896

Gloucester County ARC
W2MMD/2 2309 B-50-8584
Four Lakes ARC
W9JZ (+KA9NAT)
2707 B-30-8038
Morris RC
K2AZ/2* (+KA2FPN)
2098 B-24-7774
HFEA ARC
K6QEH 2124 B-28-7086
Metropolitan ARC
K8NOW (+KA8NLF)
843 B-10-3504
Orange County ARC
N2CF (+N2CGK)
1039 B-30-3282
Kern County ARC
W6LIE/6 (+WD6BNO)
958 B-70-3200
Empire RC
W@AJY (+KA@OAK)
570 B-18-2822
Headwaters ARC
K@GUV* 643 B-18-2661
Livermore ARK
W6OA 706 B-26-1626

9A

Silver Springs RC
KD4VW 2604 B-23-8132
Skywide ARC
VE3DRT 2446 B-38-8040

10A

Adrian ARC
W8TQE 950 B-30-2480

10A-Commercial

West Side RC
VE3JJ 1106 B-10-3664

11A

RC of Tacoma
W7DK 2366 B-56-7920
South Pickering ARC
VE3SPC 2389 B-30-7900

13A

South Jersey RA
K2AA (+N2BAZ)
4911 B-70-15,188

17A

Nortown ARC
VE3NAR/3
3187 B-50-10,870

21A

Englewood ARA
K2KX* (+KA2NTW)
845 B-30-2974

One or Two Person Portable

1B-1opr.-Battery

N8LP/8 217 A- -2270
KB7CR/7* 409 A- -2245
VE3HIE/3 137 A- -1670
WD9FSA/9 270 A- -1650
K4JEX 392 B- -1525
WB2MBM/3 104 A- -1140
N4EVC 101 A- -1110
W1EWD 199 B- -1096
W9PNE/9 106 A- -1095
WD4AVY 135 A- -1075
WA4ZIA* 393 B- - 886
N5AE 90 A- - 840
K6GLF 130 B- - 820
KL7IJG/1* 68 A- - 790
K6JRR* 120 B- - 766
W7TU 66 A- - 740
KB2UC* 314 B- - 730
KH6CP 59 A- - 700
N@AX 111 A- - 655
WA2DFI/VE3 62 A- - 620
WA6RND 49 A- - 595
WB@SZR 38 A- - 580
K5IS 49 A- - 575
WA@NSY 44 A- - 540
KR2V/1 207 B- - 528
WA@QQB/@ 47 A- - 510
K6FH* 68 A- - 480
KT@D/7 31 A- - 410
AL7DL/KL7 31 A- - 355
KA7MUV* 19 A- - 290
WA3LGG 50 B- - 200
WD6DXH/6 1 A- - 110
N6DDX 41 B- - 82
KA1IHX 10 B- - 40

1B-1 opr.

VE3JTQ 660 B- -2854
W4NW/8 494 B- -1976
K9VIS 540 B- -1908
K2TB 369 B- -1576
VE2GST (+VE2BP, opr.)
165 B- -1100
KT5Q* 225 B- - 888
WBJQ* 275 B- - 654
VE2FYO 102 B- - 608
WB7BWP/1 193 A- - 498
WA6OWH 161 B- - 402
WA4ZSN 172 B- - 360
WA3GSB/3* 110 B- - 320
KA8FHB 88 B- - 266
N9DAW/9* 72 B- - 244
N1AUV 63 B- - 152

1B-1 opr.-Commercial

N4ARO 210 B- -1018
KA7FTS/KL7 105 B- - 420

1B-2 opr.-Battery

W1ECH* (+WB1DOI)
655 A- -5915
AC6T (+WA6WHC)
446 A- -3985
AF5B/5 (+WS5OD)
349 A- -3240
N5EM (+K5HGB)
259 A- -3060
KA@HIB (+WA@VBW)
312 A- -2295
WA@RLY* (+WB@GGM)
153 A- -2030
WB8NGA/8* (2 oprs.)
173 A- -1830
AG@K (2 oprs.)
117 A- -1470
WB@ERN* (+KA@DPY)
407 B- -1272
WA2HSQ (+KA2JXF)
144 A- -1270
WB3KAS* (+KA3AHI)
483 B- -1188
WA6OIL (2 oprs.)
61 A- -1010
K7BFL/7 (+KA7EOL)
128 A- -1005
KB9Y (2 oprs.)
325 B- - 998
WA5VQK (+KA5KOA)
70 A- - 900
WA7NTU/7 (+WB7FFI)
136 A- - 790
KB7XJ (2 oprs.)
117 A- - 785
W@UY (+K@WRY)
148 B- - 692
KF5H (+N5BVU)
163 B- - 666
W6SGJ (+KA6RAI)
107 B- - 628
K7WA (+K7ZR)
92 A- - 539
VE2XL/VE7 (+VE2XS)
68 A- - 450
VE3FME/2 (2 oprs.)
41 A- - 410
W1JP/1* (2 oprs.)
50 B- - 379
K1ODY (+W1CPL)
17 A- - 370
W6WR/7*(+NB6W)
13 A- - 230
WB@PYU* (+KA@CCY)*
50 B- - 100

1B-2 oprs.

K8MFO* (+K8HHZ)
1078 B- -4172
W8TK (+WD8AUB)
907 B- -4028
W6OUL/6 (+W7CB)
1089 B- -3680
N9NE/9* (+K9DFB)
774 B- -3196
WB@NCR (+WA@JYF)
1160 B- -2820
N3CA (+N2MA)
628 B- -2712
K9SO (+K2QC)
705 B- -2678
AC8P/8 (+N8AAU)
559 B- -2602
N2RA (+N2AE)
572 B- -2584
N7AZ (+WB7SRC)
743 B- -2564
WD5IVD/5 (WB9NQH)
571 B- -2550
W1WP/1 (AD1O)
467 B- -2406
AF3B/3 (+WB3HSV)
545 B- -2260
607 B- -2094
K2OP/2 (2 oprs.)
607 B- -2094
K2CW (2 oprs.)
492 B- -1968
AD7E (+N7AXX)
343 B- -1856
W1ODY (2 oprs.)
596 B- -1772
AF1T/1 (+WA1YKG)
755 B- -1610
N7AYG/6 (+KA7HBK)
298 B- -1592
W7AEP/7 (+WB7EEI)
726 B- -1552
WB4MJF (+KA4WPS)
559 B- -1446
WD@ENU* (2 oprs.)
358 B- -1416
KT2P* (+KS2Q)
325 B- -1300
WB3KAS* (+KA3AHI)
483 B- -1188
KA6FTA (+KA6HAB)
433 B- -1166
K6EID*(+W6SRP)
471 B- -1158
W7LTL (+WA7LHZ)
372 B- -1144
K1TH/9*(+KA9FSG)
430 B- -1138
N4EWR* (2 oprs.)
423 B- -1046
W@QDL* (+N@AO)
186 B- -1044
N8EA/8* (+WA8DXK)
228 B- -1012
WA2EKK (+KA2CKR)
331 B- - 962
WA7MBL (+WA7MXZ)
297 B- - 906
KC7TV (+WA7YOK)
627 C- 830
KC9PI (+WB9FHI)
335 B- - 770
WA2LWT (+WA2QIC)
185 B- - 716
W1HBP (+WB1FAW)
296 B- - 692
VE7EXK* (+VE7EWW)
114 B- - 656
K6EWM (+WD6FJP)
185 B- - 610
WB7NJO* (+KC7VM)
196 B- - 592
KA5ABS/5 (+WB5UFS)
232 B- - 564
K6GVI/6 (+KA6GNO)
271 B- - 542
KA@JNX (+WA7WOJ)
199 B- - 498
AC8N (+K8UCN)
171 B- - 342
KA@FXH (+WA8OUH)
102 B- - 332
W@OKB (2 oprs.)
204 C- - 304
WB2BCD (+WB4RJO)
81 B- - 262

1B-2 oprs.-Commercial

WB6ZEC/4 (+WA9YNE)
420 B- -1756
N4AL5/3 (WB3EHS)
268 B- - 536
KA4LKH* (KA4JJK)
179 B- - 408

2B-Battery

N6MI (+AE6E)
944 A- -6330
KD2I/2 (+WB2TSY)
762 A- -5865
WA6POC/6 (+W6TZA)
245 A- -2415
N2APB (+KA2DNC)
466 B- -1634
WA1GMT/7 (+KA7CKB)
116 A- -1360
K2NH (+N2BCF)
109 A- -1275
W7ER (+W7TZZ)
252 B- - 992
W6JTH* (+KA3BLO)
39 A- - 680
W7KJ/7 (+W7KGQ)
175 B- - 668

2B

VE2CL (+VE3MJX)
513 B- -2450
K8GIV/5 (+K8BQI)
668 B- -2162
WB6LRV (+WB6PFJ)
679 B- -1726
WB7NNA (+WB7QQY)
535 B- -1456
WB4YDL* (+KA4RPO)
462 B- -1364
K@KYZ (+WA@COO)
561 B- -1332
K6LRN/6 (+WB6TKD)
280 B- -1126
N9TD (+WD9DLR)
236 B- -1094
KB8SV (+N8BNE)
445 B- -1092
K9QHO* (+N9BTY)
331 B- -1016
WA3KEY (+WA3RXP)
217 B- - 998
KI7T (+K7IDX)
287 B- - 946
K6OLT (+WA6HAR)
233 B- - 866
VO1GP (2 oprs.)
228 B- - 764
N9ACA (+K9IQH)
98 B- 2- 400
N8EBW* (+KA8EMF)
86 C- - 386
WB9LAU/5 (+WD8OVJ)
146 B- - 382
KD5KR (+KC5AL)
112 B- - 224

2B-Commercial

VE3ADI/3 (+VE3GAM)
668 B- -2458
N4GFB (+KA4EPB)
45 B- - 180

Mobile-1C

W6MXO/M6 232 A- -2320
K6TQ (2 oprs.)
612 B- -1826
N4IG/M4 (4 oprs.)
541 B- -1336
WA6SEN/MM (4 oprs.)
160 A- -1095
VE3FIT (3 oprs.)
507 B- -1014
WA2IMS (2 oprs.)
179 A- - 895
WA6DKY/M6 (5 oprs.)
179 A- - 895
VE3DQF/VE3
194 B- - 776
AE2E/MM (6 oprs.)
355 B- - 732
WB6QZK (2 oprs.)
143 A- - 725
WA@CQG 139 B- - 695
WA5DTK 109 A- - 600
W3TV (3 oprs.)
53 A- - 530
N4ID/6 64 A- - 500
KS6S (2 oprs.)
88 A- - 490
W1ECV (3 oprs.)
204 B- - 464
N@DLY 172 B- - 456
N5IB/MM (2 oprs.)
157 B- - 448
KD4HY/M 131 B- - 406
KA@DGU/M (2 oprs.)
331 B- - 378
VE7EWG/7 123 B- - 352
VE3HYW/MM (3 oprs.)
160 B- - 328
N4KF/M 97 B- - 310
KB5NV 149 B- - 298
W2HAE/M 58 B- - 232
KB9YY 38 A- - 190
WD@AKZ/M (2 oprs.)
90 B- - 180
WA2JCX/M (2 oprs.)
88 B- - 176
KA9V 84 B- - 168
K4WHN 80 B- - 160
KA@EPY 76 B- - 152
WD6FYJ 49 B- - 98
WA5ZIB/M 16 B- - 46
W1JR/M 8 A- - 40
VE5NR 17 B- - 34
N9BAC 8 B- - 16
K9GDF 7 B- - 16
WB1CZX 6 B- - 12
KA9KHV 3 B- - 6

2C

WA4FYZ (3 oprs.)
670 B- -1706
KJ9W/7 (2 oprs.)
123 B- - 246

4C

KE4ND (18 oprs.)
470 B- -1234

Home Station-1D

WA5ZUP (2 oprs.)
1739 B- -3478
WB6CEP (3 oprs.)
1138 B- -3330
N2DLM 539 B- -2090
K@EJ/7 643 B- -1976
N9AZR (6 oprs.)
495 B- -1726
WA4RAJ 360 B- -1440
W7TC 355 B- -1420
W7ZMD 334 B- -1336
W1GOG 318 B- -1272
W6PRI 283 B- -1104
KC@BE (2 oprs.)
516 B- -1032
AD1Z 288 B- -1010
W9NJP 238 B- - 944
WB3HVS/4 (2 oprs.)
466 B- - 932
KO8S 396 B- - 888
W8UPH 513 C- - 884
KF8X (3 oprs.)
441 B- - 882
K8PW/8 (11 oprs.)
405 B- - 846
WB1DXD 298 B- - 706
KN7H 330 B- - 660
WA5TYX 303 B- - 606
W3ARK 146 B- - 584
KC9BT (2 oprs.)
328 C- - 554
KA1DRI 55 B- - 550
N9CYB 269 B- - 544
KK5K 133 B- - 532
W7JBN (3 oprs.)
221 B- - 518
N8CPG 440 C- - 483
N@BXX 119 B- - 476
W2OW 159 B- - 456
KA3EJG 198 B- - 422
VE3SSK 104 B- - 404
W4CHD 98 B- - 392
K1TW (2 oprs.)
124 B- - 390
WD8NNM (2 oprs.)
107 B- - 386
W@TSA 106 B- - 384
WD9FQD 191 B- - 382
K6CSL 102 B- - 374
N7CBW 83 B- - 328
KB9TL 154 B- - 308
KA6RGC 152 B- - 304
W9REC 121 B- - 302
WA4HWT 133 B- - 266
KS6Q 102 B- - 266
W3QT (11 oprs.)
263 C- - 263
WD5AAR 229 C- - 229
KA8MMQ 60 B- - 224
W4EAT 55 B- - 220
WD4ORA 110 B- - 220
KA4RLP 106 B- - 212
KA8ENT 53 B- - 212
N2WX/4 50 B- - 200
KD5DR 98 B- - 196
WB9AMK (2 oprs.)
91 B- - 182
WN7AIU 18 A- - 180
WB5MLH 87 B- - 174
K3BIE 81 B- - 172
VE3MJT (2 oprs.)
43 B- - 172
W1FM 42 B- - 168
W5NR 82 C- - 164
W4LEP 74 B- - 158
WA4DYD (3 oprs.)
74 B- - 148
W3GN 68 C- - 130
N5CPO 130 C- - 130
WB5EXI 32 B- - 126
WB2DLA 26 A- - 104
WB2WEO 48 B- - 96
W3CEI 21 B- - 84
KA6PPT 20 B- - 80
KA2DSQ 19 B- - 78
WA2VUJ/3 14 B- - 76
KA1DIG 37 B- - 74
KA8KSO 18 B- - 72
KB9PA 12 B- - 64
KA5GWQ 28 B- - 56
WD6CQH 14 B- - 56
K6NS 26 C- - 52
WA6OTU 12 B- - 48
W4IZT 17 B- - 46
K9GDF 5 B- - 20
KA9KHV 1 B- - 4

2D

K9CW (5 oprs.)
1598 B- -4378
WB6OBQ (4 oprs.)
863 B- -2006
W3PQT (8 oprs.)
942 B- -1884
KX5Z (6 oprs.)
554 B- -1542
N6SL (10 oprs)
435 B- -1266
K4PQD (2 oprs.)
357 B- -1140
N2RU (7 oprs.)
482 C- - 482
KA4SYW (3 oprs.)
44 B- - 176

3D

WD9IRQ (6 oprs.)
920 B- -1914
KE4HT (3 oprs.)
750 B- -1578
WD@HSD (10 oprs.)
744 B- -1498
KB6N (3 oprs.)
549 B- -1344
WA2DQL (10 oprs.)
351 B- - 782
K9YKX (5 oprs.)
271 B- - 710
W6UUS (5 oprs.)
156 B- - 590
W4VSV (3 oprs.)
287 B- - 578
KA8DLR (10 oprs.)
102 B- - 204

4D

WA3EKL (4 oprs.)
1406 B- -3048
KI@X (7 oprs.)
624 B- -1716
K3MJW (16 oprs.)
658 B-16- 930

5D

K2USA (12 oprs.)
1073 B- -3256

Home Station Emergency Power

1E

W@WJ (5 oprs.)
531 A- -4885
W6SX (3 oprs.)
1185 B- -3988
N5QQ 265 A- -2850
WB@CRQ 245 A- -2450
KN8P 802 B- -2360
KA5HSA (2 oprs.)
1110 B- -2356
W6QRM 220 A- -2200
K8LF (3 oprs.)
2088 C- -2167
WA1YLN (3 oprs.)
239 A- -2050
W2FTY 503 B- -2012
KA4JXS 197 A- -1970
WA4FKK 197 A- -1970
K7FC 181 A- -1705
K8CV 145 A- -1450
W8AC 137 A- 1370
K7BBO 341 B- -1345
K8IVC (4 oprs.)
515 B- -1302
KJ8T (2 oprs.)
320 B- 1280
K4FPF 356 B- -1262
K6TG 125 A- -1280
W8FAO 125 A- -1250
KC8JH (4 oprs.)
1313 C- -1220
W6FTJ (2 oprs.)
128 A- -1180
KA6BIM 584 B- -1168
K4LDR (2 oprs.)
323 B- -1126
W6HCS (4 oprs.)
394 B- - 898
K3YD 73 A- - 675
KB6ZK 89 A- - 545
W@@EK 36 A- - 360
WA7ZBL 34 A- - 340
WB4CKY (20 oprs.)
168 B- - 336
KV6W (75 oprs.)
318 C- - 331
W6YVK 65 A- - 325
W3IA 30 A- - 300
K9VHF (2 oprs.)
150 B- - 300
WD8OFB 57 A- - 285
WA1YIO 54 A- - 270
W4NM 27 A- - 270
W1ZNG/4 23 A- - 230
WA6HVX 33 B- - 66
KA6SIQ 6 A- - 60
N6EJG 9 B- - 30

2E

K5QBM (13 oprs.)
976 B- -1952
KB@AG (5 oprs.)
529 B- -1638
W@TQ (4 oprs.)
189 B- - 538
KO9M (3 oprs.)
193 B- - 458

3E

K@VUW (3 oprs.)
3296 C- -3969
WA1PHY (14 oprs.)
1163 B- -4310
W3AO (10 oprs)
471 B- -1298
KA1MP (10 oprs.)
393 B- -1000
K5BY (7 oprs.)
376 B- - 894

4E

N5EK (18 oprs.)
958 B- -2462
W8RCC (9 oprs.)
570 B- -1432

15E

K9GL (25 oprs.)
8179 C- -10,541

Checklogs

K3UA,K6APW,K6KWN,
KA3DLV/3; KA7MUV,
KC5WM,KE6VL,KE6VY,
KO4D,KV4F,N1NN,W1AW,
W2FOY,W3FSB,W5UCY,
W8ACW,W8FFN,W8FXB,
W9IAL,W@AWB,WA2QKF,
WA4JUO,WB4ZTE,VE1BMN
VO1QST,VE3AWE,HF3AMF

Late/Incomplete

K6OI,K8BXQ,K8BYI,KA1BSZ,
KA1ISS,KB5FG,N9RF,W3TKQ,
W8EBG/8,W8TO,W9CCU(+KA9NFW)
W@UPS,WA@AGM/@,VE3NBC,
VE3YRA

Public Service

Conducted By Robert J. Halprin,* K1XA

2-Meter Nets and NTS

Some confusion exists concerning the proper format for National Traffic System (NTS) nets that operate on 2-meter fm repeaters. There are numerous opinions as to why NTS format should not be used on repeaters even though it is followed on hf nets.

Don't be misled. The system is structured for use on all frequencies and is to be followed by all NTS nets. Our outline is found in the ARRL *Public Service Communications Manual*, which includes procedures that are to be followed by NTS nets regardless of band/mode.

Originally, 2-meter fm nets were run by emergency coordinators (ECs) for the passing of emergency traffic within the local area. Since the widespread use of repeaters, repeater traffic nets have sprung up all over the U.S. and Canada, and are used for the daily handling of third-party formal radiograms. Traffic nets serve many functions. They keep operator skills sharp and train new operators. Such nets operate to convey traffic of a formal nature on behalf of a third party. Just by their existence, nets train operators (even those who are not active participants) when to transmit and when not to transmit, and how to follow directions. This comes under the heading of discipline.

Disciplined operations on traffic nets do not, in the least, preclude their use for emergency communications; in fact, they aid in the emergency communications effort. ECs still hold their emergency nets, but only on a limited basis because of the daily traffic nets that occupy the repeaters. Voila! Training *daily* instead of weekly.

Unfortunately, training is usually performed only on the Amateur Radio Emergency Service (ARES) nets once a week, or whenever the EC schedules the net. Training in net operation is the single most important function that a 2-meter fm net can perform. ECs conduct their nets for this purpose. All the hams in the area who listen to the repeater are subjected to the training procedures and operating skills used by the net participants. Why, then, should a traffic net that operates daily *not* use proper procedures and operating habits that are needed by the entire Amateur Radio community during emergency conditions?

Sounds more like the individual citizens of our community who say, "Why have an emergency plan for the evacuation of a nuclear power plant? Why not close the plant down; then we don't have any need for emergency preparedness." Keeping your eyes closed won't make it go away, and you also won't have any juice. Well, hams have been thinking the same way about 2-meter fm traffic nets. What is the sense of having a traffic net that operates using incorrect procedures? When we need traffic passed during an emergency, the entire ham community will want "to come to the rescue" and foul up the operation with incorrect procedures. That is precisely what they have been training to do by listening to a poor traffic net.

I ask you which is worse: having no traffic net, or having a traffic net that uses poor procedures and, when an emegency occurs, falls flat on its face in front of the public? Great public relations and community service? Even worse, a poorly operated net can obstruct an emergency communique and possibly cause damage or injury to the people we are trying to help.

The general attitude of the amateur population toward emergency preparedness needs much work. Amateur Radio will no longer be what it is today if we don't do something about our present operating habits while engaged in traffic handling on 2-meter repeaters.

Amateur Radio has much more to offer our fellow citizens than just a lot of crowded air waves. We can set a good example by using the proper procedures and by operating with courtesy. Two-meter nets do not just train the participants; they train the listener. By listening to proper procedures on a daily basis, operating with correct format comes automatically in emergency situations. Ever hear of Pavlov's Theory? Ring my bell and I'll use proper procedures without having to think about it.

I'm sure you know the reason that manufacturers put commercials on radio and television to sell products. It has been shown that people buy what they are exposed to in commercials. That is to say, whether they are directly involved in listening to the commercials or just casually listening with half an ear, they are subjected to the sales pitch and are mentally primed. They may not remember the commercial, but the product name will sure ring a bell, and that is what they will buy. There's my man Pavlov again!

The same holds true with operating procedures. Whether we are directly involved in a traffic net or just casually listening to our favorite repeater, we are taught to operate in the prescribed manner. If we are directly involved, we are taught by participating properly; if we are just listening while an efficient net is in operation, procedures rub off and things start to happen in our heads. Ideally, everything that we do over a 2-meter repeater trains both the participant and the casual listener. Now that we have a sequence of events, we can set that chain in motion by starting at the beginning.

In traffic handling, people who listen to a good net have learned how to operate in the correct manner. In this way, we set the right example and train the non-emergency personnel how to act when the real emergency occurs. We must practice what we preach, or the entire system is in jeopardy. Operating procedures must remain the same, no matter what net or mode we use. This is the single-most-important idea that I have stressed since becoming section emergency coordinator (SEC) of Eastern New York. We must be able to integrate operators anywhere in the system, no matter what band, mode or repeater is in use. Operating procedures must remain constant for every net that operates within the NTS, or the system fails. Standard operating procedures shall be in accordance with the ARRL *Public Service Communications Manual;* under no circumstances should they be ignored. — *Charles H. Johansen, KB2KW*

PUBLIC SERVICE DIARY

☐ Kenora, Ontario — July 11. VE4MY was monitoring CB channel 11 when a call requesting medical help came over the air. A woman visiting the Minaki area in southwestern Ontario had sustained a compound fracture to her wrist. VE4MY alerted VE3FY over the VE3LWR repeater. VE3EFY notified the Lake of the Woods District Hospital, which dispatched a plane to fly up to the Minaki area and pick up the injured woman. She was transported to Winnipeg, some 90 air miles, for treatment. (VE3JJH, secretary/treasurer, Lake of the Woods ARS)

☐ Kokomo, Indiana/Denver, Colorado — August 16. KJ9G received a phone call from W9PLO, who told him that there had been a death in a family near Kokomo. KJ9G's help was needed in tracking a member of that family traveling through the Denver area. KJ9G got on the 20-Meter Independent County Hunters Net and contacted WBØICP, who was mobile about 60 miles from Denver. WBØICP put out the word about the search over local repeaters and contacted WBØDUL, who then joined the search. After driving more than 20 miles, WBØDUL located the person's car. He stayed at the car until the owner showed up, and delivered the message that the driver was to call home. (W9UMH, SCM Indiana)

☐ Cline, Texas — August 26. WA7GBU was mobile when he spotted a house on fire. He contacted W5LFG, using W5LFG/R in Brackettville, some 20 miles west of Cline. W5LFG telephoned the fire department, which quickly responded. When two other residences became involved in the fire, the firefighters required additional support from another fire company. The fires were later contained, and no injuries were reported. (KC5RP, DEC Kinney, Maverick and Val Verde Cos.)

☐ Camarillo, California — August 29. WD6DND and his family were on their way to an outing when a small car cut across the median in front of them and struck a station wagon. Two of the four occupants in the wagon were killed instantly; the other two were injured. Using the Shelter Mountain RA's repeater, WA6ZTT/R, WD6DND contacted W6RIC, who notified the highway patrol by phone. After pulling over to the side, WD6DND got out of his car and crossed the highway on foot to free the other passengers in the wagon, which was smoking. County fire officials arrived on the scene only six minutes after the collision, and an ambulance appeared five minutes later to take care of the injured persons. (W6RIC, DEC Ventura Co. ARES)

☐ Lawton, Oklahoma — September 12. A fire broke out in the Southwestern Bell Telephone Co. offices and caused more than half of the city to lose service. The city's emergency operating center telephone link with the state EOC office was also severed. K5VRL was requested to activate the state EOC station in Oklahoma City to provide a direct radio link with the Lawton area. Communications with the stricken area were maintained on both 40 meters and the WR5AJV repeater for several hours until phone service was restored. (W5REC, ASCM Oklahoma)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Akron Ohio — August 16. A hazardous chemical — sulfur monochloride — escaped from a storage

*Deputy Communications Manager, ARRL

Third-Party Traffic Agreements

Here is the latest list of countries with which U.S. and Canadian amateurs may legally handle third-party traffic.

U.S. Agreements

North America: Antigua and Barbuda, Canada, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, St. Lucia.

South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela.

Europe: 4U1ITU.

Africa: Ghana, Liberia, The Gambia.

Asia: Israel, Jordan

Oceania: Australia, Pitcairn Island*.

*Informal agreement. See League Lines, October 1981 *QST*, for details.

Canadian Agreements

North America: Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, United States.

South America: Bolivia, Chile, Colombia, Guyana, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela.

Europe: 4U1ITU.

Africa: none.

Asia: Israel.

Oceania: Australia.

Keep in mind that during emergency situations special, *temporary* third-party agreements are often established between the countries concerned. W1AW carries information on these temporary authorizations. When in doubt, monitor W1AW.

tank, forcing the evacuation of residents from the surrounding area. The Red Cross set up a temporary shelter at a local high school to house the evacuees, and requested the Summit County ARES to help with communications among the RC chapter office, the evacuation shelter and the command post station set up near the spill site. Emergency communications were handled for several hours. (WB8HFZ, EC Summit Co.)

COMMUNICATIONS SERVICE OF THE MONTH

☐ Three teenage boys were overdue from a hiking and fishing trip in the Chain Lakes area near Mt. Baker. A callout for a searching mission was received about 1230 on August 12.

The Mt. Baker ARC communications van, a surplus 2-1/2 ton Army truck, was taken to the search base camp so that Whatcom County ARES members K7VNI and KC7TV could provide a communications link to the Whatcom County Court House. During the early evening hours, when the base camp was still being set up and the communications van had not yet been activated, K7IWX stayed on 146.16/76 (WR7AEF) to keep the channel clear.

The search started at dawn the next morning. By this point, the van was on the air, using the club's call sign, K7SJW, and was in communication with the court house. K7DEO went with the search team to keep the team linked with K7SKW. The weather on the mountain was bad all day, and the search was concluded for the night, with no positive results.

Although the search itself had been called off until the next morning and the court house closed at 2230, K7SKW stayed on the air, and WB7DSA, WB7EPL and WA7RUB monitored their own radios at home all night.

On August 14, the operations resumed about 0500. N7AEP, King County EC, volunteered his group's efforts, should they be required to assist with the search. Not only was their help needed, but a general call for additional communications assistance was put out. Responses from North Vancouver, Maple Ridge, Chilliwack (BC), Bremerton, Tacoma and Snohomish County came in. The group from the Seattle area included a nine-man team from Mexico, which was just visiting the area.

The weather on the second day of the search was improved somewhat, but was still questionable. About 1000, the weather cleared enough for a helicopter, dispatched from the Snohomish Sheriff's Office, to perform an aerial search.

The chopper quickly found the missing trio, who later explained that they had taken a wrong turn because of poor visibility. They had just started out again when the searchers in the helicopter spotted them. The Whatcom County Court House and Mt. Baker ARC station K7SKW were secured at 1445.

Approximately 130 people were involved with the search. Groups represented included the Whatcom County Sheriff's Department, the Whatcom County Department of Emergency Services, Bellingham Mountain Rescue, 4 × 4 Search and Rescue (a four-wheel-drive group), Explorer Search and Rescue, REACT and the Mt. Baker ARC/Whatcom County ARES. During the search, some 2500-plus man-hours were expended. *(Karl J. Peterson, WA7RUB, AEC Whatcom Co. ARES)*

Keeping track of over 1000 marathoners is easy when you have Lancaster (Nebraska) Co. ARES and Lincoln ARC to help. Here, NØCOO, marathon coordinator for the Lincoln ARC and an assistant EC, passes information into the WRØAEV net. The record board in front of him allowed spotters to pass data to the public-address announcer. *(photo courtesy KØGND)*

Among the ARRL dignitaries attending the WIMU Hamfest (combined Northwestern/Rocky Mountain Division Convention) was Oregon SCM W7QMU. *(W1YL photo)*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For August, 42 SEC reports were received, denoting a total ARES membership of 22,121. Sections reporting were: AL, AK, AB, AZ, CO, CT, ENY, IN, KS, KY, ME, MI, MN, MS, MO, NE, NH, NLI, NC, NFL, NTX, OH, OK, ON, ORG, PAC, SV, SK, SDG, SF, SJV, SC, SD, SFL, STX, TN, VA, WV, WMA, WNY, WPA and WI.

REPEATER LOG

According to reports received between August 21 and September 21, the following repeaters 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
WR1AIE						1				1
K1HF						1				1
K1KTB					1					1
KC2CY				5			1	5		11
WB2IID							1			1
WA2PAV				9				5		14
K2QIJ						1		1	4	6
W2VL	1		1			18	1			21
WB2ZII						2		1		3
W3BFL				1		3	1		4	9
W3UER						1		1		2
W3VRZ						2				2
KA4BQH	2					2				4
WB4LET						2			5	7
VE4MAN								1		1
NN4N						4				4
WB4QES			1	1		19	3			24
WA4SWF						1		1		2
WB4UGH						1				1
W5GIX			1			5				6
WA5LHL	2									2
W5RVT						1	1			2
WD6AWP						9				9
WD6FGX			1			4				5
W6GNS						3				3
KH6HHG	1								1	2
W6IYY				1		6		1	5	13
WA6QXV	2					3	1			6
K7CC						10			4	14
KC7FA			1			4			5	10
W8CCI						1		1		2
K8DDG								5	4	9
W8EWD	1							1		2
W8FG							1			1
WR9ACD								1		1
K9JSI	1									1
W9KXQ						1	1	1		3
K9LPW			1							1
K9LSB	1		1			4			4	2 12
N9RD	1									1
W9VCF								1		1
WRØAFT	1									1
WDØBQM								2		2
WØCVX	2							1		3
WDØGOL									1	1
WBØHAC			1							1
KØHPY								1		1
WØMME	1					2		1		4
WAØREX									1	1
WBØSBH	1									1
Total	17		8	3	123	8	3	24	48	3 237

NATIONAL TRAFFIC SYSTEM

The United States now has a third-party traffic agreement with Antigua/Barbuda, V2, and with St. Lucia, J6.

Certificates: 8RN/c4 — W8LYV, K8KMQ, W3RC; RN6/c4 — N6WP, W6RBT, W6NL, K6YD; 1RN/c2 — K1AQE, WB1GXZ, WA1TBY, W1EOF, KA1ON, N1BHH, N1AWX, AK1W, N1BJW, W1JTH, W1AHM, W1TN, KA1BJ, AK1E, W1CUE, N1ALM, K1OSM, K1IM, K1BQB, KA1T, WA1YYW, KA1CDC, W1KK, WA1ITL, WB1HIH.

August Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	1059	34.2	.699	91.4	
CAN	31	826	26.7	.473	100.0	
PAN*	59	657	11.1	.381	93.0	
Region Nets						
1RN	53	222	4.2	.247	64.0	96.8
2RN	62	303	4.9	.259	94.5	100.0
3RN	31	146	4.7	.361	94.4	67.1
4RN	62	575	9.3	.289	81.1	100.0
RN5	31	367	11.8	.348	96.8	100.0
RN6	60	483	8.0	.330	80.6	95.2
RN7	81	471	5.8	.355	76.7	95.2
8RN	58	263	4.5	.258	73.1	90.3
9RN	62	361	5.8	.358	99.2	100.0
TEN	31	318	10.3	.300	79.2	100.0
ECN						74.2
TWN	62	265	4.3	.355	59.0	88.7
TCC						
TCC Eastern	112[1]	818				
TCC Central	81[1]	341				
TCC Pacific	103[1]	467				
Cycle Four						
Area Nets						
EAN	31	2213	71.4	1.517	96.8	
CAN	31	1256	40.5	.909	99.5	
PAN	31	1214	39.2	.840	96.2	
Region Nets						
1RN						100.0

2RN	93	702	7.6	.504	98.7	96.8
3RN	62	394	6.4	.527	98.4	100.0
4RN						93.5
RN5	62	934	15.1	.608	96.6	100.0
RN6	62	895	14.4	.476	100.0	100.0
RN7	62	643	10.4	.862	95.6	100.0
8RN	62	747	12.1	.531	92.0	96.8
9RN	62	563	9.1	.489	98.0	100.0
TEN	62	394	6.4	.358	73.6	98.4
ECN	62	179	2.9	.293	70.9	93.5
TWN	58	432	7.4	.357	82.9	88.7
TCC						
TCC Eastern	149[1]	957				
TCC Central	56[1]	580				
TCC Pacific	114[1]	846				
Sections[2]	9704	27,674	2.9			
Summary	11,127	48,565	4.4			
Record	8995	51,307	15.2			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (225): APSN ATN (AB), AENB AEND AENH AENN AENQ AENR AENY AENZ ATNM (AL), ATEN HARC (AZ), BCEN (BC), NCN NCTN SCN/V (CA), CN CPN RTN WCN (CT), DEPN DTN NCC2MN SEN (DE), EOEM FAST FMSN FMTN FPON FPTN GN MCEN PEN QFN QFNS SEFTN SPARC SVTN SWFTN TPTN (FL), CGVHFN GCN GSN GSSBN GTN (GA), 175PN ICN ITEN TLCN (IA), ILN (IL), ICN IPN ITN QIN (IN), 3ARES 4ARES 5ARES 11ARES BARES CARN CCEN KEN KNTN KPON KRN KSN KTN KYN LCARES MKPN PAEWTN PAWN SEKEN (KY), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MN RITN (MA/RI), MEPN MMN MTN WRIN (MB), AEN CMEN MPSN PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN (MN), APN (MR/NF), MTN (MS), CFARS CMN CNCTN JFK M2MEN NCSSBN PCTN RARS THEN (NC), CN CSN (NC/SC), MNARES NCHN NE40 NE75 NMPN NSN PARC2MN PV2MN SARES WNN (NE), GSFM GSPN (NH), JSARS MCN NJN NJPN NJSN NJVN OBTTN SJVN SOCTN TCETN (NJ), NSN (NV), CDN CNYTN EPN HVN LIMARC NCVHFN NLI NLIPN NLS NYPON NYS/M OCTEN SCVHFN SDN STAR WDN (NY), BN BRTN HCARES LCNWOARES MCTN NEON O6MN OSSBN SOARES (OH), OFON OLZ STN (OK), KTN OLN OPN OSN/1 OSND (ON), BSN LBLARES MPARES ORARES OSN PDXARES PTTN SOFM WCN (OR), D3ARESN D5ARES D6ARES EPA EPEPTN PFN PTTN WARCVTN (PA), WQVUARES (PQ), A2MN BR2MN GPD2MN SCNTN SCSSBN YC2MN (SC), TNCW TNPN TNVN TSRN (TN), DFW HATN TEX TSN TTN (TX), BUN DCARES UCN (UT), SVEN VLN VN VNTN VSBN VSN (VA), VTN (VT), EWTN NTN NWSSB PSTS WARTS WSN (WA), BEN BWN NWTN WIN WNN WSBN WSSN (WI).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Independent Nets (August 1982)

1	2	3	4
Amateur Radio Telegraph Society	31	1007	324
Central Gulf Coast Hurricane	31	210	2319
Clearing House	30	140	278
Early Bird		385	901
Empire Slow Speed	31	32	336
IMRA	26	457	1107
Midwest RTTY	31	66	225
Mission Trail	31	131	1145
North American SSB Traffic	26	169	241
Southwest Traffic	31	233	1388
West Coast Slow Speed	31	122	352
20-Meter ISSB	26	650	452
75-Meter ISSB	31	672	1086
7290 Traffic	48	818	3017

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Transcontinental Corps

The following amateurs received TCC-Eastern/c4 certificates: W1EFW, W1KX, W1NJM (30th annual), W1QYY, WB1CPF, N1NH, W2CS (9th annual), W2FR, W2GKX (15th annual), W2XD, W2ZOJ, K2KIR, WA2SPL, AH2M, W3ATQ, W3FAF, W3PQ, K3RZR, WB3GZU, W4UQ, K4ZK, WA4CCK, WB4PNY, WB4WHC, WD4FTK, WD4CNQ, WD4CNR, N4KB, W8PMJ, K8JQ, WB8MTD, N8XX, AF8V, VE1WF.

1	2	3	4	5
Cycle Two				
TCC Eastern	124	90.3	1656	818
TCC Central	93	87.1	682	341
TCC Pacific	124	83.1	929	467
Summary	341	86.8	3267	1626
Cycle Four				
TCC Eastern	162	92.0	1866	957
TCC Central	62	90.3	1144	580
TCC Pacific	124	91.9	1651	846
Summary	348	91.4	4671	2383

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) — K1s CE EIC, N1BHH, W1s QYY XX, WB1HIH, AH2M, K2KIR, KB2HM, KF2T, KO2H, N2s CER YL, W2s CS XD ZOJ, WB2s IQJ MCO, K3JSZ, WB3GZU, WA4s CCK LJI, WB4PNY, AF8V, W8PMJ, WB8YDZ, VE1WF, VE3s GOL HTL. Central Area (W9JUJ, Director) — KA4MZY, W4OGG, WD4HIF, W5s CTZ KLV TFB URN, N5AMK, WB5YDD, K5s BNH KJN, W9s JUJ NXG, WB9WGD. Pacific Area (WØHXB, Director) — KV5U, W5JOV, K6s HAP OWA UYK, KM6I, KN6C, KT6A, KU6D, N6GIW, NI6A, KF7R, N7CSP, W7s DZX GHT TGU VSE, WA7BZY, WB7s TQF WOW, W9OBV, WØEJD, KØDJ, KBØMB, NØs ACW CZI. *Cycle Four* — Eastern Area (W2CS, Director) — W1s EFW QYY TM, N1NH, WB1CPF, W2s CS FR GKZ XD ZOJ, WA2SPL, N2YL, AH2M, KF2T, W3s ATQ FAF PQ, WB3GZU, W4UQ, K4s GCN ZN, N4KB, WA4CCK, WB4s PNY UHC. AB4V, W8PMJ, K8JQ, WB8MTD, AF8V, N8XX, VE1WF. Central Area (W5GHP, Director) — W4s WXH ZJY, K5s GM TL, N5TC, W5s RB TFB, KB5W, W9CXY, WB9UYU, AEØR, KØEZ, WØs AM HI. Pacific Area (KØDJ, Director) — N6FTQ, W6s EOT VZT, KN6C, KT6A, K7s HLR KSA, KN7B, W7s AK DZX EP GHT LYA VSE, WA7GYQ, WB7NHR, N7AKX, KØs BN DJ, KCØD, WØs GMO HXB OGH, WDØAIT, VE7ZK.

Public Service Honor Roll August 1982

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.

894
N4EDQ
224
K7VW
178
WA2SPL
169
W1IDK
163
KC5SF
135
WD8LRT
133
KA3GDQ
W2AHV
131
NG4J
130
WA1TBY
129
WB3GZU
127
WB7TQF
125
WD4HIF
124
WB7WOW
KK5B
123
KA1GBS
122
K5CXP
120
KA1ON
W9YCV
119
KM9B
WA4PFK
117
K8KQJ
WØOYH
116
K2ZM
W9JUJ
115
WB5YDD
114
NI6A
W5DTR
113
WA4QXT
WB2EAG
112
WB2IQJ
111
K4SCL
110
KC5NN
KV7F
W1EOF
WB2ZCM
WD8MIO
109
KA5CXW
KI1M
W7VSE
WB1GXZ
108
KA8CPS
KB5W
W2AET
WD4AWN
106
K8OZ
KV5X
W2XD
W4WXH
WA4JDH
KB2HM
W2MTA
105
KA9IKR
WD4ALY
WD8RHU
104
KV2U
N1BGW
WØLAE
103
W6VOM
W8VPW
102
N8DSW
W4CKS
WA7LGN
WD4CNQ
101
AK1W
K4JST
K5YD
K7GXZ
KA5KRI
N8AUH
WA5RVT
WB2MCO
WD9ESZ
100
AF8V
AG2R
KA2JMH
KB5EK
99
KA3GJT
KA4GFU
W2LWB
W5JOV
W9DM
WB8MTD
98
KB3XO
N5EFG
WA4CCK
WB2PKG
97
KA3DLY
KA8GJV
N9BYK
VE3GT
WAØTFC
WA3WIY
WA4EIC
WA2HEB
96
KA4AUR
N3CKQ
N5AMK
W6NTN
WA3OFD
N2CER
95
K4VWK
KT6A
N6AWH
94
KA4SAA
KC9CJ
W7LNE
WB1HIH
WB6QBZ
93
KS7I
N7DNG
92
AG9G
K5TL
KT6D
N1BJW
N8BQK
WA2FJJ
WA4STO
91
KA1AVU
KA4ASZ
VE3DPO
W5CTZ
90
K2VX
K4ZK
KA5HDT
KB3UD
89
KY4K
W4GPL
W4NFK
88
KA4MGR
W2YJR
W4ANK
W8GGX
87
KAØJQG
KA4MGQ
KA5GID
WB4WII
86
K3CR
K3JL
KE1U
VE3GOL
85
K4EV
KA9HPQ
W2ZOJ
84
KA8GHF
83
KBØMB
KB3LF
WB5MMI
82
KB4OZ
W6RNL
N2AKX
W5WZ
W7EP
81
K4IWW
KD4PJ
KF8J
N8DTZ
WB2IDS
WB3FKP
WB4WYG
WB8SYA
80
KB2KW
N2BOP
N2XJ
N5TC
W1TN
WP4AOH
79
K1JHC
N1ARI
W2BIW
WA3EHD
WBØZEN
78
N4EDH
W2TZO
W5KLV
WA4YEU
77
KA1DB
76
AC3N
K2ZVI
WA6QCA
75
K4ZN
KA3EJG
KA4BCM
W3VA
WA2ARC
WA4LXP
WB7WVD
74
NP4D
WD8KBW
73
KA4BBA
KA7ELI
KE4DA
VE3KK
WØOGH
WA8HGH
KØSI
72
K7NTG
KAØEPY
KA6BNW
N7BGW
N7CSP
WB8YDZ
71
KA2NMA
KE4XA
N4PL
WØKJZ
70
AK2E
KUØG
69
K9MX
KE8X
NW4O
W3DKX
W4FMZ
W4LXB
W8KKK
WB5LBR
KA3DTE
68
KA2GSX
KP4DJ
W7LG
67
KT7X
WA8GMT
WB4UHC
WD5GKH
WD9FRI
66
KØDJ
KD4TY
N4HIR
NN4I
W4HON
W6CPB
WB1ABQ
65
KB4LB
KD4QZ
NØCXI
WB4TZR
64
NØACW
N6GIW
W9JIJ
W9TLU
W9UMH
WB4NTW
WD4BSC
63
K5TF
KA5AZK
KE3U
KK9N
WD4HBP
KA2GSL
62
WB9IHH
KA1BBU
WB8YTD
KA2KVZ
KCØOO
KS2G
N1AJJ
N3ADU
WA8PIM
WBØHOX
WB2OWO
61
AA4WJ
KA1EHR
KA4ERP
N2BLX
N5CRU
WA2KOJ
WA2DHB
WA2CUW
60
KA4MTX
KC2QQ
N9ATP
WA2YBM
WA3WQP
WA4JTE
50
N8BZC/T
49
WD4SIH/T
47
N2DPV/T
46
KA8GGZ/T
WB2QMP/T
45
K1LCQ/T
44
KA9GBG/N
43
WA1DXT/T
42
KA4RBY/T
40
KA8NCR/N

Brass Pounders League August 1982

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: W1TN, KE4OI.

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	772	898	1296	61	3027
N4EDQ	375	817	743	814	2749
NØBQP	36	1256	288	684	2266
KA9CPA	31	1088	146	837	2102
WAØHJZ	31	944	79	651	1705
W9JUJ	2	610	629	15	1256
WA2SPL	9	512	455	77	1053
N1BBT	315	205	321	169	1010
WA1TBY	12	381	401	29	828
KCØAS	11	60	198	13	824
NG4J	26	384	360	21	791
WA4JDH		384	368	5	758
KT6A	4	350	376	11	741
WØACH	22	317	339	0	678
W7TGU	10	220	341	5	665
W1EOF	5	225	374	14	618
WB3GZU	16	290	283	28	617
WØACD	0	339	110	158	607
W7VSE	2	296	293	3	594
WB5YDD	5	280	244	56	588
K8OZ	4	271	303	10	588
NI6A	77	227	268	13	585
K4GCN	0	308	268	5	581
KA1DB	7	285	268	17	577
W3VR	20	94	261	6	562
WD4HIF	6	253	267	29	555
W8PMJ	3	292	258	0	553
WAØAUX	32	195	317	3	547
K8NCV	26	246	268	4	544
WD8KFN	0	284	239	17	540
KØJAN	0	328	0	212	540
WD8MIO	172	234	234	46	525
WA4CCK	0	227	281	2	510
KV8Q	93	154	245	11	503
N4EDQ (June)	475	381	912	380	2148
N4EDQ (July)	115	444	242	400	1201
W5TFB (June)	1	331	239	9	680
NI6A (July)	44	246	275	8	573

BPL for 100 or more originations plus deliveries:

W4ZJY	308
WØHKF	172
W8MTU	161
N5DAA	139
WØRPK	131
N1BGW	117
W1IDK	109
KA2KVZ	106
KA5KRI	106
KH6B	102

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

VHF/UHF Ad Hoc Contest Committee Progress Update

It was your typical smoke-filled back room. A bottle of Coors, half-filled with oxygen-quenched butts, teetered on the edge of the table. Bodies were sprawled out on the carpet, the bed and the few chairs of the well-appointed hotel room. Orderly discussion was suddenly broken, as the ether was ionized by an alien contribution from the doorway: "You guys just wanna make the contests for contesters!" The inflection was clearly caustic. An icy chill of resentment permeated the room. "Waddya mean we want the rules just for contesters? We're trying to make the best rules possible for everybody," fired back one of the group in self-defense. The dissident persisted, leading to an exchange of verbal volleys that had all parties in grid current. As the group filed out of the room for dinner, the vitriolic attack was dismissed as a case of having had one too many of *"Dr. Pepper."*

Awareness is brought about in strange ways. And it may seem rather elementary that the concerns of the "little guy" must be given great consideration. Not that these concerns are not being properly attended to, but the above true incident proved to be a positive, if gnawing, influence on the deliberations of the ARRL V/UHF Ad Hoc Contest Committee. The fellow who inadvertently wandered into the aforementioned informal meeting of the Committee, and promptly alienated all present, will probably never know what a positive influence he exerted.

This ad hoc committee was constituted nearly 18 months ago to investigate and make recommendations on how to better meet the objectives of v/uhf contesting. Functioning as an arm of the Communications Department with liaison to both the Contest and the V/UHF Advisory Committees, has ensured that that effort becomes reality. Internal exchange of communication has been conducted according to a rigid schedule, while correspondence from all interested parties has been distributed to the Committee on a weekly basis. Both have proved invaluable in producing welcome modification of the v/uhf contest rules. The latest report of the Committee's activities appeared in February *QST*. As an update to that report, the Committee has since taken action as follows.

The initial efforts were instituted in the QSO Party in June and repeated successfully in September. The new availability of single-band awards proved to be an overwhelming success. Unlike the hf contests, in which entries must be designated as single-band, the v/uhf scene demanded a novel approach. This resulted in single-hand awards being made available regardless of the number of bands an entrant may have utilized. The banning of contest activity on 146.52 MHz (and the lifting of restrictions on 223.5 MHz) was approached with a bit more trepidation. Such fears proved unfounded, however, as almost universal recognition of the unique status of that frequency was evidenced. Thus, this good-faith effort by contest enthusiasts properly recognized the rights of noncontesters.

These successful efforts were followed by moving the EME contest to more favorable dates and instituting RANGE scoring in the August UHF Contest, whereby more distant contacts are rewarded with more QSO points. Although the latter generally received a favorable response from the uhf crowd, it may be a concept too complicated for use in the "general" vhf contests. Thus, save the possible elimination of the serial number in the January Sweepstakes, no further rules modifications appear warranted at this time. Although it may be ill-advised to extend RANGE scoring to the other vhf contests, the grid-square multiplier appears to have great appeal.

The grid-square concept gained some considerable stature at the Region 3 IARU Conference held in Manila in May. There, the so-called "Maidenhead Proposal" of 2° × 1° grid squares was received favorably in parallel with longitude-latitude for implementation "when appropriate." Thus, the QTH grid locator, which has seen widespread European use for nearly a quarter century, could lead to a worldwide system for contest and award purposes.

The Committee, therefore, has devoted much thought to possible ARRL sponsorship of such a grid square "Century Club" award. This has met with great enthusiasm at several convention forums where the trial balloon has been launched. Many feel that with few worlds left to conquer on the traditional hf DX bands, perhaps the time is ripe for providing new goals on the very- and ultra-high frequencies. Mini-DXpeditions to rare grid squares tantalize the operating appetite. Adequate publicity plus readily available maps and simple, easy-to-read instructions to locate your grid square would be a prerequisite for instituting any such program. Also under consideration by the Committee is the desirability of offering specific single-band "sprints" as an adjunct to the present "activity nights." Such a spring fling could kick off the aforementioned grid-square awards program.

In addition to the above, the Committee is considering a host of other matters, including the ultimate best time frame for each contest activity. As has been the case right along, your input offers the best guide to produce the best results. The Committee recognizes its need to hear not only from those who have the greatest interest in contests, but the many "little guys," without whom there would not be good contest activity. Your letter to ARRL Hq., addressed to the Ad Hoc Committee, will find their individual receivers "on." After all, the contests are "not just for the contesters," and the format of the contest program must take that into consideration.

MIDNIGHT SPECIAL RESULTS

Shown below are the high scorers in two Midnight Special contests — one held on April 24, and the other July 31 and August 1. The April affair used 40-meter cw and 10-meter ssb, with a one-hour break in between for coffee or breakfast. Although 10-meter early morning conditions were not optimum that weekend, those with patience made out well. The exchange consisted of telephone area code and the type of rig (exciter) in use.

In July/August, we tried the 0300-0500Z time slot and a combination of 40-meter cw and 80-meter ssb. These two factors worked to produce some fine top scores. This Midnight Special had an added twist that might be of interest to club activities managers all over. If you want to stir up interest in contesting and have some fun, take a tip from the Poughkeepsie ARC and the Overlook Mountain ARC, both from eastern New York. These two groups had a challenge going for the MS to see which group could make the most QSOs. PARC fielded 10 members who made 850 QSOs, while OMARC mustered 18 entrants and 1250 QSOs to win the "Hudson Valley Challenge."

We received a total of 49 logs for the April event and 79 for the July/August event. Each entrant who sent an s.a.s.e. received a complete copy of the results, while the top scorers from each call area are listed below. If you have any comments and/or suggestions for future Midnight Special contests, let us know. — *Bill Jennings, K1WJ and Mark Wilson, AA2Z*

April Scores

(call, score, 40-m QSOs, 10-m QSOs, state)

K1XM (K1PR, opr)	124	55	69	MA
AB1A	105	42	63	MA
W1TN	104	45	59	NH
K2AU (N1EE,opr)	98	60	38	NY
WB2EZG	88	41	47	NY
W3TS	84	51	33	PA
N3RR	77	52	25	MD
KX4V	55	33	22	VA
KS4Q	48	36	12	GA
AA5B	140	36	104	NM
WB5VZL	94	30	64	TX
K6XO	28	0	28	CA
WA6OTU	26	19	7	CA
KN7N	71	22	49	AZ
N7TE	47	10	37	OR
WD8NNM	51	36	15	MI
K8JM	48	47	1	MI
W9YB (KK9W, opr)	68	54	14	IN
K9GDF	63	58	5	WI
AIØW	67	16	51	CO
VE3KK	32	29	3	ON

July/August Scores

(call, score, 40-m QSOs, 80-m QSOs, state)

K1VUT	98	36	62	MA
N2MF	208	77	131	NY
K5NA	194	72	122	NY
K2AU (N1EE, opr)	157	78	79	NY
W2XL	150	61	89	NY
KC2FV	100	51	49	NJ
K3LR	269	116	153	PA
W3TS	162	59	103	PA
K2SD	129	59	70	NC
NW4P	121	43	78	KY
K4JEX	112	56	56	NC
W5PWG	37	23	14	TX
N6PE	83	51	32	CA
N7AM	54	40	14	WA
KW8N	201	83	118	OH
K8MR	192	83	109	OH
AA8S	143	72	71	OH
KN8P	135	80	55	MI
KJ9W	180	79	101	IL
K9CW	163	86	77	IL
W9YB (KB9YO, opr)	157	55	102	IN
K9GDF	147	83	64	WI
WA4PGM	112	56	56	MO
KMØL	102	53	49	MO
VE2QST (VE2BP, opr)	20	11	9	PQ

*Communications Manager, ARRL

Amateur Radio Satellite Schedule

	AMSAT-OSCAR 8			Soviet RADIO 5		Soviet RADIO 6		Soviet RADIO 7		Soviet RADIO 8	
Date (UTC)	*Ref. Orbit, Mode*	*Time (UTC)*	*EQX W. Long. (Deg.)*	*Time (UTC)*	*EQX W. Long. (Deg.)*	*Time (UTC)*	*EQX W. Long. (Deg.)*	*Time (UTC)*	*EQX W. Long. (Deg.)*	*Time (UTC)*	*EQX W. Long. (Deg.)*
1 Nov.	23,738A	0016	80	0009	297	0157	326	0102	310	0133	317
2 Nov.	23,752A + J	0020	81	0004	297	0142	324	0052	310	0130	318
3 Nov.	23,766X	0025	82	0158	327	0126	322	0043	309	0127	318
4 Nov.	23,780A	0029	83	0153	327	0111	319	0033	308	0125	319
5 Nov.	23,794A + J	0033	84	0147	327	0055	317	0023	307	0122	320
6 Nov.	23,808J	0038	85	0142	328	0040	315	0014	306	0119	321
7 Nov.	23,822J	0042	87	0137	328	0025	312	0004	305	0116	322
8 Nov.	23,836A	0046	88	0131	328	0009	310	0154	334	0113	322
9 Nov.	23,850A + J	0050	89	0126	328	0153	338	0144	333	0110	323
10 Nov.	23,864X	0055	90	0121	328	0137	335	0134	332	0108	324
11 Nov.	23,878A	0059	91	0115	328	0122	333	0125	331	0105	325
12 Nov.	23,892A + J	0103	92	0110	329	0106	331	0115	331	0102	326
13 Nov.	23,906J	0108	93	0105	329	0051	328	0106	330	0059	327
14 Nov.	23,920J	0112	94	0059	329	0036	326	0056	329	0056	327
15 Nov.	23,934A	0116	95	0054	329	0020	324	0046	328	0053	328
16 Nov.	23,948A + J	0121	97	0049	329	0005	321	0037	327	0051	329
17 Nov.	23,962X	0125	98	0043	330	0148	349	0027	326	0048	330
18 Nov.	23,976A	0129	99	0038	330	0133	347	0017	325	0045	331
19 Nov.	23,990A + J	0133	100	0033	330	0117	344	0008	324	0042	331
20 Nov.	24,004J	0138	101	0027	330	0102	342	0157	353	0039	332
21 Nov.	24,018J	0142	102	0022	330	0047	340	0148	353	0036	333
22 Nov.	24,031A	0003	77	0017	331	0031	337	0138	352	0034	334
23 Nov.	24,045A + J	0008	79	0011	331	0016	335	0128	351	0031	335
24 Nov.	24,059X	0012	80	0006	331	0000	333	0119	350	0028	335
25 Nov.	24,073A	0016	81	0001	331	0144	0	0109	349	0025	336
26 Nov.	24,087A + J	0020	82	0155	1	0128	358	0059	348	0022	337
27 Nov.	24,101J	0025	83	0149	1	0113	355	0050	347	0019	338
28 Nov.	24,115J	0029	84	0144	2	0058	353	0040	346	0017	339
29 Nov.	24,129A	0033	85	0139	2	0042	351	0030	345	0014	340
30 Nov.	24,143A + J	0038	86	0133	2	0027	348	0021	345	0011	340
1 Dec.	24,157X	0042	87	0128	2	0011	346	0011	344	0008	341
2 Dec.	24,171A	0046	88	0123	2	0155	14	0002	343	0005	342
3 Dec.	24,185A + J	0051	90	0117	3	0139	11	0151	12	0002	343
4 Dec.	24,199J	0055	91	0112	3	0124	9	0141	11	0159	14
5 Dec.	24,213J	0059	92	0107	3	0109	7	0132	10	0157	15
6 Dec.	24,227A	0103	93	0101	3	0053	4	0122	9	0154	15
7 Dec.	24,241A + J	0108	94	0056	3	0038	2	0113	8	0151	16

Orbit predictions by Project OSCAR, K1HTV, KA1GD and W9KDR. To keep abreast of the latest developments, tune in the regular phone and cw bulletins over W1AW, or the AMSAT nets. Tuesday — East Coast and Mid States at 9 P.M. and West Coast at 8 P.M. local time on 3850 kHz. Saturday — International at 2200 UTC on 28,878 kHz. Sunday — International at 1800 UTC on 21,280 kHz and 1900 UTC on 14,282 kHz. OSCAR 9 orbits are no longer listed — because of its low altitude, long-range predictions are not always accurate. Use W1AW and AMSAT Bulletins for weekly updates. O8 modes of operation are Monday and Thursday — Mode A. Tuesday and Friday — Modes A + J. Wednesday is reserved for authorized experiments or recharge of the batteries. Do not operate through the OSCAR or RADIO satellites on Wednesday UTC. *Do not use more power than is needed to operate through the OSCAR or RADIO satellites.* Your downlink signal should never be stronger than the satellite's telemetry beacon. *Reduce your uplink power* to prevent overload causing 10 dB attenuation of received signals. Advise operators whose signals are stronger than the telemetry beacons.

Orbit numbers will not be used for the Radio satellites.

Satellite	*Period (min.)*	*Increment (deg.)*	*Inclination (deg.)*	*Height (km)*
OSCAR 8	103.1645	25.7934	98.79	919
RADIO 5	119.5555	30.0157	82.95	1682
RADIO 6	118.7174	29.8061	82.95	1632
RADIO 7	119.1966	29.9260	82.94	1654
RADIO 8	119.7640	30.0679	82.95	1681

RADIO 3 and RADIO 4 orbital data will not be listed because these satellites are for Soviet experiments. QSLs and telemetry reports should be sent to Box 88, Moscow.

Spacecraft Frequencies

	Uplink	*Downlink*	*Beacon*
OSCAR 8			
Mode A	145.850-145.950 MHz	29.400- 29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.200-435.100 MHz	435.095 MHz
RADIO 5	145.910-145.950 MHz	29.410- 29.450 MHz	29.330/450 MHz
RADIO 6	145.910-145.950 MHz	29.410- 29.450 MHz	29.410/450 MHz
RADIO 7	145.960-146.000 MHz	29.460- 29.500 MHz	29.340/500 MHz
RADIO 8	145.960-146.000 MHz	29.460- 29.500 MHz	29.460/500 MHz
RADIO 5 ROBOT	145.826 MHz	29.331 MHz	
RADIO 7 ROBOT	145.835 MHz	29.341 MHz	

RADIO 3 and RADIO 4 are for experiments only to be announced by USSR.

OSCAR 9
Hf Beacons — 7,050, 14,002, 21,002 and 29,510 kHz. On-off keying with Morse telemetry. Interspersed with a carrier or continuous carrier.
Vhf Beacon — 145.825 MHz nbfm ± 5 kHz. ASCII, Baudot, voice, afsk and Morse.
Uhf Beacon — 435.025 MHz nbfm ± 5 kHz. ASCII, Baudot, voice, afsk and Morse.
S-Band Beacon — 2401.0-MHz nbfm ± 10 kHz. ASCII, Baudot, voice, afsk and Morse.
X-Band Beacon — 10.470-GHz steady carrier. S- and X-band beacons use lhcp.

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 s.a.s.e., to ARRL Hq.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL Hq. The OSCARLOCATOR package is now available: $7 U.S., $8 elsewhere.

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 67. 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.

5-Band WAS

Awards issued June 2, to September 10, 1982

1089 N4XM

1090	1100	1110
1090 KA4PKB	1100 VE3JPJ	1110 W2ARQ
1091 KNØL	1101 WD8EMI	1111 N2JJ
1092 WØKXZ	1102 VE6OA	1112 NI4U
1093 W5AYZ	1103 WA3GNW	1113 K7DVK
1094 W6KON	1104 N3UN	1114 KA7FIP
1095 WDØCQA	1105 VK9NS	1115 N6BAK
1096 W6JAZ	1106 KC4UC	1116 KW8G
1097 W6SZN	1107 KBØZZ	1117 EA9IE
1098 K6JAD	1108 W4OWJ	1118 N5DWS
1099 W7WMO	1109 WD4KXB	1119 KS6A
		1120
		1120 XE2MX

SCM ELECTION RESULTS

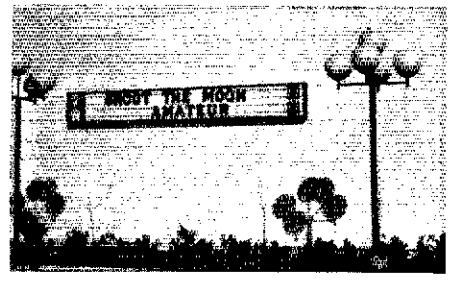
The following were elected for a two-year term of office beginning January 1, 1983:

Uncontested: Quebec — Harold Moreau, VE2BP; *Saskatchewan* — W. C. "Bill" Munday, VE5WM; *Western Pennsylvania* — Otto L. Schuler, K3SMB; *Southern New Jersey* — William C. Luebkemann, Jr., WB2LCC.

SECTION MANAGER ELECTION NOTICE

Notice of impending elections for Section Manager appears in Happenings elsewhere in this issue.

Strays



It's probably not so, but could there really be a movie out about EME? W1BG, of Andover, Massachusetts, spotted this ambiguous sign at a nearby theater.

I would like to get in touch with . . .

☐ any amateurs who are interested in producing local programming on Amateur Radio for cable television. George Fisher, KCØKM, Operations Supervisor, Minnesota Cablesystems-Southwest, 10210 Crosstown Cir., Eden Prairie, MN 55344, tel. 612-941-9820.

☐ hams engaged in any phase of the newspaper business who would be interested in a net or occasional contacts with other members of the same profession. — John Black, WD4CVR, 279 W. Wood St., Spartanburg, SC 29303.

☐ any hams who were in the Radio Controlled Airplane Target Group at Fort Bragg about 1943. Nick Bourisk, W4APN, 3221 71 Ave., N., St. Petersburg, FL 33702.

☐ aviation-oriented hams in the Philadelphia, Pennsylvania, area who are interested in joining a very informal net. Mike Pozzani, W3SV, RR 2, Box 435, Elverson, PA 19520

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark J. Wilson,* AA2Z

NOVEMBER

3

West Coast Qualifying Run, 10-35 wpm, at 0500Z Nov. 4 (9 P.M. PST Nov. 3). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and full mailing address. A large s.a.s.e. will help expedite your award/endorsement.

3-4

YL Anniversary Party, phone, Oct. *QST*, page 92.

6-7

ARRL November Sweepstakes, cw, Oct. *QST*, page 73.

ARRL International EME Competition, Part 2, Sept. *QST*, page 77.

Corona 10-Meter RTTY Contest, Aug. *QST*, page 82.

International Police Assn. Contest, sponsored by the IPARC German Section, from 0000 to 0300, 0700 to 1000 and 1400 to 1800Z each day, Nov. 6-7. Cw and phone. Non-IPA stations work IPA members only. Exchange signal report and serial number. U.S. stations also send state. Work stations once per band. IPA members also send "IPA." Count 2 points per QSO on 80 and 40, except 8 points for DX. Count 4 points per QSO on 20-15-10 meters. Multiply by sum of IPA countries/states worked per band. Frequencies: phone — 3.650 3.775-3.800 7.075 14.295 21.295 28.650; cw — 3.575 7.025 14.075 21.075 28.075. Mail entries by Dec. 31 to: Anton Kohten, DK5JA, P.O. Box 40 01 63, 4152 Kempen 1, Federal Republic of Germany.

10

W1AW Qualifying Run, 10-35 wpm, at 0300Z Nov. 11 (10 P.M. EST Nov. 10). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. See Nov. 3 listing for more details.

13-14

European DX Contest, RTTY, July *QST*, page 84.

Delaware QSO Party, sponsored by the Delaware ARC, from 1700Z Nov. 13 until 2300Z Nov. 14. Work stations once per band and mode. Exchange serial number, signal report and QTH (county for DE stations; ARRL section or country for others). Suggested frequencies: cw — 1.805 and 60 kHz from low end; phone — 3.975 7.275 14.325 21.425 28.650; Novice — 3.710 and 20 kHz from low end. DE stations count 1 point per QSO; multiply by total ARRL sections and countries worked. Others count 5 points per DE QSO; multiply by total DE counties worked per band and mode (max. 36 possible total). There are 3 DE counties: Kent, New Castle and Sussex. Awards. Mail logs by Dec. 17 (include large s.a.s.e. for results) to: Charlie Sculley, AE3H, 103 E. Van Buren Ave., New Castle, DE 19720.

ALARA Contest, sponsored by the Australian Ladies' ARA, from 0001-2359Z Nov. 13. YLs work everyone; OMs work YLs only. Work stations once per band and mode. Exchange signal report, serial number and name. ALARA members so indicate. Suggested frequencies up from: cw — 3.525 7.010 14.050 21.125 28.100; phone — 3.570 7.100 14.280 14.180 21.350 21.180 28.480. Count 10 points per ALARA club station QSO (VK3DYL, VK3DYF); 5 points per ALARA member; 3 points for nonmember YLs; 1 point per OM (YLs only). Cw QSOs count double points. Mail entry to be received by Dec. 31 to: M. Luft, VK3DML, 28 Lawrence St., Castlemaine, Victoria, Australia 3450.

CQ-WE Contest, sponsored by the Bell System AR fraternity, with various sessions from 1400Z Nov. 13 until 0500Z Nov. 15. The contest is open to all present and retired employees of Bell, WE, AT&T and subsidiaries of AT&T. Contact local interworks coordinator for logs and information.

North Carolina QSO Party, sponsored by the Alamance ARC, from 1700Z Nov. 13 until 0200Z Nov. 14 and from 1200Z Nov. 14 until 0100Z Nov. 15. Work stations once per band; no crossband or repeater QSOs. Exchange signal report and QTH (county for NC stations; ARRL section for others). Suggested frequencies: phone — 3.980 7.280 14.280 21.380 28.580; cw — 60 kHz from lower band edge; Novice — 20 kHz from lower band edge. NC stations count 1 point per QSO; multiply by total ARRL sections. Others count 2 points per NC QSO; multiply by total NC counties worked. Bonus of 25 points for working club station K4EG. Mail logs by Dec. 13 (include large s.a.s.e. for results) to: F. R. Ashley, WB4M, 2731 Blanche Dr., Burlington, NC 27215.

OK International DX Contest, sponsored by the Central Radio Club, for the 24-hour UTC period Nov. 14. Phone and cw, 160-10 meters. Exchange signal report and ITU zone. Count 1 point per QSO; OK QSOs count 3 points. Contacts with own country count for multiplier credit only. Multiply QSO points by sum of zones worked per band. Single op — all band and single band, and multiop categories. Mail entry by Dec. 31 to: CRC, P.O. Box 69, 11327 Praha, Czechoslovakia.

Puerto Rico QSO Party, sponsored by the Adjuntas Radiotelegraphers RC, from 0000-2400Z Nov. 13. All bands, cw; work stations once per band. Exchange signal report and QTH. Suggested frequencies: cw — 35 kHz up from low end; Novice — 30 kHz up from low end. Count 2 points per QSO and 5 points for each KP4/NP4/WP4 QSO. Multiply by total KP4/NP4/WP4 QSOs for final score. Add 200 points to final score for each QSO with: KP4s EMD, EY, FI, NP4s BN, C, WP4s BFQ, BYY, CHM. Awards. Mail entry by Dec. 13 (include large s.a.s.e. for results) to: Ivan Belvis, KP4FI, P.O. Box 952, Adjuntas, PR 00601.

20

W1AW Qualifying Run, 10-35 wpm, at 2100Z (4 P.M. EST) Nov. 20. See Nov. 10 listing for more details.

20-21

ARRL November Sweepstakes, phone, Oct. *QST*, page 92.

27-28

CQ Worldwide DX Contest, cw, Oct. *QST*, page 92.

30

West Coast Qualifying Run, 10-35 wpm, at 0500Z Dec. 1 (9 P.M. PST Nov. 30). See Nov. 3 listing for more details.

DECEMBER

4-5

ARRL 160-Meter Contest, this issue, page 84.

Telephone Pioneers QSO Party, sponsored by the Telephone Pioneers of America, from 1900Z Dec. 4 until 0500Z Dec. 6. Open to TP members. For more information, contact T. Phelps, W8TP, c/o WE, Dept. 45430, 6200 E. Broad St., Columbus, OH 43213.

EA DX Contest, phone (this year's rules not received).

9

W1AW Qualifying Run, 10-40 wpm, at 0300Z Dec. 10 (10 P.M. EST Dec. 9). See Nov. 10 listing for more details.

11-12

ARRL 10-Meter Contest, this issue, page 84.

HA-DX Contest (this year's rules not received).

EA DX Contest, cw (this year's rules not received).

26-31

QRP Winter Sports, see Feb. *QST*, page 88, for details.

28

W1AW Qualifying Run

JANUARY

15

World Communications Year Contest, sponsored by the Potomac Valley Radio Club (USA), from 0001-2400Z Jan. 15, 1983. All bands and modes, 1.8 MHz through 275 GHz (excluding the 10, 18 and 24-MHz bands). Single and multioperator, mixed mode only. All stations are limited to one transmitter. Exchange ITU region and ITU zone (example: DL1AA would send 128; W1AAA would send 208; JA1AA would send 345). A map showing zones and regions is available from the sponsor for an s.a.s.e. or 1RC. Work stations once per band; telegraphy and telephony emissions count as separate bands (SSTV counts as telephony, RTTY counts as telegraphy). No cross-emission contacts. Count 1 point for contacts in your ITU zone, 2 points for contacts in your ITU region but outside your zone, and 4 points for contacts outside your region. Multiply by total of ITU zones worked per band. Logs should indicate UTC time, band, call, complete exchange and QSO points. Indicate multipliers. Dupe sheets required if more than 200 QSOs are made on any band. Summary sheet must show QSOs, QSO points, multipliers and score calculation. In addition: entrant's call, name, address, Region and Zone. Multiops also show names/calls of all operators. Entries may be disqualified for more than 2% score reduction and will be disqualified for more than 2% duplicates left in log. Penalty of 8 QSO points assessed for each duplicate QSO, miscopied call or exchange found during checking. Awards. Mail entry by Feb. 28, 1983 to: PVRC, P.O. Box 337, Crownsville, MD 21032 USA.

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received for each QSO claimed for the contest credit.

2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.

3) Crossband, crossmode and repeater contacts are usually not permited. Contacts with the same station on different bands are usually permitted.

4) Your log should be checked carefully for duplicate QSOs, and, if more than 200 QSOs are made, dupe sheets should be included with your entry.

5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.

6) Avoid standard net frequencies.

7) International contests generally offer awards to top scorers from each U.S. call area and each country; state QSO parties to each state/province.

8) Your summary sheet should include the following statement: "I have observed all competition rules as well as regulations established for Amateur Radio in my country." The declaration should be signed and dated.

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*Assistant Communications Manager, ARRL

Section Activities

Coordinated By Jim Clary, WB9IHH

A-1 OPR ➘ EC ➘ DXCC ➘ RCC ➘ WAS ➘ STM ➘ OES ➘ ORS ➘ NM ➘ SCM ➘ ARES ➘ OVS ➘ SEC ➘ OBS ➘ TCC ➘ OO ➘ NTS ➘ WAC ➘ CP

CANADIAN DIVISION

ALBERTA: SCM, E. Roy Ellis, VE6XC — SCM/SEC: VE6XC. ASCM: VE6AMM. STM/NM ATN & APSN: VE6ABC. EC: VE6AGH VE6AVV VE6AMM VE6AHC VE6FV VE6ABC VE6ASL VE6AFO. VE6ABC assumes appointment as NM of APSN. He doesn't do much between 3 & 5 A.M. so why not. VE6AFO retires as NM to devote his energy towards other appointments. A number of section net certificates were issued during the month to deserving hams. Plans for SET are under way with gov't depts showing interest. Traffic: VE6ABC 23, VE6CHK 14, VE6EO 6, VE6SA 5, VE6ARL 2, VE6YW 1.

MANITOBA: SCM, Peter Guenther, VE4PG — ASCM: JP. SEC: HK. STM: RO. NMs: VJ ACX NM TE HW. Congrats to Shana, daughter of Ron and Cathy Moore, on passing her Advanced exam. Walter is now VE4OO, instead of VE4ALX. The CTN CW Net on 40 meters starts at 7:30 local time and not 7:15 as mentioned before. It's a fairly new net and is expected to expand coast to coast in the future. It's on 7055 and operates daily. MTN will also be on a daily sked starting Sept. 6. MTN QNI 88, QTC 88, sess. 18. MEPN QNI 819, QTC 27, sess. 31. WRIN QNI 256, QTC nil, sess. 9. MMN QNI 451, QTC 31, sess. 31. Traffic: VE4AJE 201, VE4TE 32, VE4JA 25, VE4PG 19, VE4ALX 16, VE4AAD 15, VE4CR 15, VE4NE 11, VE4ID 6, VE4LB 6, VE4TL 6, VE4FK 5, VE4GB 4, VE4AED 1.

MARITIME/NEWFOUNDLAND: SCM, D. R. Welling, VE1WF — ASCM: VO1FG. SEC: VE1EI. NMs: VE1WF VO1JN. STM: Open. Silent Keys: VE1AAW VO1JS. Hospital: VE3IQ/1. VE1QE recently received his WAVO Award. Congrats. VERY large turnout at the Charlottetown Convention. Weather was great and everyone had a good time. Some of the prize winners were: Ten Tec Xcvr WB2LCN; 2M handheld VE1AGT; hidden xmtr hunt-1st VE1BCI, 2nd VE1ABU, 3rd VE1AMA; Men's cw copying VE1MX, ladies cw copying VE1ARB; kooky code VE1ARB. VE1RT Memorial for tfc hndlg VE1WF. VE1WF setting up CRRL/ARRL bookstore to cover Maritimes. S.a.s.e brings price list. APN: 31 sess., QNI 133, QTC 64, QTR 324. Traffic: VE1WF 247, VE1XF 39, VE1BKM 22, VE1BPM 6.

ONTARIO: STM: Larry Thivierge, VE3GT — ASCM: VE3GOL. SEC: VE3GV. STM: VE3GFN. VE3FGU has been appointed manager of OSND. VE3CLT VE3AUR VE3IV and VE3IRS attended the 1982 YLRL Convention in Washington DC. A good time was had by all. The Amateur Radio fraternity will sorely miss the help and advice from Les Smith, the crystal manufacturer who passed away recently. Winners in the recent TFMCS foxhunt were VE3s BDJ KWX and EJW. Special event station CH3ROW was a huge success. Operating from a Winnebago trailer provided by the Armed Forces at the Henley Regatta, 20 local amateurs enjoyed 2255 contacts, including 104 countries and 49 states. (They missed Alaska.) The event was organized by VE3MMB. The Trillium weekend contest will be held from 1930 EST November 5th thru 1930 EST November 6th. Using 2-metre mobile and the club repeater, VE3NRS, 31 operators of the Niagara Peninsula ARC provided comms for the Jim Lyons Soccer Tournament from five different peninsula locations: Port Colborne, Niagara Falls, St. Catharines, Thorold and Grimsby. Sixty games in all were played by teams from southern Ontario and New York state. My sincere thanks to all those clubs and individuals who help to make this column a success by sharing their news and activities with us. I would, though, like to receive some news from northern Ontario. VE3LVH, organizer of the above mentioned soccer comms, has moved to Bathurst, NB. Traffic: VE3KK 289, VE3GOL 236, VE3GNW 150, VE3HGJ 131, VE3GT 125, VE3HTL 116, VE3DPO 90, VE3KCZ 72, VE3BZB 66, VE3AJN 45, VE3EWD 39, VE3KXB 39, VE3WM 38, VE3AWE 30, VE3DUK 25, VE3AYZ 20, VE3EFX 20, VE3KLX 18, VE3JRT 13, VE3WG 8, VE3LNN 7, VE3ANJ 6. (July) VE3KXB 44, VE3LNN 12.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2PJ. NMs: VE2PJ VE2FSA. Congrats to VE2GTD, who is now active on ht and vhf, and to VE2QO, who has now 204 countries confirmed (phone). Some twenty blind amateurs and their sponsors attended a corn roast at VE2BP's QTH. A good time was had by all. Inform your local club if you know candidates for code and theory classes. Plus de deux cent amateurs ont participe au congres de RAQI, a St-Hyacinthe, et plusieurs d'autres au hamfest. VE2RGM est relie en chaine avec VE2FX. Traffic: VE2EC 46, VE2EKC 46, VE2BP 34, VE2FSA 16, VE2GAG 15.

ATLANTIC DIVISION

DELAWARE: SCM, Harold K. Low, WA3WIY — STM: W3DKX. SEC: W3PQ. PSHR: WA3WIY K3JL W3DKX. Very little news this month, as most clubs did not have meetings for the last several months. I would appreciate a little more input from all. The DTN has a new NCS in the person of WA3PWT. He is handicapped but you wouldn't guess it to hear him handle the net. He is also net manager of SEN. He can't drive but has equipped a bicycle with an antenna and battery and is mobile on the rptrs. DTN QNI 277, QTC 62, in 23 sess. DEPN QNI 49, QTC 4 in 4 sess. SEN QNI 36, QTC 8 in 5 sess. Traffic: W3PQ 192, W3QQ 89, W3DKX 64, WA3WIY 60, WB3DUG 45, K3JL 30, W3WD 12, KA5DIJ 10, K3ZXP 8, N3AXH 5, WA3PWT 5. (July) W3PQ 46.

EASTERN PENNSYLVANIA: SCM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: K3JSZ. DEC: AA3C K3QXC KB3QW N3BFL N3CJP W3EEK.

Net	Freq.	Time	QNI	QTC	Sess.
EPAEPTN	3917	6 P.M. Dy	512	168	31
EPA	3610	7/10 P.M. Dy	496	194	57
PTTN	3610	6:30 P.M. Dy	286	61	31
PFN	3958	5:30 P.M. Dy	274	255	31

Local and vhf nets reports (QNI/QTC/sess.): D3ARES 248/23/5; D5ESN 79/7/5; D6ARES 24/0/3; WARCVTN 33/5/3. OO reports: KB3XO W3GTN W3KEK. OBS reports: K3EBZ W3CL W3VA. PSHR reports: AA3C KA3DLY KA3EJG KA3GJT KB3LF KB3UD KE1L/3 KE3U KB3XO W3IPX W3VA WA3EHD WA3OFD WA3WQP WB3FKP WB3FYT. New appt: K3YD, OES. EPA welcomes KB3XO KE1L/3 WB8KPE/3. EPAEPTN welcomes KE1L/3 N3CFR WB3IWZ. PTTN welcomes KE1L/3 N3CYN WB8KPE/3. New gear: AF3Z Ten Tec 544; KB3LF an IC2AT & 2M 11-el beam; W3EEK a SB221, Telrex TB5EM Yagi and SM220 station monitor. Upgrades: Extra-N3AIU WA3JWP WB3FAA; Adv-WB3FYT; Gen-N3CXB; Tech-N3CXY (KA3IYJ), N3CZU (KA3IHI). KA3BMV KA3HXA WB3HJN. Congrats. WA3OFD announces PTTN will meet every Sat & Sun on 3710 kHz to encourage Novice & Tech ops to handle traffic. WB3FPL reports Reading ARC provided comms for Gringsmill 10K Run. K3AI repairing 2M rig and he put up a quad ant. KA3EJG was NCS for EPAEPTN for first time. WB3KUZ sez it's nice to be back in nets again after long summer vacation. The *Easton Express* devoted entire page to Amateur Radio. Traffic: W3IPX 221, WA3WQP 181, W3FAF 155, AA3B 148, KB3LF 136, WA3OFD 125, W3VA 108, KA3GJT 95, KA3DLY 90, KB3UD 80, W3DP 63, KB3XO 63, W3TWV 51, KE3U 47, KA3EJG 34, WA3EHD 28, W3ADE 25, N3BFL 24, W3CL 22, W3AQN 17, K3QXC 16, WB3KUZ 14, WB3FKP 13, WA3VIL 11, N3BAY 7, K3EBZ 5, W3ID 5, WA3CKA 5, K3YD 4, AF3Z 4, W3HK 2, KE1L/3 2, AA3C 1.

MARYLAND — DISTRICT OF COLUMBIA: Karl R. Medrow, W3FA — SEC: WA3TAI. STM: WB3GZU. It's KA3HIY to N5EAZ to NA5E. Congrats. Considering the summer W3ZNW has been very active. KA3R is doing yeoman service as OO. WB3LTA has reason to be real proud of that mobile rig. W3JPT is back into satellite DX. KC3D got dried out in Arizona. KE4OI, ex WA3IIV/WB4FVV, is back and pushing tfc. KA3CDQ sees winter in MTN ckins from NY and FL. WB3BFK is overcoming bad propagation. W3LDD looks to fall DX. KJ3E opines that his code speed is increasing. W3OYY is looking to bigger QNI avgs as fall comes. KB3NL overcame technical difficulties with ease. Congrats and happy birthday to W3AKO, 83 years young and very active. W3UT is back in swing after his summer fling. WB3GZU's XYL is back from Africa with 600 slides of wild life! WB3KJT is juggling too many projects. K3ORW has a better antenna mount than the old tree the county cut down. The FAR's scholarship chairman, W3ABC, reports 10 winners. The *Ham Arundel News* reports W5RFQ and N3CKP Advanced. KA3JOS is N3CZP, and WB3JRC is the proud possessor of KK3F. Congrats to you all. SMARC: KJ3T, ex-KA3DUC, is the bulletin editor. Their Novice class produced KA3JRA KA3JSA KA3JQJ KA3JQI KA3JQK and KA3JRY. A big hand to you all! With the nets: Net/Mgr sess/tfc/QNI Avg. MTN/KA3CDQ 20/15/4.7. WR PON/WB3BFK 22/23/13.6. MDC PON/W3OYY 4/5/17. MEPN/WB3GZU 30/120/25.5. Toppers: WB3BFK KA3CDQ N3CRW W3LDD, KA3ARH missed less than 3. KC3AV is busy teaching Novices for the AARC. MTN meets 1930 local on 3733 Mon thru Fri. The MEPN meets daily 1600 local on 3920 kHz. MDD meets at 1900 and 2200 local 3643 kHz daily. The PONs are at 1700 local 3905 kHz except on Sunday. Lots of activity on a single frequency! Traffic: WB3GZU 617, W3FA 205, KA3CDQ 139, W3UT 75, KE4OI 53, KJ3E 46, WB3BFK 34, W3ZNW 23, KB3WL 20, WB3KJT 14, NA5E 8, W3LDD 8, KB3NL 6, KC3D 2.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: N2CER. August 21 appeared like any other day, bright and sunny, until a commercial jetliner cruising over our section at about 30,000 feet heard an emergency locator transmitter (ELT) coming from somewhere near the Burlington Co. Airport. This info was reported through the FAA in New York to Air Force authorities. Within a short time K2QIJ, EC for Burlington Co., was notified. By then it was 11 P.M. and, with a big hamfest scheduled the next day and K2QIJ responsible for the talk-in operations, the last thing he needed was to stay up all night looking for a downed aircraft. Boy, was he in for a surprise. He immediately alerted W2HOB, our SEC, about the situation and asked for people who had aircraft monitoring capability in their vehicles. W2HOB and K2QIJ were the only ones available with this capability, and so they immediately sprung into action. K2QIJ operated from his home station, giving direction and map information to W2HOB who was mobile. The search was on!!! Tune in next month for details. Traffic: N2CER 452, WB2IQJ 385, WA2HEB 123, WB2PKG 93, KM2E 58, KA2BKF 35, WA2CUW 34, WB2GFM 33, KA2GSL 16, WB2JCE 16, WB2LCC 10, KA2KTR 7.

WESTERN NEW YORK: SCM, William W. Thompson, W2MTA — SEC: W2BCH. STM: W2ZOJ. ASCM: W2GLH. DECs: WA2AIV KA2BHR WB3CUF WB2NAO. THANKS WA2DHZ past service as DEC Southern. Silent Key: W2RN, NYSCN RACES and QCWA regular.

Net	Freq.	Time/Day	QNI	QSP	QND
NYS/1*	7077	1000/M-S	—	—	—
NYSCN	3677	1000/Sn	43	22	5
THIN	3913	1600/Sn	32	—	4
NYPON*	3913	1700/Dy	622	366	31
NYSPTEN	3925	1800/Dy	734	102	31
ESS	3590	1800/Dy	320	27	30
LEWIS CO	43/03	1815/Sn	(ARES)		
OCTEN*	34/94	1830/Dy	376	68	30
Q NET	31/91	1830/Dy	428	2	31
STAR/E*	99/39	1830/Dy	75	13	26
WCATSKILL	3540	1830/M	(ARES)		
WDN/E*	04/64	1830/Dy	632	89	31
NARASEN	75/15	1900/Sn	79	—	5
NYS/4*	3677	1900/Dy	411	212	31
ONEIDA CO	34/94	1930/T	(ARES)		
SLVARES	31/91	1930/Sn	(ARES)		
ONONDAGA	90/30	1930/M	(ARES)		
JCARCN	10/70	2000/Dy	581	12	31
OARCN	25/85	2000/W	(ARES)		
VHF THIN	04/84	2000/Sn	69	—	5
WIN	04/64	2000/M	(SKYWARN)		
WNYEC Net	3955	2000/Sn	(ARES)		
BRVRAN	055/655	2100/Dy	286	0	31
CNYTN*	90/30	2115/Dy	459	90	31
STAR/L*	325/925	2130/Dy	88	23	27
WDN/L*	04/64	2130/Dy	897	136	31
NYS/5*	3677	2200/Dy	291	235	31

*NTS net. PSHR: W2AET N2BLX WA2FJJ WB2IDS WA2KOJ W2MTA WB2OWO KC2QQ W2ZOJ. ADVICE: codeless license — LOOK before LEAP; OVS loss invites field comment in writing to K1ZZ — experimenters are still needed! Appts: KC2QQ NM Western District Net; N2APB retains NYS CW Net. Reports: OO-N2NW (4); OBS-K2KWK W2GLH; OES-W2TFL; OVS-KA2LHO K2QR (EME contest Second Call Area winner). OCTEN July 381-74-31. Club officers: ARATS WB2WUB KA2CJS K2LRL; Rochester DXA KB2NU W2TZ KS2F. Comms: Boonville ARC Oneida Co. Fair, and Woodsman Field Days; RARA Corn Hill 10K, Triathalon, WNY Pony, and Strong Mem'l Marathon; Ogdensburg/Seaway Festival (ARES) WA2RXO KA2CMQ WA2PHW KA2JXI and KA2FSP; Empire State Games WA2PUU and 110 others from WNY. FB. Congrats: WA2YMS, Foundation for Amateur Radio scholarship; Tompkins ARC sponsored Finger Lakes Fest at Trumansburg with 500 attendees. Novice classes: Lewis Co.-WA2OEP; Oneida Co.-K2KLV; Rochester area-N2EH. Traffic: W2AET 339, W2MTA 320, WA2HSB 290, KO2H 272, W2ZOJ 263, WA2FJJ 228, WB2IDS 215, W2FR 161, KA2CLT 142, WB2OWO 127, WB2QIX 115, KG2D 99, AF2K 52, KC2QQ 47, N2BLX 45, WA2KOJ 41, N2ABA 34, K2RN 27, WA2AFE 23, WA2SMZ 19, WB2PID 17, N2ARD 16, WA2AIV 14, WA2OEP 13, WB2FQE 5, KA2DBD 4, KC2SD 4, K2VR 4. (July) KO2H 250.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM/STM: N3EE. NMs: AC3N N3ADU W3MML W3NEM. SEC: AB3Q. DECs: WB3JDI KB3OO KN3ZAN WB3EFO WA3ZNP WB3KJH N3ADU.

Net	QNI	QTC	Sess.	kHz	T/D
WPACW	353	205	31	3585	7:00 P/D
WPAPTN	564	140	31	3983	6:15 P/D
WPA2MTN	540	116	31	146.28/88	8:00 P/D
NWPA2MTN (July)	469	10	30	146.04/64	9:00 P/D
NWPA2MTN	544	4	31	146.04/64	9:00 P/D
PFN	274	255	31	3958	5:00 P/D

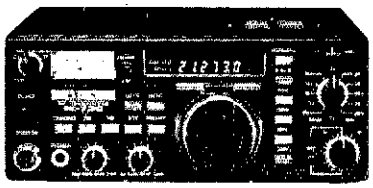
I regret to announce that W3CRV is a Silent Key. The PTTN will change its schedule on Saturdays and Sundays to be on 3710 kHz at 6:30 P.M. The net will meet Mondays thru Fridays, same as usual. This will give Novices and Techs a chance to get involved in tfc handling. New Novices from Erie classes are: KA3s JLH JOJ JRJ JSC JAK JSL JST JSY JTD JTE JTQ JUH JVX. New General is KA3ITZ. Congrats to all. W3GQ has been promoted again. He is now Pilot Instructor with USAir. Does

5-STORE BUYING POWER in action!

NEVER BEFORE... NEVER AGAIN!

ICOM

IC-730



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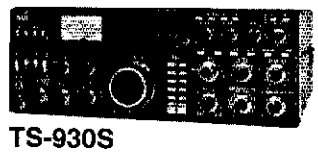
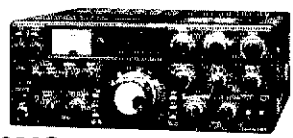


TS-930S

TR-2500

NEW

TR-7950
2 METERS, 45 WATTS,
21 CHANNEL MEMORY



TS-830S

KLM/Tri Ex

KT-34A
4 ELEMENT TRIBANDER
REGULAR $389.95
SALE! $309

KT-34XA
6 ELEMENT TRIBANDER
REGULAR $569.95
SALE! $459

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TRI EX W51 TOWER w/KLM KT-34A **$1099**

TRI EX W51 TOWER w/KLM KT-34XA **$1239**

TRI EX W51, 51' TOWER
REGULAR $999.95 **$829.95**

PRICES ARE FOB CALIF. EXCEPT FOR CERTAIN COMBINATIONS. PLEASE INQUIRE.

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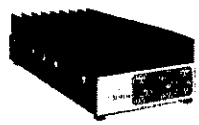

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30W in, 160W out.	10W in, 160W out.
REG. $239.95	REG. $279.95
SALE! $199.95	**SALE! $249.95**

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2 METER
FT-208R

70CM
FT-708R

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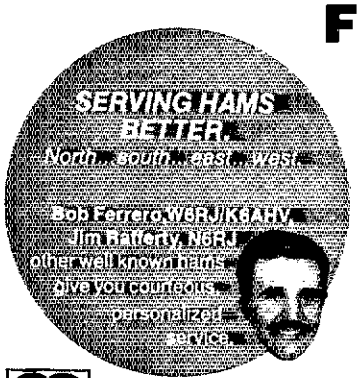

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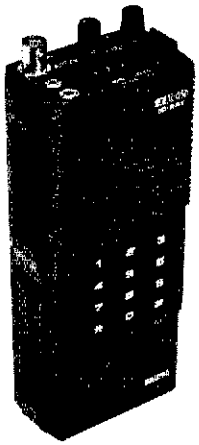

2 METER
IC-2AT

●

220 MHz FM
IC-3AT

●

70CM FM
IC-4AT

●

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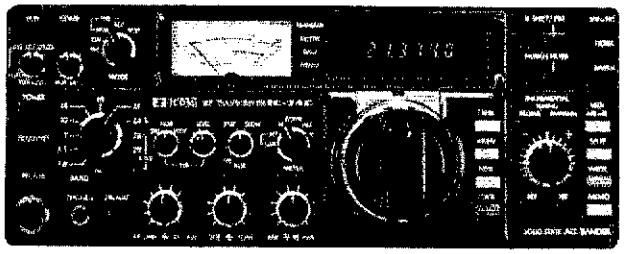
NEW IC-740



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IC-720A ALL-BAND TRANSCEIVER

All 9 bands • All solid state • Broadband tuned • Digitally synthesized w/10Hz resolution • Two VFO's • General coverage receiver, 0.1MHz to 30 MHz (no transmit on general coverage). • Simplex, duplex • RIT • 100W pep output on SSB, 100W CW & RTTY, 40W AM • Digital readout • Passband tuning • Operating voltage, 13.8VDC @ 20A • Dozens of other desirable features.

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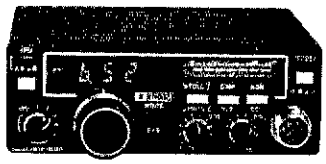
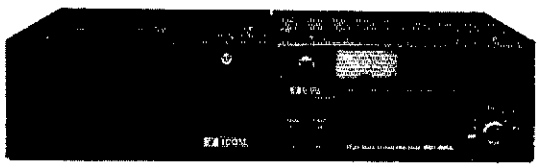


• Very small package 2"H, 5½"W, 7"D with 25 watt punch! • 5 memories • Priority channel • Touchtone™ microphone standard. Full band scan/programmable scan (set your own limits) memory scan • 2, VFO's with data transfer standard • Two tuning rates, 5kHz (A-vfo), or 15kHz (B-vfo).



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IC-2KL LINEAR AMPLIFIER

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REGULAR $829

$649.95

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FREE SHIPMENT, ALL OF THE ABOVE ITEMS, UPS (Brown)

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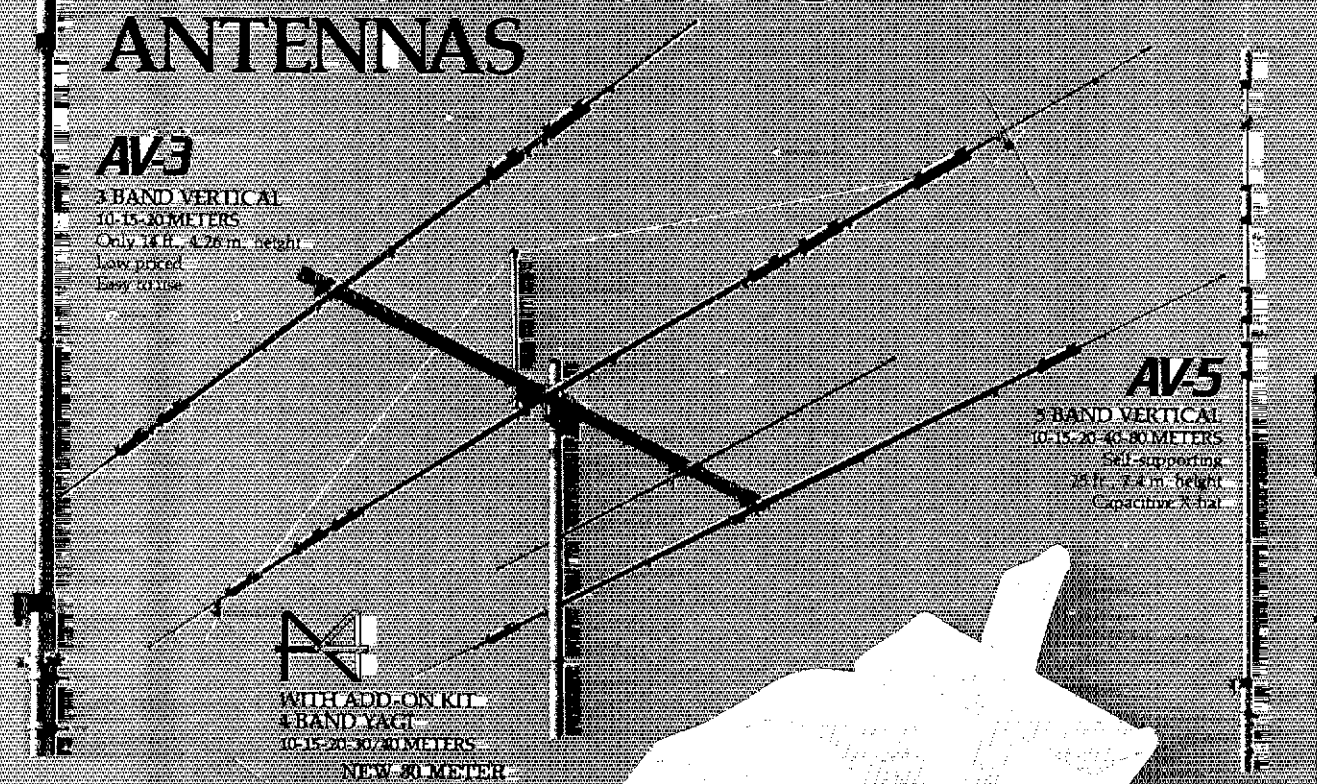
CUSHCRAFT HF MULTIBAND

CONTEST WINNING ANTENNAS



AV-3

3 BAND VERTICAL
10-15-20 METERS
Only 16 ft., 4.26 m. height
Low priced
Easy to use

AV-5

5 BAND VERTICAL
10-15-20-40-80 METERS
Self-supporting
28 ft., 8.4 m. height
Capacitive X-hat

A4

WITH ADD-ON KIT
4 BAND YAGI
10-15-20-30/80 METERS
NEW 80 METER WARC BAND WITH A3 OR A4

A3

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10-15-20 METERS

R3

3 BAND VERTICAL
20-15-20 METERS
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Remote tuning
Better than average performance
22 ft., 6.7 m. height

The world renowned Cushcraft HF Multiband antennas are chosen time after time for DX-peditions to far corners of the globe. Their excellent gain, outstanding radiation pattern, 2kw power rating, easy assembly, and high strength-clean profile aluminum construction enable the adventurous DX-er to travel further and make more contacts.
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A3
Broadband, excellent gain and f/b ratio, 2 kw power rating direct 50 Ω feed, Boom 14 ft., 4.26 m., longest element 28 ft., 8.5 m, weight 27 lbs., 12.9 kg., turn radius 15.5 ft., 4.7 m., mast dia. 1¼ in. to 2 in., 3.18 cm. to 5.08 cm., material 6063-T832 seamless aluminum.

A4
Broadband, excellent gain and f/b ratio, 2 kw power rating, direct 50 Ω feed, boom 18 ft., 5.48 m., longest element 32 ft., 9.7m., weight 37 lbs., 16.8 kg., turn radius 18 ft., 5.48 m., mast dia. 1¼" to 2 in., 3.18 to 5.08 cm., material 6063-T832 seamless aluminum.

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We're AGL, North Texas' AUTHORIZED Dealer for more than 70 different product lines of Amateur Radio Equipment. Need antennas and towers? We got 'um—just call Bill (K5FUV) or Gordon (N5AU) for your special requirements. Mike (KG5F) can advise you on transceivers and accessories. Let Gary (KM5X) box it up and send it your way, while Bob (W5AH) stands ready to help with your service and warranty needs. We like to talk radio, DX, contests, or tell jokes...Gordon's busy learning some new Texas Tall Tales!

CUSHCRAFT

A3 3el triband beam	$174.00
A4 4el triband beam	$227.00
A743 7-10 mhz add-on kit	$62.00
A744 7-10 mhz add-on kit	$62.00
20-3CD 3el monobander	$172.00
20-4CD 4el monobander	$240.00
15-3CD 3el monobander	$96.00
15-4CD 4el monobander	$108.00
10-3CD 3el monobander	$76.00
10-4CD 4el monobander	$89.00
A32-19 19el 2m "Boomer"	$84.00
214B 14 elem. SSB "Jr. Boomer"	$69.00
214 FB FM "Jr. Boomer" 2m	$69.00
ARX2B 2m "Ringo Ranger II"	$35.00
ARX450B 450 mhx "Rng. Rngr."	$35.00
A-147-20T 20el 2m	$62.00

HY GAIN

V2S 2m gain vertical	$38.00
TH7DX 7 el tribander	$369.00
TH5MK2S 5el tribander	$312.00
TH3MK3S 3el tribander	$215.00
TH2MK3S 2el tribander	$135.00
TH3JRS 3el jr. tribander	$157.00
HQ-2S 2el quad	$265.00
402BAS 2el 40m	$196.00
205BAS 5el 20m	$295.00
204BAS 4el 20m	$226.00
203BAS 3el 20m	$132.00
155BAS 5el 15m	$176.00
153BAS 3el 15m	$74.00
105BAS 5el 10m	$116.00
103BAS 3el 10m	$55.00
DB1015AS 3el duobander	$150.00
64BS 4el 6m	$62.00
66BS 6el 6m	$99.00
18 HTS hy tower vertical	$339.00
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214 14el 2m	$32.00
2BDQ 2 band dipole	$49.00
5BDQ 5 band dipole	$98.00
BN86 balun	$17.00

Note. Part numbers with S on the end denote stainless steel hardware. Some small quantities remain of older stock; call for prices.

KLM

KT34XA 32 ft. boom tribander	$449.00
KT34A 16 ft. boom tribander	$309.00
7.2-1 40m dipole	$155.00
7.2-2 40m 2el beam	$289.00
7.2-3 40m 3el beam	$439.00
7.2-4A 40m 4el beam	$599.00
5el 20m "Big Sticker" mono	$429.00
6el 20m "Big Sticker" mono	$610.00
6el 15m "Big Sticker" mono	$389.00
6el 10m "Big Sticker" mono	$225.00
144-148-13LB 2m "Long-Boomer"	$75.00
144-150-16C 2m circular	$95.00
432-16LB 432mhz "Long-Boomer"	$59.00
420-470-18C 450mhz circular	$57.00

KLM antennas may be shipped from California or Texas, Freight Collect. Most require truck shipment. Call for details.

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6BTV 5 band trap vertical $99.00

Mobile antenna resonators:

	std	super
10m	$10.00	$15.00
15m	$10.00	$15.00
20m	$12.00	$18.00
40m	$15.00	$21.00
75m	$17.00	$32.00
BM-1 bumper mount		$16.95
MO-1 fender mount mast		$22.36
MO-2 bumper		$22.36
CGT-144 2m colinear w/mount		$46.70

SANTEC

October Special $285.00

ST-144 µP

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The Newest in Competition Grade Radios.

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It's what the Competition is trying to Equal!

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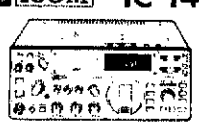
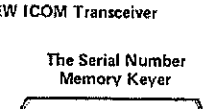


The NEW ICOM Transceiver

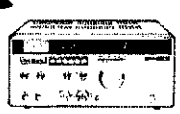
The Serial Number Memory Keyer

CK2



Other AEA Products Available

KWM-380



CALLING AND CAN'T GET THROUGH?

In their infinite wisdom, the phone people require that we have twice as many lines as people to answer them. Just be patient and try again later; we aren't going belly-up any time soon. Also, we can't keep someone down here to answer the phone at night or on weekends, and we're too busy to answer the WATS on Saturdays.

TEXAS FOLKS

Please note that we're open until noon on Saturdays just for you. Visitors are welcome, too. We're in Keystone Park Shopping Center, across from Texas Instruments. Look for us under our two towers.

TELREX ANTENNAS

WARNING: These antennas are not for the faint of heart. They are heavy. They are large. They are expensive. They also work. These antennas require truck delivery and come in large boxes.

	WT.	Area
10m523 5el 10m beam	64lb.	4.5
10m636 6el 10m beam	85lb.	6.0
15m532 5el 15m beam	95lb.	10.0
15m845 5el 15m beam	140lb.	14.0
20m436 4el 20m beam	108lb.	12.0
This is a custom antenna.		
20m536 5el 20m beam	113lb.	13.5
20m546 5el 20m beam	n/a	n/a
This is a custom antenna.		
20m646 6el 20m beam	176lb.	17.0
40m329 3el 40m beam	110lb.	12.6
40m346 3el 40m beam	177lb.	13.8
TB5EM 5el tribander beam	49lb.	7.0
TB6EM 6el tribander beam	85lb.	10.0

Call for pricing — F.O.B. Dallas.

ROHN TOWER

25G 10 ft. section	$40.50
45G 10 ft. section	$91.90
25AG4 top sec., req. bearing	$54.00
45AG4 top sec., req. bearing	$103.00
GA25G guy bracket with bars	$22.00
GA45G guy bracket with bars	$43.00
SB25G short base section	$19.00
SB45G short base section	$43.00
EP 2534-3 3 hole equalizer plate	$9.95

Self Supporting Towers

HBX56 56 ft. self support	$335.00
HDBX40 40 ft. self support	$249.00
HDBX48 48 ft. self support	$305.00

Our BX series towers include the base stubs. Beware those who charge extra for them. Also, freight collect from Dallas may save over freight pre-paid because of varying distances and routing. Drop ship or factory pick-up prices may be higher due to factory pricing policies. West Coast/Rocky Mountain prices may be 10% higher depending upon shipping point. Call for firm quote before ordering.

ROHN FOLD-OVER TOWERS

FK2548 48 ft. 25G foldover	$699.00
FK2568 68 ft. 25G foldover	$869.00
FK4544 44 ft. 45G foldover	$981.00
FK4564 64 ft. 45G foldover	$1170.00

Freight prepaid on foldover towers. Sales tax may be applicable in some areas. West Coast/Rocky Mountain prices 10% higher.

HY-GAIN CRANK-UP TOWER

HG-52 SS 52 ft. self support $874.00
HG-54-HD 54 foot self support $1414.00
HG-70 HD 70 foot self support $2187.50

Above shipped from Lincoln, NE. Sales tax required in some areas, freight paid on shipments in 48 states. Call for details on these and other Hy-Gain items.

PHILYSTRAN GUY CABLE

This is RF transparent, sun resistant, guy cable. Avoid those hours of putting insulators into steel cable. Enjoy the advantages of freedom from unwanted resonances that can soak up your radiated RF energy.

HPTG 4000 4000 lb. test cable ..... $.44/ft.
HPTG 6700 6700 lb. test cable ..... $.60/ft.
9901LD potting head $4.99
9902LD potting head for 6700 lb. $5.49
Socketfast potting compound. $9.00/pt.

TOWER HARDWARE

3/16" EHS steel guywire	$.12/ft.
1/4" EHS steel guywire	$.15/ft.
3/16" ccm cable clamp	$.29 ea.
1/4" ccm cable clamp	$.39 ea.
3/8 x 6" TBE&E turnbuckle	$5.39
1/4" th thimble	$.24 ea.
3/16" preformed guy grip	$1.75
GAS604 screw anchor	$12.00
GAR604 concrete guy anchor	$12.00
M200H 2" x 10' steel mast	$37.00
600D guy insulator	$.85
502 large guy insulator	$1.80

Note: Some items too large for UPS shipment. Call before ordering to check shipment mode.

HY-GAIN PACKAGE #1

TH7DX ..... 7el Tribander
HG 52SS ..... Self Supporting Tower
Ham IV ..... Rotor
COA ..... Coax Arms (3 Furnished)
HG-10 ..... 10 ft. steel mast
HG-TBT ..... Thrust Bearing

Your Price!!! $1,533.00

FREIGHT PRE-PAID!!!

May require 4 to 6 weeks delivery. Sales tax may be applicable in some states. Shipped from Lincoln, NE. Cashier's check or money order in advance required—no credit cards. Sorry, no substitutions on this package.

HY-GAIN PACKAGE #2

HG-52-SS ..... 52 Ft. Crank-Up
HG-10 ..... 10 Ft. Mast
HG-TBT ..... Thrust Bearing
HG-COA ..... (3) Coax Arms
Ham IV ..... Rotor

ALL FOR ONLY $1,190!!!

Shipped from Lincoln, NE. Allow 4 to 6 weeks for delivery.

ROTORS

Ham IV	$192.00
T2X	$247.00
HDR300 for LARGE arrays	$419.00
Alliance HD73	$94.00

CABLE

Saxton RG213 50 ohm coax	$.31/ft.
RG 11/U 75 ohm coax	$.31/ft
LDF4-50 Andrews HELIAX®	$1.48/ft.
8 cond. rotor cable	$.18/ft.
8 condHD rotor cable (for 150+ ft.)	$.36/ft
Mini 8 52 ohm small coax	$.16/ft.

Heliax® cannot be shipped by UPS as it cannot be coiled tightly enough to conform to size restrictions without damage.

CONNECTORS

Amphenol PL259 (Silver Plated)	$1.25 ea
Amphenol 82-61 type n	$2.85 ea
Andrews L44U UHF female	$17.00 ea.
Andrews L44PUHF male	$17.00 ea.

SPECIAL NOTICE

We will be CLOSED the 29th and 30th of OCTOBER for the CQ WWSSB CONTEST

Sorry, we can't accept personal checks for mail orders, and can't ship C.O.D.

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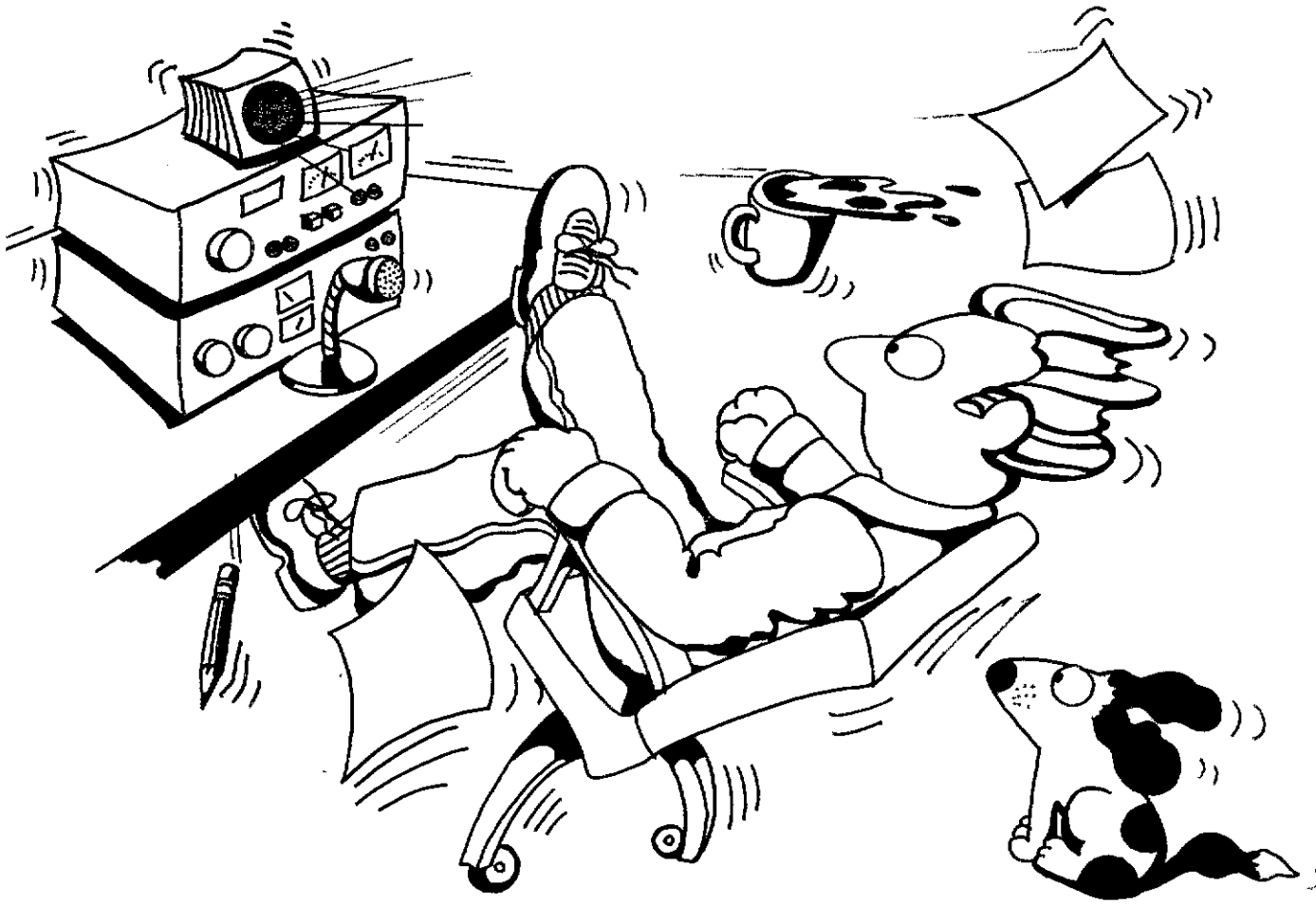
". . . (click) . . . just turned on the ALPHA . . ."



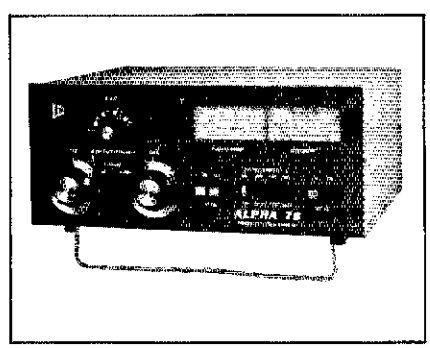
Ever notice how many of the really **dominating** signals you hear originate from ALPHAs? You know that a great amplifier alone doesn't guarantee a standout signal. Still, it obviously must be a big step in the right direction.

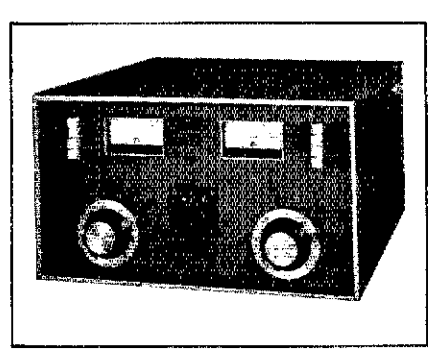
Of course the ALPHA owner knows that he's stoking the coax with first-rate rf. Perhaps the confidence that he will get through on the first call puts that extra crispness and authority into his signal.

And common sense says that anyone with the good judgment to invest his hard-earned money in a superb ALPHA linear isn't likely to tie it to a raunchy-sounding exciter or a wet string dipole.

But in the final analysis, the ALPHA edge is basically simple: maximum clean rf power output, minimum distortion and heat.

For a dozen years, ALPHAS have set the standards by which other amplifiers are judged—performance, durability, convenience, warranty protection, person-to-person service, resale value. Most ALPHA owners are serious operators, simply unwilling to get along without these legendary ALPHA advantages.





So, if you're tired of being just another voice in the crowd, you're ready for an ALPHA. Sure you can buy a cheaper linear . . . "but is that really what you want?"

Contact your ALPHA dealer or ETO today for full details and specifications.

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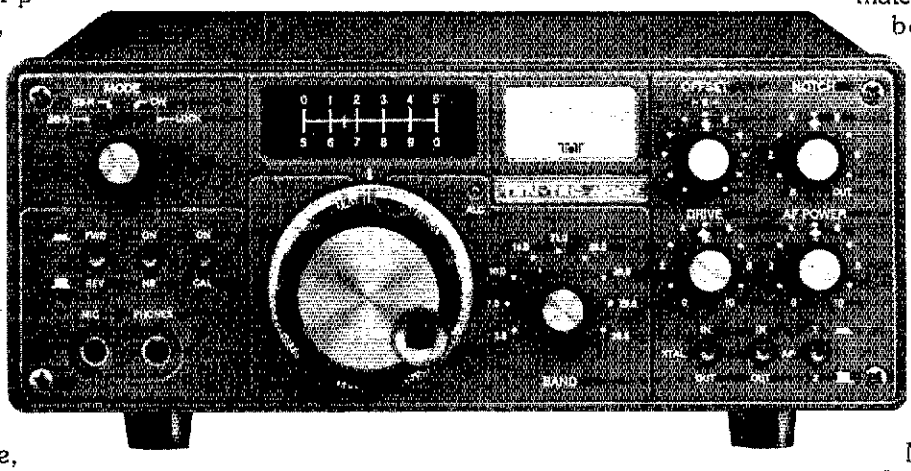

The right design — for all the right reasons. In setting forth design parameters for ARGOSY, Ten-Tec engineers pursued the goal of giving amateurs a rig with the right features at a price that stops the amateur radio price spiral.

The result is a unique new transceiver with selectable power levels (convertible from 10 watts to 100 watts at the flick of a switch), a rig with the right bands (80 through 10 meters including the new 30 meter band), a rig with the right operational features plus the right options, and the right price for today's economy—just $549.

Low power or high power. ARGOSY has it. Now you can enjoy the sport and challenge of QRPp operating, and, when you need it, the power to stand up to the crowds in QRM and poor band conditions. Just flip a switch to move from true QRPp power with the correct bias voltages to a full 100 watt input.

New analog readout design. Fast, easy, reliable, and efficient. The modern new readout on the ARGOSY is a mechanical design that instantly gives you all significant figures of any frequency. Right down to five figures (± 2 kHz). The band switch indicates the first two figures (MHz), the linear scale with lighted red bar-pointer indicates the third figure (hundreds) and the tuning knob skirt gives you the fourth and fifth figures (tens and units). Easy. And efficient—so battery operation is easily achieved.

The right receiver features. ***Sensitivity*** of 0.3 μV for 10 dB S+N/N. ***Selectivity:*** the standard 4-pole crystal filter has 2.5 kHz bandwidth and a 2.7:1 shape factor at 6/50 dB. Other cw and ssb filters are available as options, see below. I-f frequency is 9 MHz, i-f rejection 60 dB. ***Offset tuning*** is ± 3 kHz with a detent zero position in the center. ***Built-in notch filter*** has a better than 50 dB rejection notch, tunable from 200 Hz to 3.5 kHz. An optional noise blanker of the i-f type has 50 dB blanking range. ***Built-in speaker*** is powered by low-distortion audio (less than 2% THD)

The right transmitter features. ***Frequency coverage*** from 80 through 10 meters, including the new 30 meter band, in nine 500 kHz segments (four segments for 10 meters), with approximately 40 kHz VFO overrun on each band edge. ***Convertible power:*** 100 or 10 watts input with 100% duty cycle for up to 20 minutes on all bands. ***3-function meter*** shows forward peak power on transmit, SWR, and received signal strength. ***PTT*** on ssb, ***full break-in*** on cw. PIN diode antenna switch. ***Built-in cw sidetone*** with variable pitch and volume. ***ALC control*** on "high" power only where needed, with LED indicator. ***Automatic*** normal sideband selection plus reverse. ***Normal 12-14V dc*** operation plus ac operation with optional power supply.

The right styling, the right size. Easy-to-use controls, fast-action push buttons, all located on raised front panel sections. New meter with lighted, easy-to-read scales. Rigid steel chassis, molded front panel with matching aluminum top, bottom and back. Stainless steel tilt-up bail. And it's only 4" high by 9½" wide by 12" deep (bail not extended) to go anywhere, fit anywhere at home, in the field, car, plane or boat.

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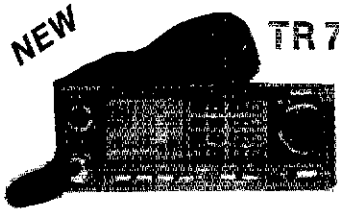

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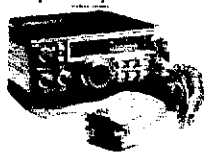

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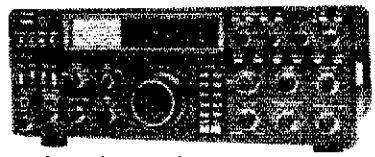

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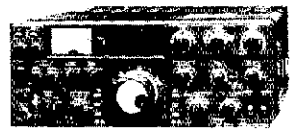

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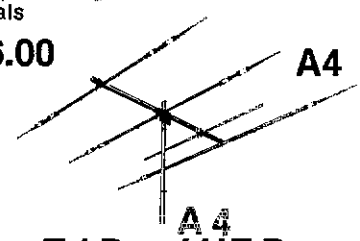

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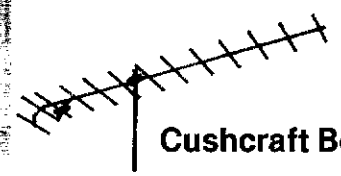

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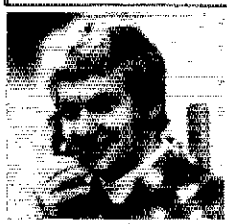
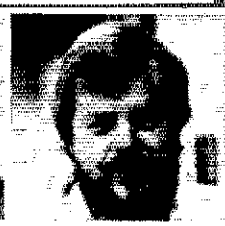


W7QG
Gary



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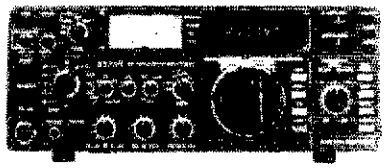

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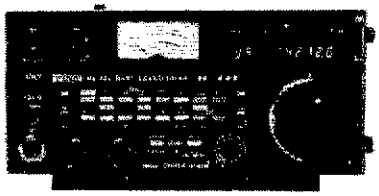

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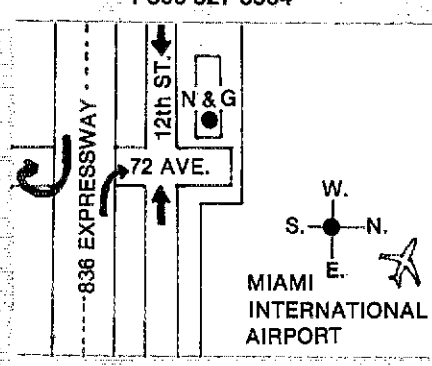

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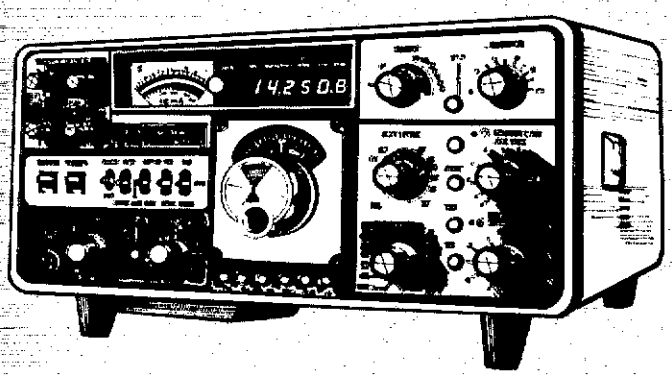

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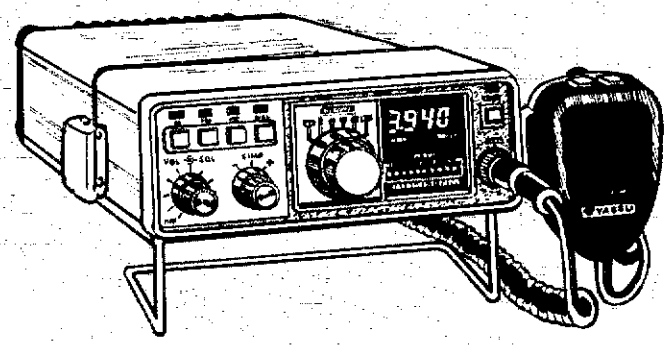

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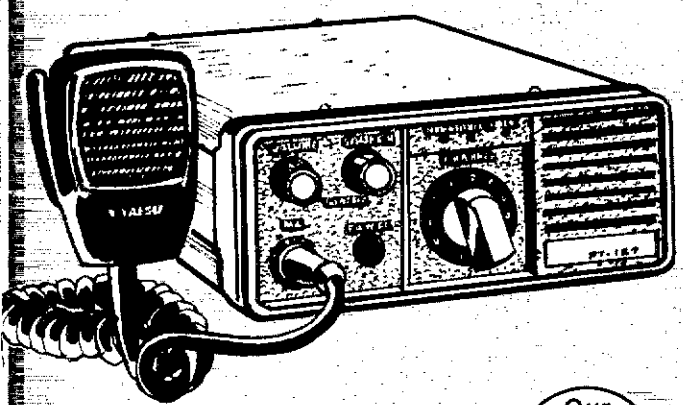
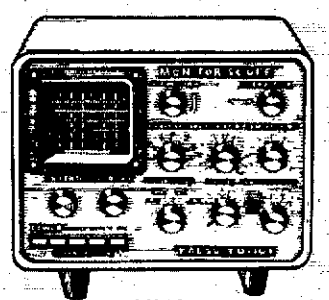
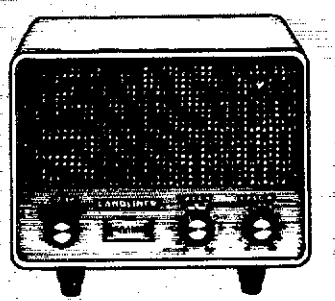




Y0101



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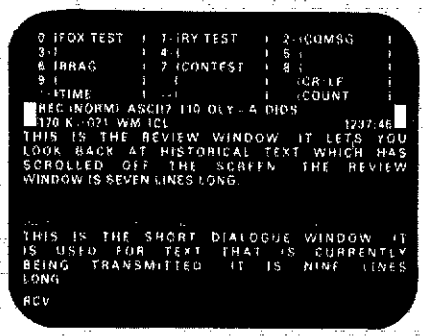

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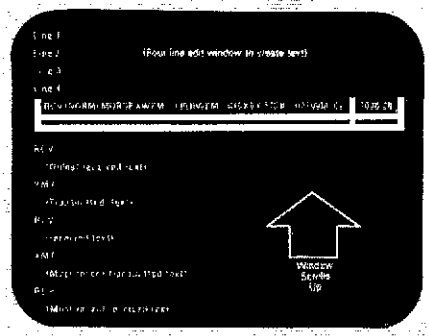

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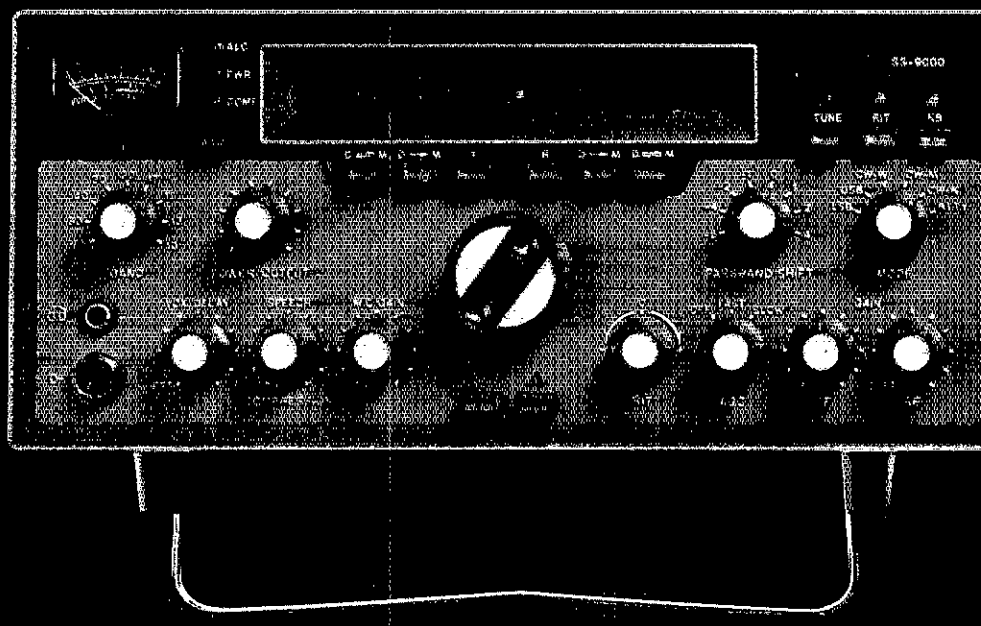

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MORE TOTAL TALK POWER

Even without a command terminal, Heath's SS-9000 will be the best transceiver your club or QTH ever aired. The superbly sensitive front end is mated to a transmitter providing 1W QRP or 100W PEP output on SSB/CW/RTTY. At any level, dedicated operators who appreciate the finest and expect great results will discover it to be a hot CQ and DX magnet.

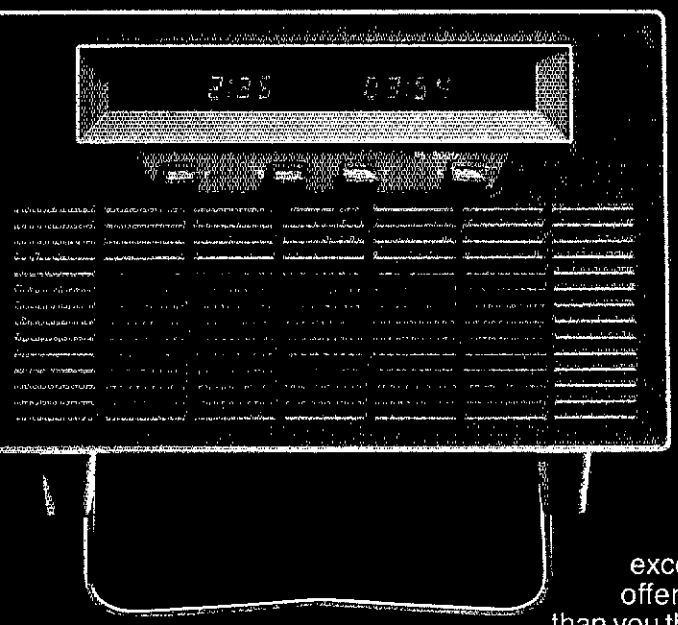
The SS-9000 features push-button up or down band scan and RIT with a rotary tuning dial that utilizes an optical encoder (plus quartz PLL-synthesized BFO, HFO and a VFO linked to separate readouts). This gives you digitally-precise tuning with ±100 Hz resolution in 16 selectable scan rates. Our dual fluorescent display is not just an advance in panel design … it's a quantum leap forward in T/R/Tr flexibility! Now you can write, recall and shift a total of 27 separate frequencies (3 per band) around the dual display and work simplex operation on one or two frequencies, split operation on different T & R frequencies or cross-mode on either or both displayed frequencies. The unseen frequency stored in memory remains available for instant exchange and

There's more for the Ham at Heath®

Heathkit®

Heath Company

than ever before.



display, offering you speed and advantage that was undreamed of until now.

MORE MICRO CONTROL

Harness the SS-9000 to a video terminal, ASCII teletype or home computer. You'll have an unbeatable team to travel the airwaves. Using built-in ROM (Read-Only Memory) commands, the Terminal Interface within each SS-9000 acts as a control/monitor with battery backup to handle a wide variety of tasks the user may define. This unique feature lets you write-in and display (or change) the operating and memory frequencies for each band, set T/R/Tr activity on each readout, toggle between and alternate either one freely with the memory frequency.

Keyboard command also allows you to set and switch the band, mode, pass-band shift, baud and scan rates, plus switch to one of five band-matched antennas. One on-board F8 CPU raises switching efficiency to the highest limit.

MORE FOR YOUR MONEY

Try one for the most exceptional capability ever offered. More QSO action than you thought possible. And all for a lot less than you'd expect to pay. Test-prove the SS-9000. See how it's perfectly matched to the PS-9000 AC Power Supply that has an in-cabinet speaker and two digital 12 or 24-hour clocks. Both units benefit from thermal and over-current protection with high VSWR cutback. Ahead of their time, the SS-9000 and PS-9000 are not kits. They come to you fully assembled, calibrated and aligned, with a one year limited warranty.

MORE IN STORE FOR YOU

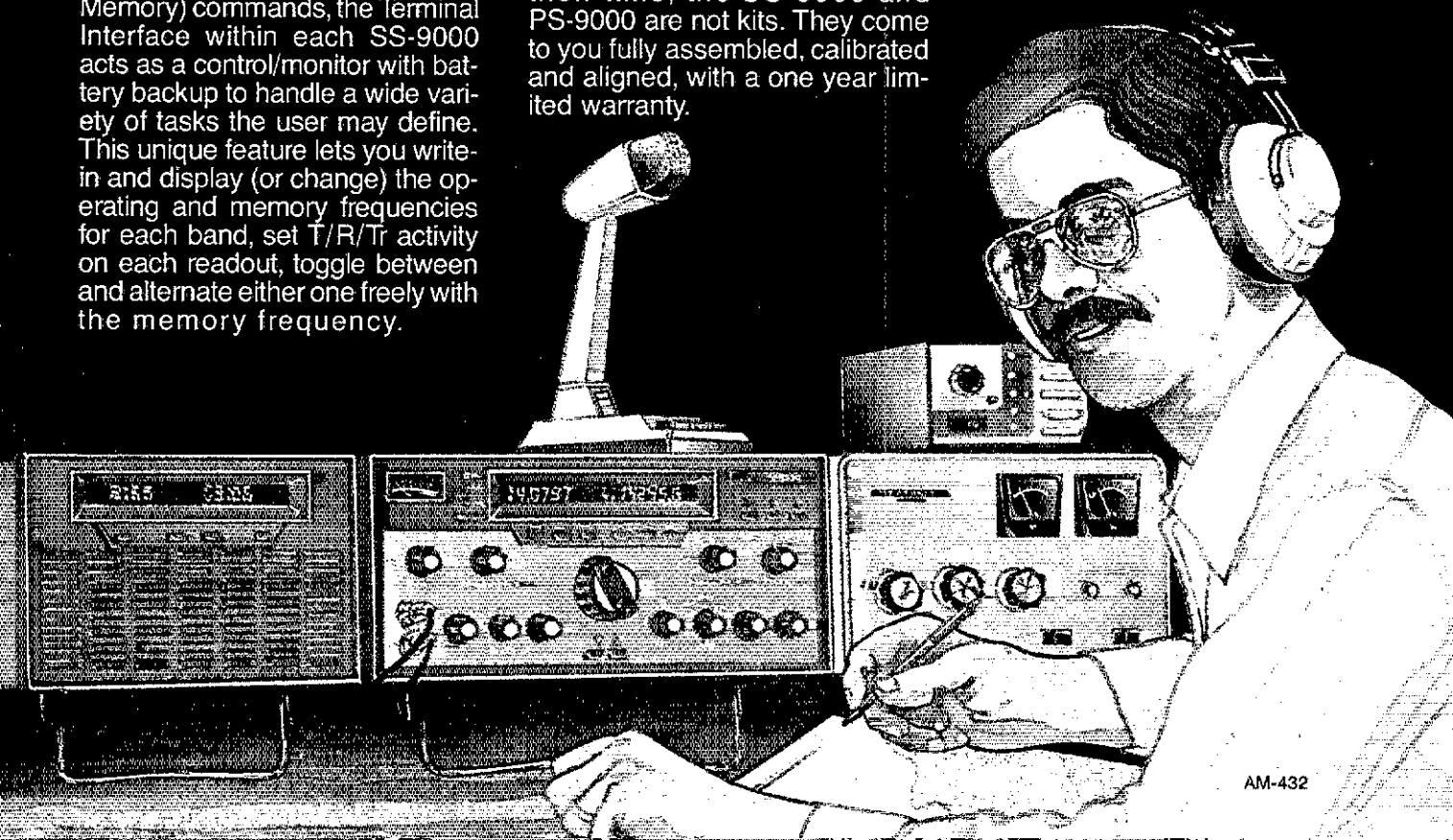
Your local Heathkit Electronic Center* is eager to demonstrate the SS/PS-9000 Team – our first 'intelligent' rigs. *Ready for the future of Amateur Radio, they're here, today!* Get a hands-on tryout at your nearby Heath Ham Headquarters.

MORE IN CATALOG, TOO

For complete details and specs, get a copy of your FREE Heathkit catalog. Write: Heath Company, Dept. 009-954, Benton Harbor, MI 49022.

*Units of Veritechnology Electronics Corporation in the U.S., a subsidiary of Zenith Radio Corporation.

In keeping with Heath's ongoing policy of product improvement, specifications are subject to change without notice or obligation.



AM-432

NEW

"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.
Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz-30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC bands, on SSB, CW, FSK, and AM. Features 150 kHz-30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch in 1-MHz steps. A new, innovative, quadruple "UP" conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 50-kHz spacing, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuits with cooling fan, SWR/Power meter built-in.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for smooth, quiet operation. Switchable to semi-break-in.
- **Automatic antenna tuner, built-in.**
  Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection. HIGH/LOW cut control rotation not affected by selecting USB or LSB modes.
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100 kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Six digit readout to 100 Hz (10 Hz modifiable), plus digitalized sub-scale with 20-kHz steps. Separate two digit indication of RIT frequency shift. In CW mode, display indicates the actual carrier frequency of received as well as transmitted signals.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power," improved intelligibili
- **One year limited warranty on parts and labor.**

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 H plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- SO-1 commercial stability TCXO (temperature compensated crystal oscillator). Requires modifications.
- MC-60A deluxe desk microphone with UP/DOWN switch, pre-amplifier, 8-pin plug
- TL-922A linear amplifier (not for CW QSK
- SM-220 station monitor (not for pan-adapt
- HS-6, HS-5, HS-4, headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

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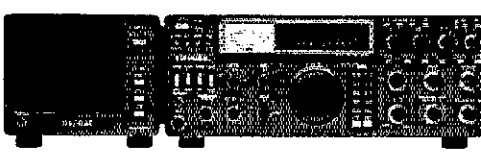
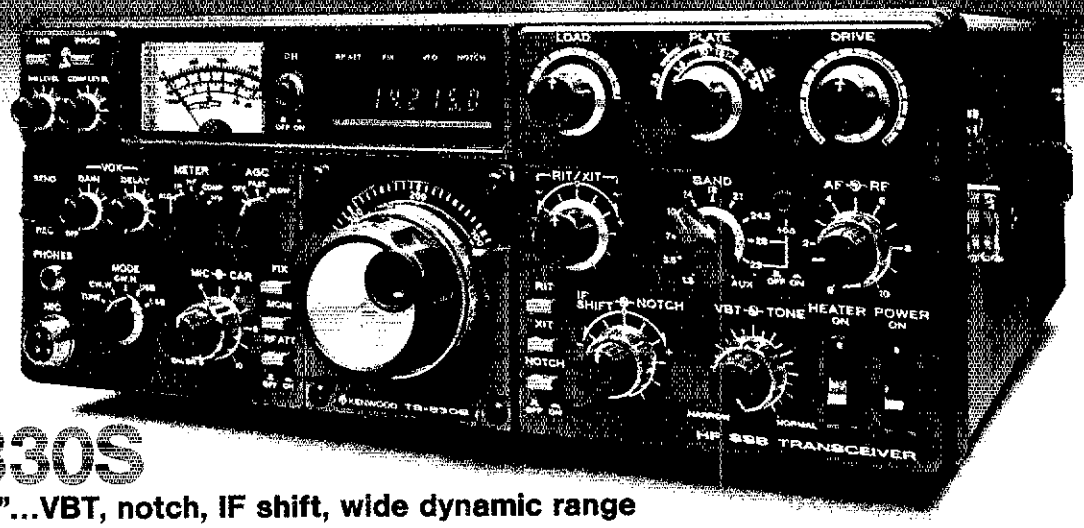


Specifications and prices are subject to change without notice or obligation



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.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- 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).
- Noise-blanker threshold level control.
- Built-in digital display, (fluorescent tube), with analog dial.
- 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.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

TS-530S

"Cents-ational"...IF shift, digital display, narrow-wide filter switch

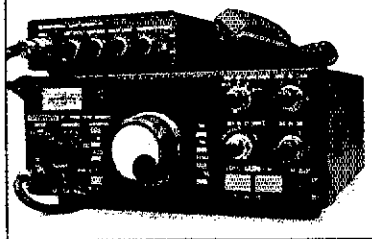
The TS-530S SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

TS-530S FEATURES:

- 160-10 meters, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- IF shift tunes out interfering signals.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.



TS-660

The TS-660 "QUAD BANDER" covers 6, 10, 12, 15 meters.

- FM, SSB (USB), CW, and AM
- Dual digital VFO's
- Digital display
- IF shift built-in
- 5 memories with memory scan
- UP/DOWN microphone
- All-mode squelch
- Noise blanker
- CW semi break-in/sidetone
- 10 W on SSB, CW, FM; 4 W on AM.

Optional accessories:

- PS-20 power supply
- VOX-4 speech processor/VOX
- SP-120 External speaker
- MB-100 Mobile mount
- YK-88C, YK-88CN CW filters
- YK-88A AM filter.

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R-600

"Now hear this"...digital display, easy tuning

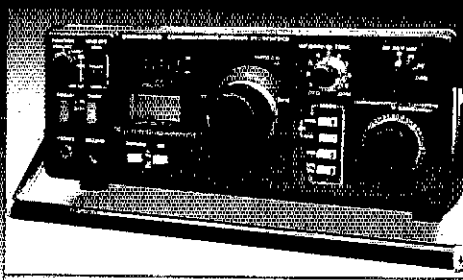
The R-600 is an affordably priced, high performance general coverage communications receiver covering 150 kHz to 30 MHz in 30 bands. Use of PLL synthesized circuitry provides maximum ease of operation.

R-600 FEATURES:

- 150 kHz to 30 MHz continuous coverage, AM, SSB, or CW.
- 30 bands, each 1 MHz wide, for easier tuning.
- Five digit frequency display, with 1 kHz resolution.
- 6 kHz IF filter for AM (wide), and 2.7 kHz filter for SSB, CW and AM (narrow).
- Up-conversion PLL circuit, for improved sensitivity, selectivity, and stability.
- Communications type noise blanker eliminates "pulse-type" noise.
- RF Attenuator allows 20 dB attenuation of strong signals.
- Tone control. • Front mounted speaker.
- "S" meter, with 1 to 5 SINPO "S" scale, plus standard scale.
- Coaxial and wire antenna terminals.
- 100, 120, 220, and 240 VAC, 50/60 Hz. Selector switch on rear panel.
- Optional 13.8 VDC operation, using DCK-1 cable kit.
- Other features include carrying handle, headphone jack, and record jack.

Optional accessories for R-600 and R-1000:

- DCK-1 DC Cable kit. • SP-100 External Speaker.
- HS-6, HS-5, HS-4 Headphones.
- HC-10 Digital World Clock.



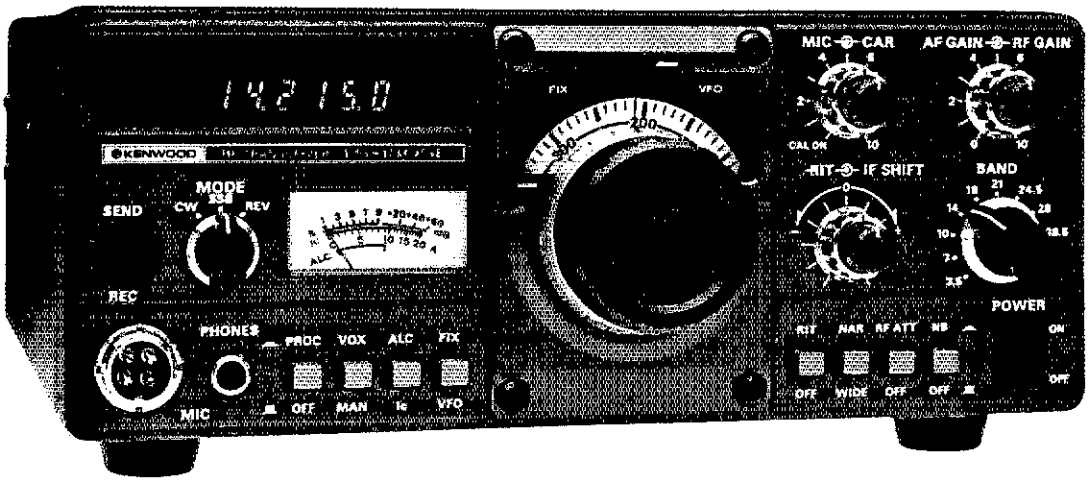
R-1000

High performance, easy tuning digital display

The R-1000 high performance communications receiver covers 200 kHz to 30 MHz in 30 bands. An up-conversion PLL synthesized circuit provides improved sensitivity, selectivity, and stability.

R-1000 FEATURES:

- Covers 200 kHz to 30 MHz.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gea dial mechanism.
- Built-in 12-hour quartz digital clock/timer.
- RF step attenuator.
- Three IF filters for optimum AM, SSB, CW.
- Effective noise blanker. • Tone control.
- Built-in 4-inch speaker. • Dimmer switch.
- Wire and coax antenna terminals.
- Voltage selector for 100, 120, 220, and 240 VAC. Operates on 13.8 VDC with optional DCK-1 kit.



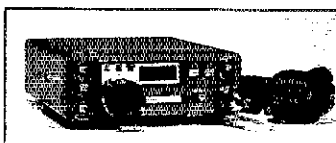
TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.
- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Effective noise blanker.
- Final amplifier protection circuit assures maximum reliability. Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.



Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

Optional accessories:

- PS-30 matching power supply (TS-130SE).
- KPS-21 power supply (TS-130S)
- PS-20 power supply (TS-130V).
- SP-120 external speaker.
- VFO-120 remote VFO.
- FA-4 fan unit (TS-130SE).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 antenna tuner.
- MB-100 mobile mounting bracket.

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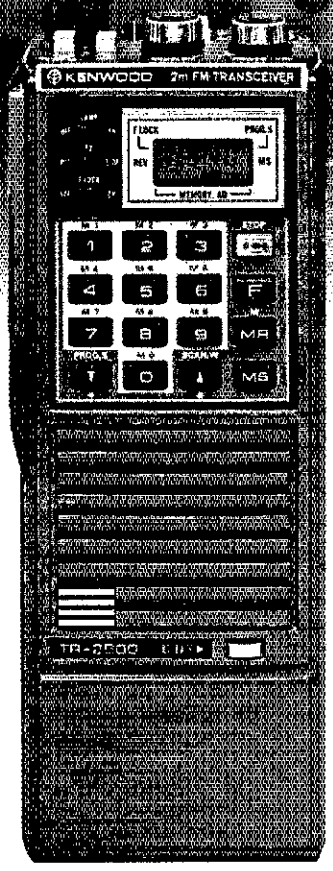
TR-2500

The performance small size, smaller price!

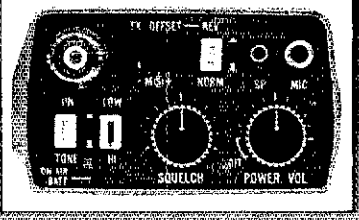


The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.

TR-2500 FEATURES:

- Weighs 540 g, (1.2 lbs), 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches).
- LCD digital frequency readout.
- Ten memories includes "MO" for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output. (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch encoder.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz.

CONVENIENT TOP CONTROLS



- Optional MS-1 mobile or ST-2 AC charger/supply for operation while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

Optional accessories:

- ST-2 Base station power supply/charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/charger/power supply.
- VB-2530 2-M 25 W RF power amps., (TR-2500 only).
- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.

NEW

TR-3500

70 CM FM Handheld

- Covers 440-449.995 MHz in 5-kHz steps.
- Hi-1.5 W, Low-300 mW.
- TX OFFSET switch, ±5 kHz to ±9.995 MHz programmable.
- Auto/manual squelch control.
- Tone switch for opt. TU-35B
- Other outstanding features similar to TR-2500.

- BH-2A Belt hook.
- RA-3 2 m 3/8 λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap.
- EP-1 Earphone.

TR-7950/7930

Big LCD, Big 45 W, Big 21 memories, Compact.

Outstanding features providing maximum ease of operation include a large, easy-to-read LCD display, 21 multi-function memories, a choice of 45 watts (TR-7950) or 25 watts (TR-7930), and the use of microprocessor technology throughout.

TR-7950/TR-7930 FEATURES:

- New, large, easy-to-read LCD digital display. Easy to read in direct sunlight or dark (back-lighted). Displays TX/RX frequencies, memory channel, repeater offset, sub-tone number, scan, and memory scan lock-out.
- 21 new multi-function memory channels. Stores frequency, repeater offset, and optional sub-tone channels. Memory pairs for non-standard splits. "A" and "B" set band scan limits. Lighted memory selector knob. Audible "beep" indicates channel 1 position.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- 45 watts or 25 watts output. HI/LOW power switch for reduction to 5 watts.
- Automatic offset. Pre-programmed for simplex or +600 kHz offset, in accordance with the 2 meter band plan. "OS" key for manual change in offset.
- Programmable priority alert. May be programmed in any memory.
- Programmable memory scan lock-out. Skips selected memory channels during scan.
- Programmable band scan width.
- Center stop circuit for band scan, with indicator.
- Scan resume selectable. Selectable automatic time resume-scan, or carrier operated resume-scan.
- Scan start/stop from up/down microphone.
- Programmable three sub-tone channels with optional TU-79 unit (encoder).
- Built-in 16-key autopatch, with monitor (Audible tones).
- Front panel keyboard control.
- Covers 142.000-148.995 MHz in 5-kHz steps.
- Repeater reverse switch. (Locking)
- "Beeper" amplified through speaker.
- Compact lightweight design.

Optional accessories:

- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.

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NEW

TR-9130

All mode (FM/SSB/CW) 25 watts, plus...!!!

The TR-9130 is a powerful, yet compact, 25 watt FM/USB/LSB/CW transceiver. Available with a 16-key autopatch UP/DOWN microphone (MC-46), or a basic UP/DOWN microphone.

TR-9130 FEATURES:

- 25 Watts RF output on all modes, (FM/SSB/CW).
- FM/USB/LSB/CW all mode. Selectable tuning steps of 100-Hz, 1-kHz, 5-kHz, 10-kHz.
- Six memories. On FM, memories 1-5 for simplex or ±600 kHz offset, using OFFSET switch. Memory 6 for non-standard offset. All six memories may be simplex, any mode.
- Memory scan.
- Internal battery memory back-up, using 9 V Ni-Cd battery, (not KENWOOD supplied). Memories are retained approx. 24 hours, adequate for the typical move from base to mobile. External back-up terminal on the rear.
- Automatic band scan.
- Dual digital VFO's.
- Transmit frequency tuning for OSCAR operations.
- Squelch circuit for FM/SSB/CW.
- Repeater reverse switch.
- Tone switch.
- CW semi break-in; sidetone.
- Compact size and lightweight.
- Covers 143.9 to 148.9999 MHz.
- High performance noise blanker.
- HI/LOW power switch. 25 or 5 watts on FM or CW.
- RF gain control. • RIT circuit.

Optional accessories:

- KPS-7A AC power supply.
- PS-20 AC power supply (TR-9500 only).
- BO-9A system base with memory back-up supply.
- SP-120 external speaker.
- TK-1 AC adapter for memory back-up.

TR-9500

70 CM SSB/CW/FM transceiver

- Covers 430-440 MHz, in steps of 100-Hz, 1-kHz, 5-kHz, 25-kH or 1-MHz.
- CW-FM HI=10 W, Low=1 W. SSB 10 W.
- Automatic band/memory scan Search of selected 10-kHz segments on SSB/CW.
- 6 memory channels.

TR-7730

Dyna-"mite"... miniaturized, 5 memories, memory/band scan.

The TR-7730 is an incredibly compact, reasonably priced, 25 watt, 2 meter FM mobile transceiver, with five memories, memory scan, automatic band scan, plus other convenient operating features. It is available with a 16-key autopatch UP/DOWN microphone, (MC-46), or with a basic UP/DOWN microphone.

TR-7730 FEATURES:

- Dimensions: 5-3/4 W x 2 H x 7-3/4 D, inches. Weighs 3.3 lbs.
- Extended frequency coverage, 143.900-148.995 MHz, in 5 or 10-kHz steps.
- 25 watts RF output power, with HI/LOW power switch.
- Five memories. Simplex or repeater operation, with transmit offset switch. The 5th memory stores receive and transmit frequencies independently, for non-standard splits. Memory back-up terminal on rear panel.
- Memory scan, plus automatic band scan. Locks on busy channel, resumes when signals disappear, or when scan switch is pressed. Scan HOLD or PTT switch on microphone cancels scan.
- UP/DOWN manual scan on microphone, either version.
- Four digit LED frequency display.
- S/RF bar meter. LED indicators for BUSY, ON-AIR, REPEATER operation.
- Tone switch for internal tone encoder (not Kenwood supplied).
- Offset switch ±600 kHz, or simplex. Fifth memory for non-standard offset.

Optional Accessories:

- MC-46 16-key autopatch UP/DOWN microphone.
- SP-40 Compact mobile speaker.
- KPS-7A Fixed station power supply.

TR-8400

Synthesized 70-cm FM mobile rig

- Covers 440-450 MHz, in 25-kHz steps, with two VFOs
- Transmit offset switch for ±5 MHz. Non-standard offset uses fifth memory.
- HI/LOW power switch selects 10 or 1 watt RF output.
- Similar to TR-7730 in other features, including five memories, memory scan, automatic band scan, UP/DOWN manual scan, four digit display, S/RF bar meter, LED indicators, tone switch, and same optional accessories.
- Basic UP/DOWN microphone supplied with unit.

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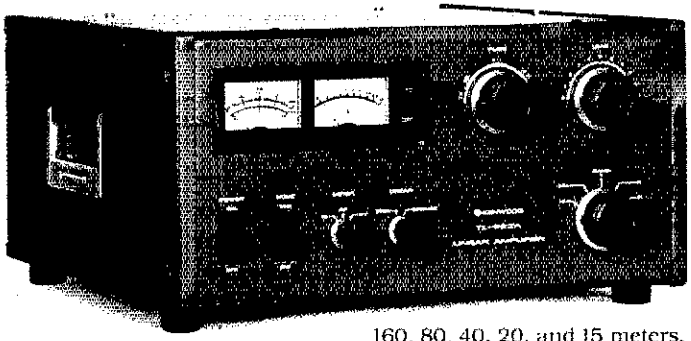
1111 West Walnut, Compton, California 90220



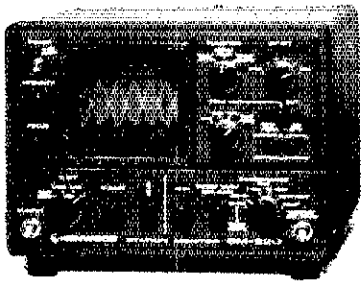
TL-922A

Maximum legal power on 160-15 meters

The TL-922A linear amplifier provides maximum legal power on the 160-15 meter Amateur bands.

TL-922A FEATURES:

- 2000 W PEP (SSB)/1000 W DC (CW, RTTY) input power on 160, 80, 40, 20, and 15 meters, with 80 W drive.
- Excellent IMD characteristics.
- Pair of EIMAC 3-500Z high-performance transmitting tubes.
- Safety protection.
- Blower with automatic turnoff-delay circuit.
- Variable threshold level type ALC.
- Two meters, one indicating plate current, and the other indicating grid current, relative RF output, and high voltage.



SM-220

High-performance oscilloscope for various monitoring functions

The SM-220 Station Monitor provides a variety of waveform-observing capabilities, and an optional pan display.

SM-220 FEATURES:

- Monitors transmitted SSB and CW waveforms from 1.8 to 150 MHz.
- Monitors signal waveforms in receiver's IF stage.
- Functions as high-sensitivity, wide-frequency-range (up to 10 MHz) oscilloscope.
- Tests linearity of linear amplifiers (provides trapezoid pattern).
- Allows observation of RTTY tuning points (cross pattern).
- Built-in two-tone (1000-Hz and 1575-Hz) generator.
- Expandable to pan-display capability for observing the number and amplitude of stations within a switchable ±20 kHz/±100 kHz bandwidth.

Optional accessories:

- BS-8 pan-display module for TS-180S, TS-830S, and TS-820 Series.
- BS-5 pan-display module for TS-520 Series.

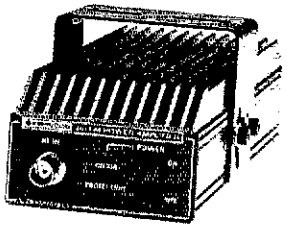
ACCESSORIES

A wide selection of optional accessories is offered for optimum operating flexibility. In addition to the optional items listed with each piece of equipment described in this catalog, the following accessories are also available:

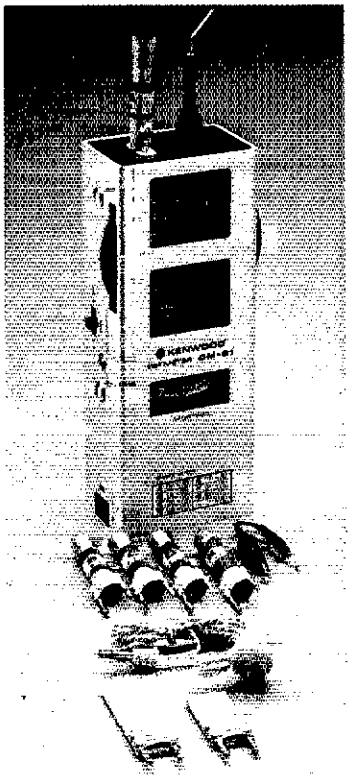
(FCC Part 68 registered)

PC-1A Phone Patch
PC-1A Phone Patch with hybrid circuit and VU meter for null and audio gain measurements.

BO-9A System Base (for TR-9130, TR-9500, TR-9000).
With memory backup supply, speaker sound port, ST-BY switch, power switch, headphone jack.



VB-2530 25 W RF Power Amplifier (for TR-2500).
BNC-BNC cable, and mounting bracket supplied.

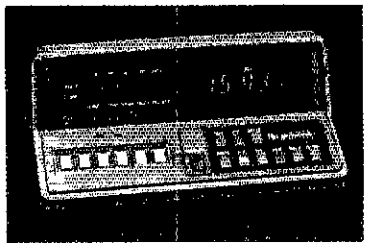


DM-81 Dip Meter

The DM-81 dip meter is highly accurate and features, in addition to the traditional inductive-coupling technique, capacitive coupling for measuring metal-enclosed coils and toroidal coils.

DM-81 FEATURES:

- Measuring 700 kHz-250 MHz in seven bands.
- Capacitance probe for measuring resonant frequencies without removing coil shields, and also for measuring resonant frequencies of toroidal coils.
- Built-in storage compartment for coils, and accessories.
- All solid-state and built-in battery.
- HC-25U and FT-243 sockets for checking crystals and marker-generator function.
- Amplitude modulation.
- FET for good sensitivity.
- Absorption frequency meter function.
- Earphone for monitoring transmitted signals.



HC-10 Digital Quartz Clock
The HC-10 digital world quartz clock with dual 24-hour display shows local time and the time in 10 preprogrammed plus two programmable time zones.

MICROPHONES:

- **MC-60A** Deluxe desk microphone with UP/DOWN switch, pre-amplifier, 50 kΩ/500Ω, 8-pin. Adapter cords PG-4A (4-pin), PG-4B (6-pin), available. PG-4C, supplied with MC-60A.
- **MC-60N4** Deluxe desk microphone, 50 kΩ/500Ω, 4-pin. (UP/DOWN switch, pre-amp. (not included). PG-4C available.
- **MC-50** Desk microphone, 50 k/500Ω, 4-pin.
- **MC-46** 16-key autopatch UP/DOWN microphone, 6-pin.
- **MC-42S** Hand microphone with UP/DOWN switch, 500Ω, 8-pin.
- **MC-30S** Hand microphone, 500Ω, noise-cancelling, 4-pin.
- **MC-35S** Hand microphone, 50 kΩ, noise-cancelling, 4-pin.

Microphone Plug Adapters:

- MJ-48 (4-pin microphone to 8-pin transceiver).
- MJ-84 (8-pin microphone to 4-pin transceiver).
- MJ-86 (8-pin microphone to 6-pin transceiver).

HEADPHONES:

- **HS-5** Deluxe headphones.
- **HS-6** Lightweight headphones.
- **HS-4** Standard headphones.

GENERAL PURPOSE AC POWER SUPPLIES:

- **KPS-7A** 13.8 VDC, 7A intermittent.
- **KPS-12** 13.8 VDC, 12A intermittent.
- **KPS-21** 13.8 VDC, 21A intermittent.

OTHER ACCESSORIES:

- **SP-40** Compact external mobile speaker.
- **RD-20** Dummy load, 50Ω, DC-500 MHz, 50 W intermittent, 20 W continuous.
- **PG-3A** DC line noise filter for mobile.

SERVICE MANUALS:

- Available for most transceivers, receivers, and major accessories.

NOTE: Prices and specifications of all Trio-Kenwood products are subject to change without prior notice or obligation.

KENWOOD
TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

your county have an EC? Check with AB3Q. If not, you are needed. How to publicize Amateur Radio and meet the public, spend some time on the traffic nets. You will be surprised how much most people appreciate receiving these personal messages. Many want to know about this phase of Amateur Radio and how it is done. It is the best way to brag about our hobby. You are needed on all traffic nets. Traffic: N3ADU 319, N3CKQ 228, AC3N 193, K3CR 147, W3OKN 101, WA3QNT 63, W3IQD 50, W3RUL 50, K3SMB 49, KI3C 40, W3EGJ 29, WB3GUK 28, W3MML 24, K3HCT 23, W3KYN 20, W3NGO 18, W3KUN 17, WA3UNX 17, W3TTN 16, N3BKV 15, W3KMZ 15, K3LTV 14, KB3NV 14, W3SN 14, KB3UO 14, N3BKU 13, K3NPW 8, K3TUA 5, N3KB 4, AB3X 4, W3LOD 1. (July) N3WS 15, K3NPX 3, KF3V 3.

CENTRAL DIVISION

ILLINOIS: SCM, David E. Lattan, WD9EBQ — ASCM: K9ORP. SEC: W9QBH. STM: WB9JSR.

Net	Freq	Times/Dy	QNI	QTC	Sess.
ILN	3690	2330/0300 Dy(Z)	499	265	62
Il Phone	3915	2130 Dy	605	130	31
NCPN	7270	1215 Dy	92	44	24
NCPN	3915	0700 Dy	413	93	26
IEN	3940	1400 Sn(Z)	---	9	5
ITN	3705	1900 Dy	---	---	---

D9RN 100%; W9HOT W9NXG WD9WGD WB9ODN, CAND 100%; W9HOT W9NXG WD9WGD. W9VEY memorial station reports 78 QNI and 69 QTC in 5 sess. SEC W9QBH is working on filling in the blanks in the counties left that don't have ECs. Interested? If your county doesn't have an EC, or you don't know who your EC is, contract W9QBH at PO Box H, Riverside, IL 60546. QBH's accomplishments since becoming SEC a little over two years ago have been amazing. Lets ALL help him to keep up the effort by being active in the ARES. The asst. SEC for northern IL, K9ZDN, has been assisting W9QBH by handling the software engineering of computerizing some parts of the weather data operation at Brookfield. The new system is up and running there, and is being considered as a replacement for the mechanical selection which is used in the southern part of the state. KEEP UP THE GOOD WORK! ASCM K9ORP spoke during the three hour workshop on disaster management held for area EMTs. As EC for McLean Co., he explained the role of ARES as it applies to EMTs working a disaster site. He also reports that 15 members of McLean Co. ARES participated in the tornadic storm there that caused two million dollars worth of property damage and destroyed 1000 acres of crops on Aug 24. So IL ARS reports that they are sponsoring a damage assessment class which is being taught for them by the disaster staff of the American Red Cross Bi-State Division office at St. Louis. Interest in this idea came up when local ARES members working on the disaster relief effort at Marion IL were informed by the ARC staff there that hams trained in damage assessment can help cut the ARC response time by as much as 24 hours in a disaster. Many ARES groups have enhanced their comms. abilities by being trained as spotters by the NWS. ARC disaster damage assessment training will help enhance our comms. abilities, such that we can assist them when called upon. Remember that both ARRL and ARC are members of NVOAD. If interested in this contact your local chapter office. REMEMBER: In a disaster PRIOR PLANNING makes the difference. Trying to break into NTS? ILN too fast? Remember ITN is alive and well and living on 3705 nightly at 7 P.M.! WA9RUM reports having a ham radio demo set up in his yard during the local homecoming festivities with help from XYL WB9OVF. Great way to spark some new interest! W9VEY memorial station was used for the passing of traffic to and from the "Old Settlers Days Celebration" this month. Tnx to K9AXS. Traffic: W9HOT 385, W9OK 102, KD9K 82, W9NXG 74, W9TLU 69, WA9RUM 65, K9BVE 52, WA9SHE 42, W9LNQ 32, K9KR 26, K9EHP 13, K9ORP 12, N9DIX 10, K9DQU 6.

INDIANA: SCM, Bruce Woodward, W9UMH — SEC: WB9ZOE. STM: W9JUJ. SOOC: KJ9G. NMs: ITN-W9OYY; QIN-KJ9J; ICN-WD9CSZ; VHF-W9PMT; IWN-N9BHT; IPN-W9WKM; 6SSB-WD9HQJ.

Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2300	2101	402	2193	62
QIN	3656	1430/0100/0400	716	406	2134	92
ICN	3707	0015	---	---	---	---
IPN	3910	2130	1033	117	830	31
IWN	3910	1310	3714	—	720	31
6SSB	50150	0030	296	7	2630	31

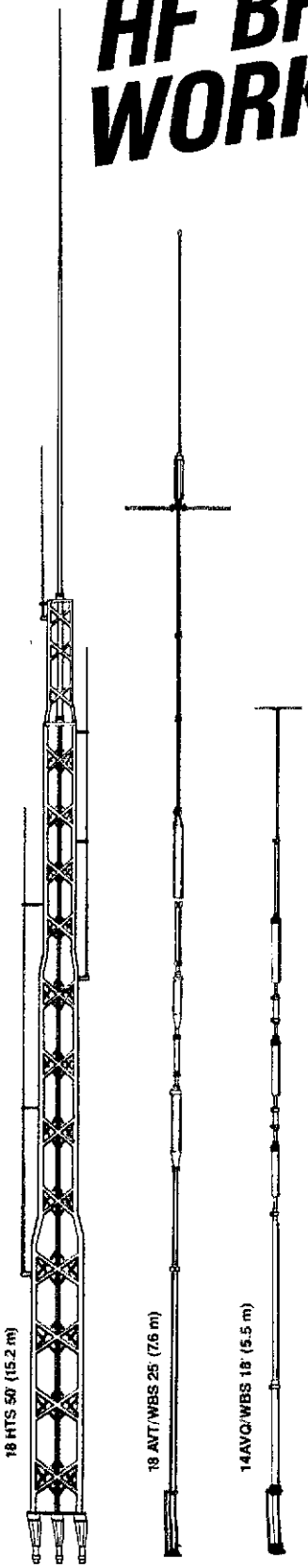
Hoosier vhf nets: QNI 4339, QTC 204, QTR 5596, bulletins 51 for 21 nets. D9RN 100% 361 messages in 62 sess. IN stns W9JUJ K9CGS W9URQ KA9EIV KB9NR. CAND D9RN 100% 826 QTC in 31 sess. IN stn W9JUJ. Appts: NM 6SSB Net-WD9HQJ; SOOC-KJ9G; OO-KJ9G WA9LHP KC9C; OBS-KI9R; ECs-W9SIO for Bartholomew Co., WA9IPS for Montgomery Co., K9ET for LaPorte Co., W9VJX for Randolph Co., WB9SBI for Fayette Co., KA9ENN for Martin Co., K9DGS for Clinton Co. Silent Keys: K9RFY WB9ACI. The Lafayette Hamfest forum was better this year, thanks to W9JUJ WB9ZOE and N9BHT. If you haven't attended one of our forums you ought to. We are getting better and better. I talked at the Clark Co. club meeting. If there was a rating system for clubs they would top the list. Thanks to N9AOJ and N9AST for a fine welcome. I have created one of the new section level appts. this month, SOOC. I fear that trends in Washington are going to make it imperative that we do a more effective job of monitoring what is going on on our frequencies. Thanks to W9DLF's XYL the camper group met for a weekend at Lapel. Included were WD9BKP W9UEM WA9NII K9FHO WA9DPO WA9EIC W9DKP W9AUN K9FVL K9CEG W9URS W9WKM KA9NWS and the Drumms. Yes, I've joined the computer craze. Any Trash 80 color programs would be appreciated. I have a good data base program, thanks to K9JRI, and am updating all records onto tape. I have two cw send programs, thanks to WB9UNG and WB9JKU. What I am running out of is time. Traffic: W9JUJ 1256, KJ9J 206, WB9UYU 184, W9QLW 139, W9EI 111, W9OYY 111, W9URQ 107, KM9B 104, K9FZX 76, WB9ZOE 76, W9UMH 67, WA9OCF 56, KB9HH 56, W9PMT 55, WD9DWD 45, K9WWJ 40, KA9EIV 36, KK9N 35, N9AEI 28, N9PS 28, W9JZV 26, WB9MIK 24, WA9OKK 24, WD9JAA 24, K9DIY 23, W9UEM 22, N9AST 19, KA9FFO 17, WA9OHX 15, W9RTH 15, KK9D 14, W9LKU 13, K9OUP 12, K9FVN 11, K9CGS 9, N9COS 9, W9BDP 5, W9ENU 4, W9XD 4, WA9JNC 3, W9UPI 3, W9YEW 3, WB9AJY 1, W9KNY 1, W9VJX 1. (July) KK9D 17, N9AEI 16, K9OUP 2.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1115Z QNI 1050, QTC 1128 WB9YPY. BEN 3985 1700Z QNI 660, QTC 162 WB9FSM. WSBN 3985 2200Z QNI 980, QTC 329 WD9ESZ. WNN 3723 2300Z QNI 144, QTC 20 KA9HPQ. WSSN 3645

hy-gain®

HF BROADBAND VERTICALS WORK THE WORLD

Hy-Gain broadband vertical antennas load the new auto-tune solid state rigs, require minimal space and provide low angle radiation without the expense or the problems of support structures.

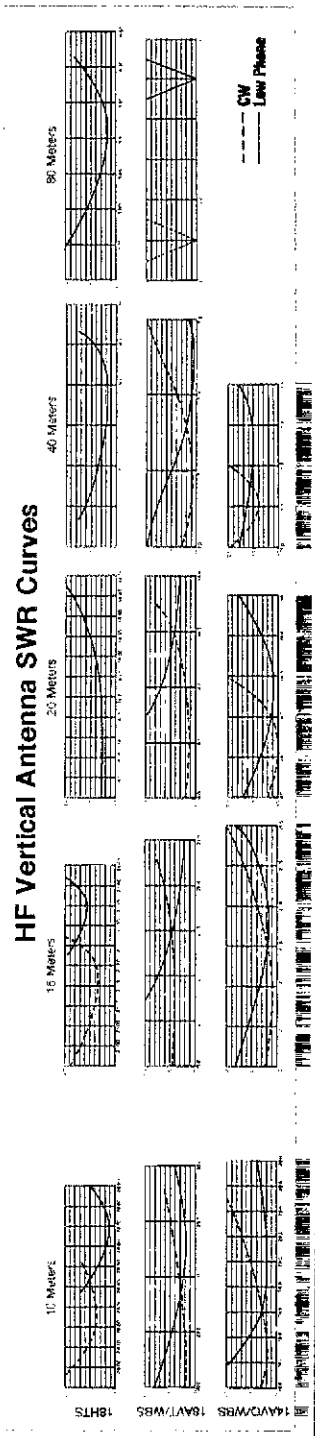


18AVT/WBS (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is dc grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included.

14AVQ/WBS (40-10 meters) Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel.

18 HTS (80-10 meters, 160 meters with optional loading coil) The superb reliability of the 18 HTS is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical ¼ wavelength (or odd multiple ¼ wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended ¾ wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware. WARC kits to be available.

Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware.



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Any two identical Hy-Gain verticals can be phased for excellent gain and directivity. A great system for beam performance on 40, 80 and 160 meters or for 10, 15 and 20 meters where space is limited. Send for our free technical report "Phased Verticals".

Hy-Gain Verticals that work the world at better Amateur Dealers.

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2330Z QNI 152, QTC 43 N9BYK. WIN-E 3662 0000Z QNI 321, QTC 162 W9YCV. WIN-L 3662 0300Z QNI 336, QTC 139 K9LGU. NWTN .34/.94 2330Z QNI 622, QTC 40 WB9YPY Gr. Bay .72/.12 0145Z Wed. QNI 15, QTC 1 WB9NRK. WCWTN .31/.91 2330Z QNI 405, QTC 24 N9AUG. New Novices Baraboo area: KA9NVX KA9NVQ KA9VUG, N9ATP & W9OAK will be sponsoring Amateur Radio at WCDDA at emergency government and coordinators meeting at Wausau. WCWTN certificates at N9DHT WD9AQO KA9HWN N9DDX N9OBE & N9DDW. WB9YSD will be attending UW-Madison. Thanks to all those who donated prizes for the WNA picnic. It's very much appreciated. KA9IRE & KA9IKR are planning to run a class for Novices to upgrade to Tech. or Gen. KA9IRE & KC9QD are involved flying model airplanes. KB9FM is a hot air balloonist. Very interesting. KA9CPA made BPL. New Novice Oconomowoc area is KA9DDH. W9YCV DXCC total is now 133. He has QSOed Europe 3 times through Russian satellite, and has 20 states confirmed through satellites. KA9BGQ & KA9BGR have upgraded. Traffic: KA9CPA 2102, WD9ESZ 375, W9CXY 247, K9GDF 225, W9YCV 212, WB9YPY 169, K9FHI 134, KA9IHR 128, N9BYK 122, KA9HPQ 112, WA9WYS 106, W9IEM 104, K9AKG 99, AG9G 99, W9UCL 97, WD9FRI 96, N9DIH 71, W9CBE 68, KC9CJ 68, W9DND 66, WB9ESM 64, W9SO 61, W9LDO 55, WB9ICH 54, N9AUG 48, K9JPS 44, WB9NRK 44, W9IHW 42, KB9GO 31, WA9ZTY 31, KC9GW 29, KA9GYO 29, WB9JGA 28, WA9YVC 28, KB9NG 27, WB9JSW 26, N9DCF 25, K9HDF 25, W9FDY 24, W9UW 21, WD9BKT 19, N9ATP 17, K9UTO 16, W9SQJ 15, WA9GYF 13, KB9FM 12, KA9IHR 12, WD9IMZ 12, WB9TOC 11, KG9B 10, KA9EWJ 7, N9CP 3. (Aug) W9FDY 49, WA9ZTY 45, KB9BG 42.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — STM: ADØS. SEC: KNØJ. ASCM: KCØT. Congrats to: WBØHOX on her reelection as SCM; KAØOTX on his Novice; NØDUQ KAØKOU & NØDWM, who are new Generals; KCØUN & KCØVD (no jokes please) for new Advanced calls. The Int'l Canoe Classic was held at Anoka, with comms by WDØBQP KKØC NØCSS KNØD WAØDVH KAØHFS KØJE KØOLG & WBØSNP for 4 hours for the 25 miles. St. Paul ARC meets 1st Fri. at Red Cross bldg. They had a fine picnic Aug 1 at the zoo. The Wx net is back, short summer. HI. CU at Dakota convention Sept 16-18. Annual Handi-ham winter hamfest at Faribault Eagles Club Dec. 4. Call WØFIT.

Net	Freq.	Time	QNI	QTC	Mgr.
PICO	3925	12:00 P.M.	2329	273	WØHZU
MSPN/E	3929	5:30 P.M.	1215	217	KCØT
MSPN/N	3945	12:10 P.M.	564	70	WAØAIN
MSN/1	3685	6:30 P.M.	379	171	W9DM
MSN/2	3685	10:00 P.M.	195	78	KØJCF
MSSN	3710	7:00 P.M.	—	—	WBØWXU
MNWX	3929	6:15 P.M.	—	—	WDØCGM

Traffic: WAØTFC 452, WØHKF 356, KBØMB 224, WØHZU 155, KTØU 131, KAØEPY 126, WBØHOX 118, NØCLS 106, KCØT 103, W9DM 91, WØTRW 56, WØMFW 52, KAØJUX 50, KAØIAQ 41, ADØS 41, KØJCF 31, KTØR 30, WØAIN 28, WØOPX 19, W9DRIO 12, NØDUQ 11, KAØGDS 11, KAØMZJ 10, KØCSE 8, KNØJ 8, WDØBGS 7, WBØDJQ 4.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØRWM — SEC: WBØTEE. OBS: WØDM. ORS: WØCAQ. NM: KRØW. Congrats to our new SCM, Dean Summers, KQØC. I hope you all will give him the cooperation you gave me. New callsigns from BARK are NØDYZ NØDYX KCØUP and KAØOUK. NØEAO is publicity chrm for BARK. WBØQHC WAØVGJ and WAØRWM were asked by the local Rotary Club to demonstrate and tell what Amateur Radio can do for the public. WØAUH is now running slow scan. This is my last column, so direct your newsletters to KQØC. Thank you all for making my job easy as SCM.

Net	Freq.	Sess.	QNI	QTC	Mgr.
DARA	3996.5	26	220	24	KRØW

Traffic: KAØFSM 43.

SOUTH DAKOTA: SCM, Fredric Stephan, KCØOO — Leadership and station appts. available. Sioux Falls ARC elected new officers: KØLXE, pres.; W1GMX, v.p.; WØRWE, secy.; NØBOU, treas. Minnehaha Co. ARES was recently formed with 30 participants, lead by WØNRW WBØYQT WAØARS and WB7DRU. Hot Springs ARC have exciting xmtr hunts. Emergency Services Fair in Rapid successful, with WBØPWA WDØHVW WDØBJO KAØNFB KØCXL WØAGG NØCTK KAØIKA WDØEMQ WBØPZO NØCDY KA7DSC KCØWC NØCDX and KAØEER. Good job in uht contest by WØPUF AAØF KØUDZ and WBØLTV. NTS regional phone and cw nets reps were WØKJZ KØFRE WAØTNM WAØAOY and WBØKWX. We need more traffic handlers for DTRN and TEN. SD Mng Net 80 QTC, 814 QNI; WØNEO Net 31 QTC, 961 QNI; WØNJQ Net 25 QTC, 583 QNI; Sun Mng Emg Net 6 QTC, 84 QNI. Traffic: WØHOJ 114, KØAIE 96, WAØVRE 83, WØDVB 56, KCØOO 38, WØKJZ 34, WBØOMF 33, WØMZI 29, WØRWE 10.

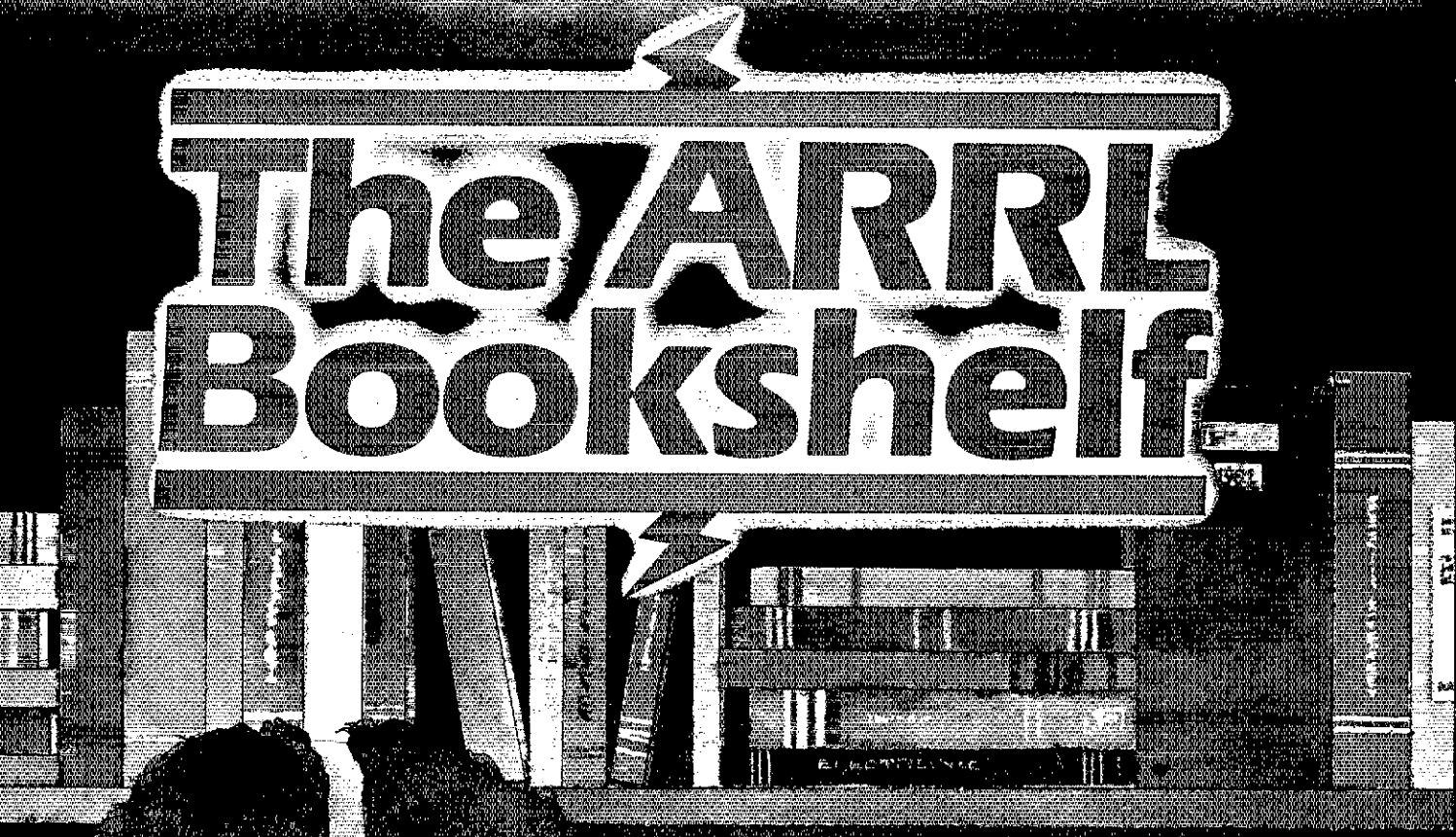
DELTA DIVISION

ARKANSAS: SCM, Dale Temple, W5RXU — SEC: WB5IGF. Net Reports: OZK NM W5MYZ 107 checkins, 13 tfc. Mockingbird NM WA5ZWZ 520 checkins, 17 tfc. Arkansas Phone Net mgr W5QFU 300 checkins, 32 tfc. Razorback Net mgr KC5CE 809 checkins, 44 tfc. AE5L W5TUM WB5GQH W5UWL W4AZJ & W9YCE represented AR 100% on DRN5. Thanks guys. W5KL advises the Jasper rptr frequency will be changing from 146.01/.61 to 146.025/.625 to avoid interference with Jonesboro. Arkansas is losing a fine ham family, that of KB5HV & KB5HW who are moving to Temple, TX. Good luck. Traffic: W5QFU 46, W5UAU 8, W5KL 4.

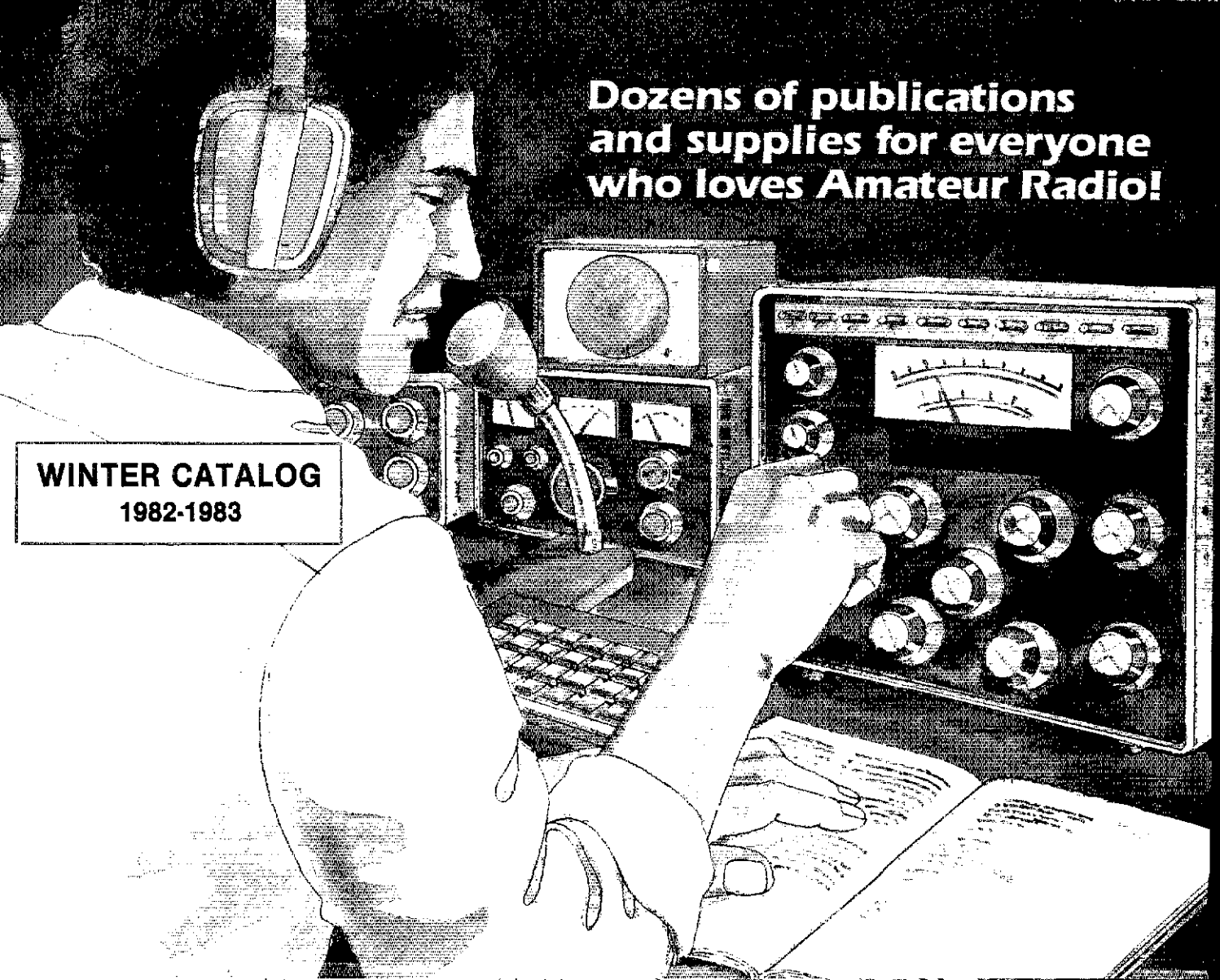
LOUISIANA: SCM, John Meyer, N5JM — ASCM: KC5SF. STM: W5GHP. In 1957 I built a DX-100 xmtr and it worked right off; last month I finished a Heath H-89 computer and it flunked the smoke test. Who said hams get better with age? Hopefully this new addition will speed up section correspondence and other matters. W5GXO, 75 years young and still helping others, had a fine write-up in the local paper on his good deeds. Congrats! K5RSG, avid DXer and DDXA pres., has authored a book on DXing of all things! KA5LLJ drumming up interest around B.R. area for a Sunday net on 144.210 USB, vert. mode at 9 P.M. local. Looks like an Amateur Radio exhibit at the 84 World's Fair is out owing to a need to man a booth 12 hours a day. Any ideas out there? With the heat of summer behind, now is the time to peruse the new *ARRL Antenna Book* and to refurbish the skywires for DXing, ragchewing or perhaps checking into one of the nets listed below; no experience necessary.

Net	Freq. (kHz)	Time	Mgr.
LAN	3610	7 & 10 P.M. Dy	KC5SF
LTN	3910	6:30 P.M. Dy	N5ANH
LSN	3703	7:30 P.M. M-F	WD5CWK

The ARRL Bookshelf



Dozens of publications and supplies for everyone who loves Amateur Radio!



WINTER CATALOG
1982-1983

INSTRUCTION AND LICENSING

- **THE BASIC BOOK OF HAM RADIO** An interest whetter for the would-be ham. Presents many of the interesting facets of Amateur Radio. This publication by the editors of *Consumer Guide*, contains many useful tips for the beginner, a glossary of ham terminology and a description of commercial ham gear. Of particular interest to the CB'er and shortwave listener. Copyright 1978. 128 pages. **$4.95.**
- **LICENSE MANUAL** Every ham needs an up-to-date *License Manual.* Contains complete FCC rules, FCC study outlines and theory needed for upgrading to the Technician/General, Advanced and Extra license classes. You'll find addresses of all FCC field offices, international regulations, information on reciprocal operation in foreign countries, lists of countries permitting third party traffic with the U.S. and Canada, a chart of available Amateur Radio frequencies and an explanation of the new WARC-bands. 182 pages, copyright 1981. (Revised as needed.) **$4.00** U.S., **$4.50** elsewhere.
- **ARRL CODE KIT** Boost your code speed from 5 to 13 words-per-minute quickly and enjoyably. Two C-60 cassettes provide one-half hour of random code characters at 5, 7-1/2, 10 and 13 wpm. The booklet included in this package is packed with proven suggestions and hints for increasing your ability to "copy". Copyright 1976. **$8.00.**
- **ARRL Q & A SERIES** Test yourself before the exam with these pocket-size manuals. Helpful in discovering weak points. Meant to be used in conjunction with other ARRL study manuals. **NOVICE** copyright 1979, 95 pages **$2.00, TECHNICIAN/GENERAL** copyright 1979, 127 pages **$2.50, ADVANCED/EXTRA** copyright 1980, 176 pages. **$3.00.**
- **C-60 CODE PRACTICE CASSETTES** Consist of random code groups and straight text. Tape #1 30 min. at 5 wpm and 30 min. at 7-1/2 wpm. Tape #2 30 min. at 10 wpm and 30 min. at 13 wpm. Tape #3 30 min. at 15 wpm and 30 min. at 20 wpm. Each tape is **$5.00.**
- **TUNE IN THE WORLD WITH HAM RADIO** Over 20,000 persons have used this package as their steppingstone into Amateur Radio. Teaches you all you need to know in order to pass the FCC Novice exam and get on the air! The 60-minute cassette teaches you the Morse Code letter-by-letter and number-by-number. Packed into the booklet are chapters on:

  EXPLORING HAM RADIO: Hams come from all walks of life; age is no barrier; building your own station; a look back in time.

  MANAGING THE RADIO SPECTRUM: The FCC; rules and regulations; the Novice license; licensing classes.

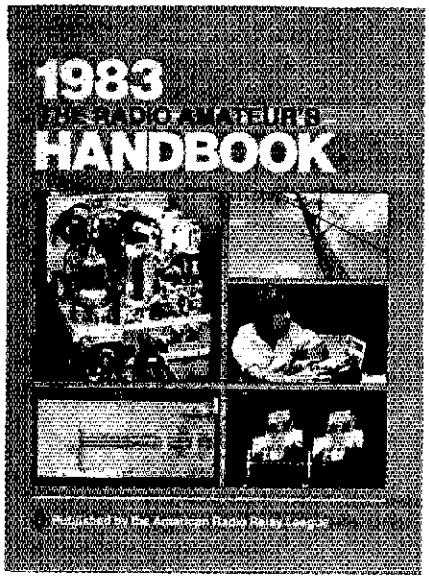
  LEARNING YOUR NEW LANGUAGE: The Morse Code — why every ham knows it; how to learn it the right way.

  UNDERSTANDING BASIC THEORY: Easy-to-learn explanation of electronic theory and what you need to know to qualify for a Novice license.

  SETTING UP YOUR STATION: Choosing a location; how to select your equipment; what antenna to use; glossary.

  OVER THE AIRWAVES PAINLESSLY: How to operate; tuning up; safety; identifying stations in foreign countries; awards; clubs; The ARRL and QST.

  In addition to the 134 pages of text, the booklet contains 26 pages of equipment and publication advertising. Copyright 1981. **$8.50.**



The 1983 Edition of the *RADIO AMATEUR'S HANDBOOK* continues the tradition of presenting the most up-to-date concepts in radio frequency communications. The previous 58 editions can be found in the libraries of engineers, technicians, students and radio amateurs around the world.

Expanded emphasis is given to the use of Amateur Radio satellites including tracking programs. The builder will find a wealth of new construction projects. The following three pages show some of the material added to the new edition and a breakdown of the contents of each chapter.

Chapters included in this big 640-page edition are:

- Amateur Radio
- Electrical Laws and Circuits
- Radio Design Technique and Language
- Solid State Fundamentals
- AC-Operated Power Supplies
- HF Transmitting
- VHF and UHF Transmitting
- Receiving Systems
- VHF and UHF Receiving Techniques
- Mobile, Portable and Emergency Equipment
- Code Transmission
- Single Sideband
- Frequency Modulation and Repeaters
- Specialized Communications Systems
- Interference with Other Services
- Test Equipment and Measurements
- Construction Practices and Data Tables
- Wave Propagation
- Transmission Lines
- Antennas for High Frequency

Projects and topics added to the new Handbook include:

- Code Practice Oscillator
- QSK kW HF Linear Amplifier
- 250-Watt Linear Amplifier Covering 30-m Band
- Two-Tone Generator
- High-Performance ssb Speech Processor
- Simple Switching Regulator
- General-Purpose RTTY Demodulator
- 50-MHz Transmitting Converter
- 8-Band Communications Receiver
- Frequency Spectrum Chart
- Introduction to Packet Radio and Spread Spectrum
- New RFI Chart showing Frequency Relationships Between Amateur Bands (including WARC) and Other Services (including CATV)
- 10 GHz Gunnplexer, Communications
- New Antennas for vhf fm
- Updated Parts Supplier List

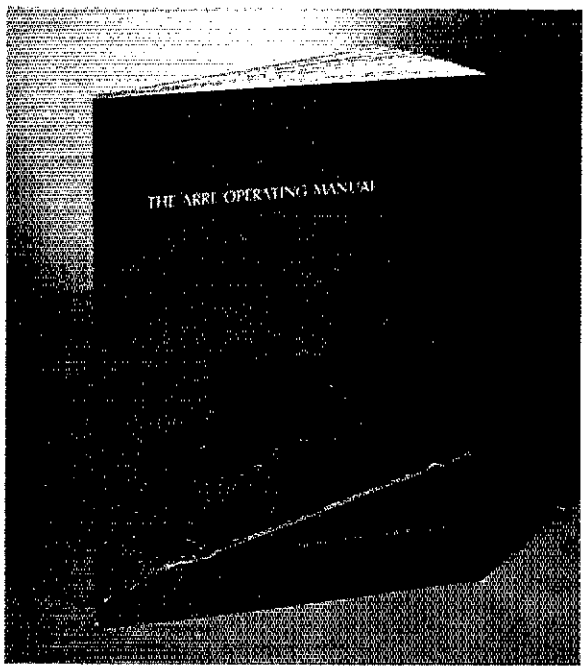
Paper Edition: $12 in the U.S., $13 in Canada, $14.50 elsewhere. Cloth Edition: $17.75 in the U.S., $20.00 elsewhere.

THE ARRL OPERATING MANUAL

We think that this is the finest book on Amateur Radio operating ever written, and the 1980 Edition is well on its way to becoming one of the ARRL's best sellers! Each chapter was written by an expert with extensive on-the-air experience in his or her field. You'll find dozens of useful charts and tables. All facets of operating are covered in a style which shows how fun and rewarding the Amateur Radio experience can be.

Chapters include: Basic Amateur Radio, Rules and Regs, Traffic Handling, Emergency Communications, DX and DXing, Contests, Awards Chasing, FM and Repeaters, VHF/UHF Operating, Satellites, Visual Communications, Microcomputers, and Shortwave Listening.

Contains these important references: 5BDXCC country check-off list with continents, ITU and CQ zones of each country, ARRL Numbered Radiograms, International Call Sign Allocations, Q Signals, CW Abbreviations, RST System, Beacon Frequencies, DX Operating Code, Spanish Phonetics plus much more!



The 1980 Edition is the first in the large (8-1/2 × 11) format and replaces the *Operating Guide* and the three previous editions of the old *Operating Manual. 154 Pages, $5.00in the U.S., $5.50 elsewhere*

GREAT TECHNICAL PUBLICATIONS

SOLID STATE BASICS A complete beginner's course in the theory of solid state devices. Incorporates in 155 pages four popular series from *QST:* Let's Talk Transistors, Learning to Work with Semiconductors, Understanding Linear Ics and Learning to Work with Integrated Circuits. You can learn-by-doing as you construct the simple and useful projects described. Copyright 1978. **$5.00** U.S., **$5.50** elsewhere.

FM and REPEATERS Whatever your interest in fm — repeaters, amplifiers, transmitters, receivers, mobile and portable gear, antennas or accessories — you'll find it covered in detail in the 2nd Edition of this popular book. Includes repeater design, operation, control, and troubleshooting. Also has tips on buying gear as well as projects you can build yourself. Copyright 1978, 175 pages. **$5.00** U.S., **$5.50** elsewhere.

WEEKEND PROJECTS FOR THE RADIO AMATEUR Some of the most popular construction articles which have appeared in the pages of *QST.* You'll find simple converters, preamps, power supplies, test equipment and station accesories. Copyright 1979, 61 pages. **$3.00** U.S., **$3.50** elsewhere.

ANTENNA ANTHOLOGY The best *QST* hf antenna articles and theory presentations. Verticals: 2 and 4 band verticals for the novice, Cheapie GP, High Performance system for 20, 40 and 80, other loaded systems. Yagis: Short antennas, and The Log-Yag Array. Quads: Wire quads for 80 and 40, 2-Element Quad for the Novice, Miscellaneous Antennas: Loops, Delta-loops, Antennas for travel trailers and campers, plus matching devices and antenna test accessories. Copyright 1978, 148 pages. **$4.00** U.S., **$4.50** elsewhere.

ELECTRONICS DATA BOOK Now in one place, all of these needed tables, charts and formulas: Math Aids, Time and Frequency, RF Circuits, L, C, and R Networks, Transformers, Filters, Antennas and Feed Systems plus a Catalog of Solid State Circuits, Construction and testing Data And Data Potpourri. Copyright 1976, 125 pages. **$4.00** U.S., **$4.50** elsewhere.

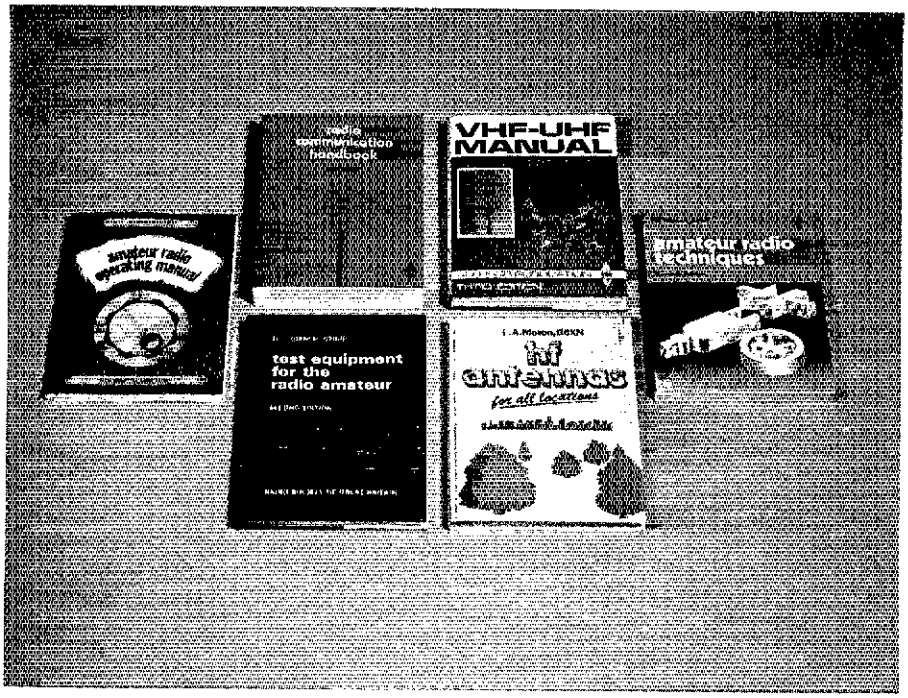
OSCARLOCATOR PACKAGE 10 steps to successful OSCAR communications, station requirements, how to operate, input vs. output frequency charts, orbital plotters, Amateur Radio satellite launch history chart, pictures, telemetry forms, UoSAT educational satellite information, and AMSAT data. **$7.00** U.S., **$8.00** Elsewhere.

SOLID STATE DESIGN Prepared for those who wish to extend their theoretical understanding of these devices and gain experience in their practical application in communications equipment. Includes an extensive appendix and bibliography and these 9 chapters: Semiconductors and the Amateur, Basics of Transmitter Design, More Transmitter Topics, Power Amplifiers and Matching Networks, Receiver Design Basics, Advanced Receiver Concepts, Test Equipment and Accessories. Modulation Methods, and Field Operation, Portable Gear and Integrated Stations, 253 pages, Copyright 1977. **$7.00** U.S., **$8.00** elsewhere.

UNDERSTANDING AMATEUR RADIO Just the book for the newcomer and experienced amateur. Some of the topics contained in this "junior handbook" of interest to the beginner are: how to solder, how to use a VOM, theory needed for the technician/general class FCC exam, proper use of a transmatch, how transmitters and receivers work. The more experienced amateur will find information on how to troubleshoot your equipment, where to buy components, review of electronic basics and useful construction projects. 3rd Edition, Copyright 1977, 217 pages. $5.00 in the U.S., $5.50 elsewhere.

RADIO FREQUENCY INTERFERENCE This book has been prepared to help you slay the RFI dragon. You'll learn the causes of RFI and how to cure it. The 2nd Edition contains a chapter on interference to and from cable television (CATV) systems. Extensive coverage is given to preventing and curing interference to home entertainment devices. 70 pages, copyright 1981. $3.00 in the U.S., $3.50 elsewhere.

HINTS AND KINKS — Watch *QST* for availability of the new volume. Previous volumes are out of print.



PUBLICATIONS FROM THE RADIO SOCIETY OF GREAT BRITAIN

VHF-UHF MANUAL by Dain Evans, G3RPE and G.R. Jessop, G6JP. You will find the the *VHF-UHF Manual* jam-packed with practical theory and construction projects for the region above 30 MHz and extending into microwave regions. In fact there are 70 pages contained in the microwave chapter alone! Receivers and Transmitters for these bands are covered in 181 pages. The balance of this 349-page book contains chapters on Propagation, Tuned-circuits, Space Communications, Filters, Test Equipment, Antennas, and a handy Data section. (Since this is a British publication, there is little coverage of the 6-meter band, but many of the 4-meter band projects can be adapted by the experienced amateur for use on 6-meters.) 3rd Edition. Copyright 1976. Hardbound **$17.50.**

AMATEUR RADIO OPERATING MANUAL by R. J. Eckersley, G4FTJ. Get the British side of operating. Besides such chapters as Setting Mobile, Portable and Repeater Operation, the reader will find information in the Appendices most useful. There are continental and regional maps which show the prefixes assigned to each area and listing of countries showing ITU callsign allocations, callsign systems for each country, notes on foreign amateur operation, address of licensing administration and the name and address of the National Amateur Radio Society. 189 pages. Copyright 1979, 2nd Edition. Softbound **$10.00.**

HF ANTENNAS FOR ALL LOCATIONS by L. A. Moxon, G6XN. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close - spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; The Antenna and its Environment; Single-element Antennas; Horizontal Beams; Verticle Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00.**

RADIO COMMUNICATION HANDBOOK 5th Edition. You probably have the ARRL *Radio Amateur's Handbook* in your library. Now you can have a second source of authoritative radio frequency and electronics information at your fingertips. Contains 23 chapters (778 pages); Principles, Electronic Tubes and Valves, Semiconductors, HF Receivers, VHF and UHF Receivers, HF Transmitters, VHF and UHF Transmitters, Keying and Break-in, Modulation Systems, and RTTY, Propagation, HF Aerials, VHF and UHF Aerials, Mobile and Portable Equipment, Noise, Power Supplies, Interference, Measurements, Operating Techniques and Station Layout, Amateur Satellite Communication, Image Communication, the RSGB and the Radio Amateur, and General Data. Now in one paperback volume. Copyright 1982, **$22.00.**

AMATEUR RADIO TECHNIQUES by Pat Hawker, G3VA. Contains 800 diagrams and 384 pages of circuit ideas and devices which the author has gathered during 22 years of writing the *Technical Topics* columns in *Radio Communication*. It is not a text or handbook, but an idea book — RSGB's version of ARRL's *Hints and Kinks*, but on a larger and more in-depth scale. Copyright 1980, 7th Edition. Soft cover **$12.50.**

TEST EQUIPMENT FOR THE RADIO AMATEUR by H.L. Gibson, G2BUP/. A great addition to the library of the Radio Amateur who builds his own equipment. Beside covering measuring techniques, you wil find a wealth of test equipment which you can build yourself. Construction projects range from simple dummy loads and attenuators to a 150 MHz digital frequency counter and timer. You will find simple signal soures for 1296 and 2304 MHz and 10 GHz. Chapter titles and number of pages devoted to each: Current and Measurement — 23, Frequency Measurement — 23, Wavemeters — 19, RF Power Measurement — 9, Aerial and Transmission Line Measurements — 9, Noise Measurements — 8, Components, Valves and Semiconductors — 12, Signal Sources and Attenuators — 12, Oscilloscopes and Modulation Monitors — 6, Power Supplies — 3, and Reference Data — 8. Copyright 1978, 2nd Edition. Hardbound **$11.00.**

THE HISTORY OF ARRL AND AMATEUR RADIO

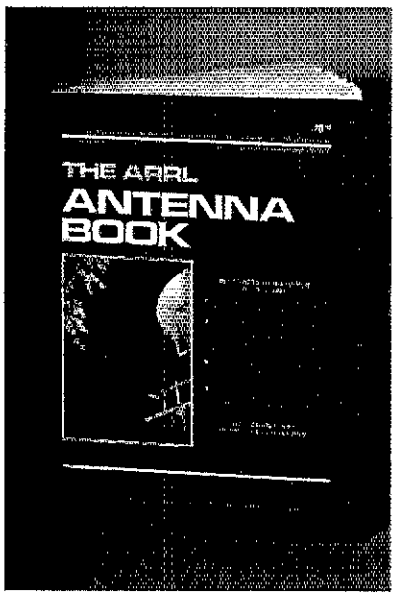
200 METERS & DOWN by Clinton B. DeSoto. Chronicles the exciting evolution of Amateur Radio from the pioneers who perfected the "wireless art" up through the technical advancements of the mid-1930's. Tells first-hand how the A.R.R.L. came about and how the League saved Amateur Radio from certain oblivion during the early years. Copyright 1936 (reprinted in 1981). 184 pages **$4.00.**

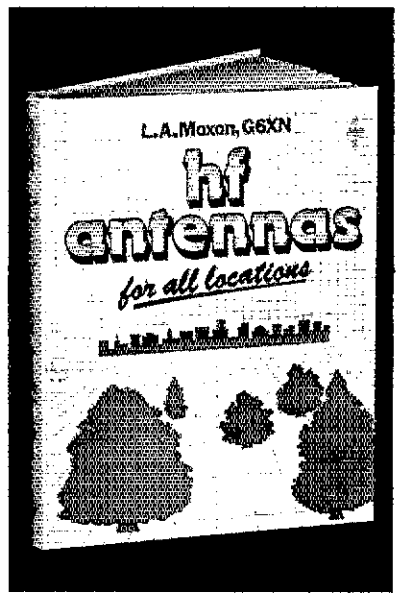
FIFTY YEARS OF A.R.R.L. A reprint of the golden anniversary articles that appeared in the 1964 issues of *QST*. Packed with photographs of old gear. "Old Timers" can relive their own amateur experiences, and newcomers can learn the fascinating tale of Amateur Radio's early years up through the early 1960's. Copyright 1965. 151 pages. **$4.00.**

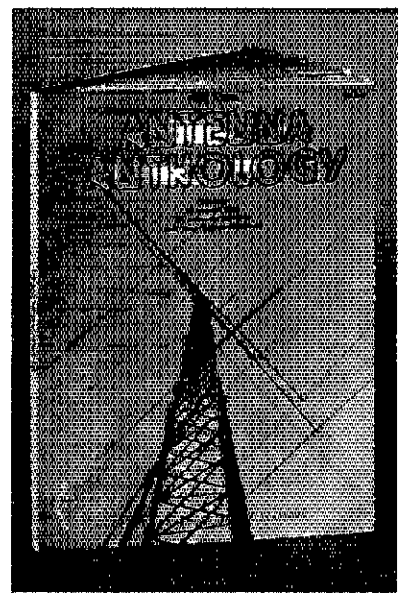
HIRAM PERCY MAXIM by Alice Clink Schumacher. A fascinating biography of the father of Amateur Radio, who was also a car builder, author and inventor. Copyright 1970. 153 pages. **$4.95.**

BOOKS

"A STATION IS ONLY AS EFFECTIVE AS ITS ANTENNA SYSTEM"







THE ARRL ANTENNA BOOK The best and most up-to-date antenna information around. The just revised 14th Edition contains in its 328 pages propagation, transmission line and antenna fundamentals. You can update your present antenna system with practical construction details of antennas for all amateur bands - 160 meters through microwaves. There are also antennas described for mobile and restricted space use. Tells how to use the Smith chart for making antenna calculations and covers test equipment for antenna and transmission line measurements. Over 600,000 copies of previous editions sold. Paperbound. Copyright 1982. **$8.00** in the U.S., **$8.50** elsewhere.

HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; the Antenna and its Environment; Single-element Antennas; Horizontal Beams; Verticle Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00.**

ANTENNA ANTHOLOGY The best *QST* hf antenna articles and theory presentations. Verticals: 2 and 4 band verticals for the novice, Cheapie GP, High Performance system for 20, 40 and 80, other loaded systems. Yagis: Short antennas, and The Log-Yag Array, Quads: Wire quads for 80 and 40, 2-Element Quad for the Novice, Miscellaneous Antennas: Loops, Delta-loops, Antennas for travel trailers and campers, plus matching devices and antenna test accessories. Copyright 1978, 148 pages. **$4.00** U.S., **$4.50** elsewhere.

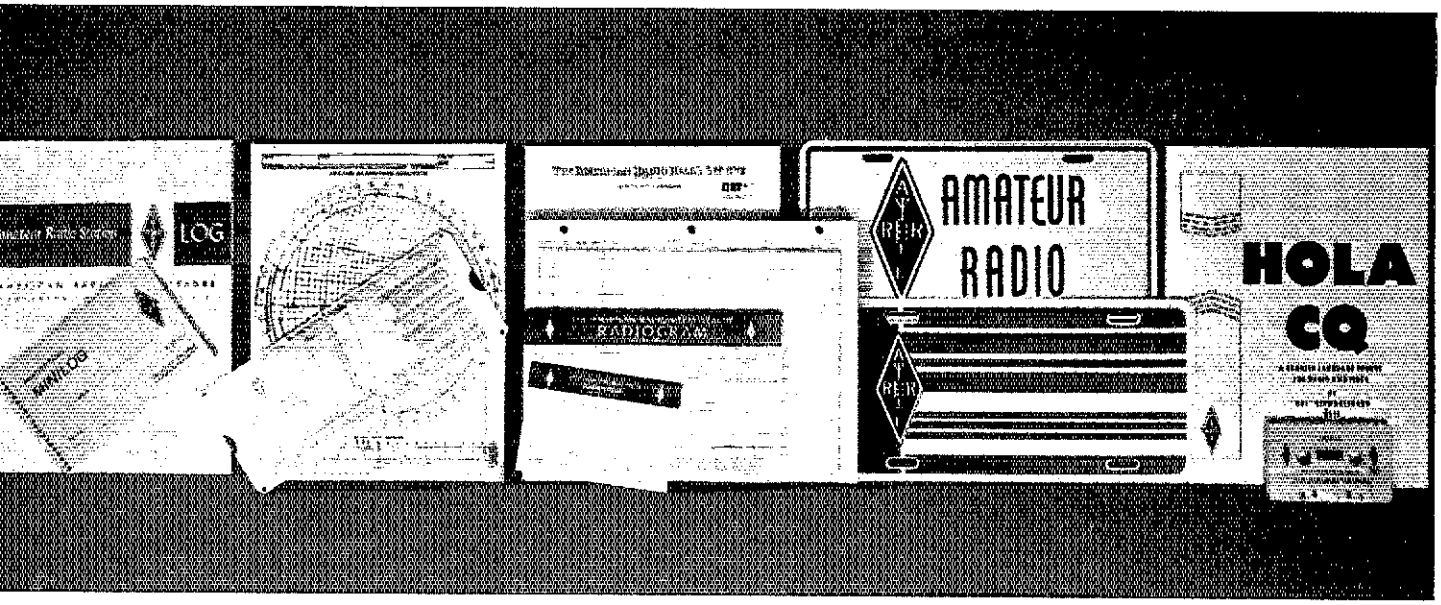
1982

ARRL

REPEATER DIRECTORY

If you use repeaters . . . You've got to get a copy of the ARRL REPEATER DIRECTORY. Available at your local ARRL dealer or direct from ARRL, it's the most up-to-date listing of repeaters you can get. For your operating convenience repeaters are listed by frequency and by state. There are over 6,000 listings on 16, 6, 2, 1 1/4, 3/4 meters and up.

1982 Edition — *$2.00*
5 copies or more, $1.75 each.



SUPPLIES FOR THE ACTIVE AMATEUR

HOLA CQ - Learn to communicate with Spanish-speaking amateurs by using this course. Includes 90 minute cassette and 16 page text. $7.00

ARRL Logs - Keep all the information about your QSO's in one neat place. Meet FCC logging requirements. STATION LOG 8-1/2 × 11, spiral bound $1.75 in the U.S., $2.50 elsewhere. MINI-LOG 4 × 6 for mobile and portable work. $1 U.S., $1.50 elsewhere. LOG SHEETS 96 punched loose leaf sheets $3.00.

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L/C/F CALCULATOR Tells you at the flick of your wrist the number of turns you need for a particular coil. Determining the resonant frequency of a coil or capacitor is a snap. Can be used to solve most common problems involving inductance, capacitance, frequency or coil dimension. $3.00

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MESSAGE DELIVERY CARDS 10 for 0.50

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Lapel Pin	2.50
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3′ × 5′ flag for inside use	21.00

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BUMPER STICKERS 2 titles: "Amateur Radio-A National Resource" and "Amateur Radio-One World, One Language" $2 each. League diamond BUMPER PLATE 2-1/2 × 6 inches with mounting holes: $2.50

QST PROTECTOR!

You have an investment in your copies of QST. Protect this investment with sturdy QST binders.

Binder for QST prior to January, 1976: $6.00 Binder for QST beginning with the January, 1976 issue: $7.00.

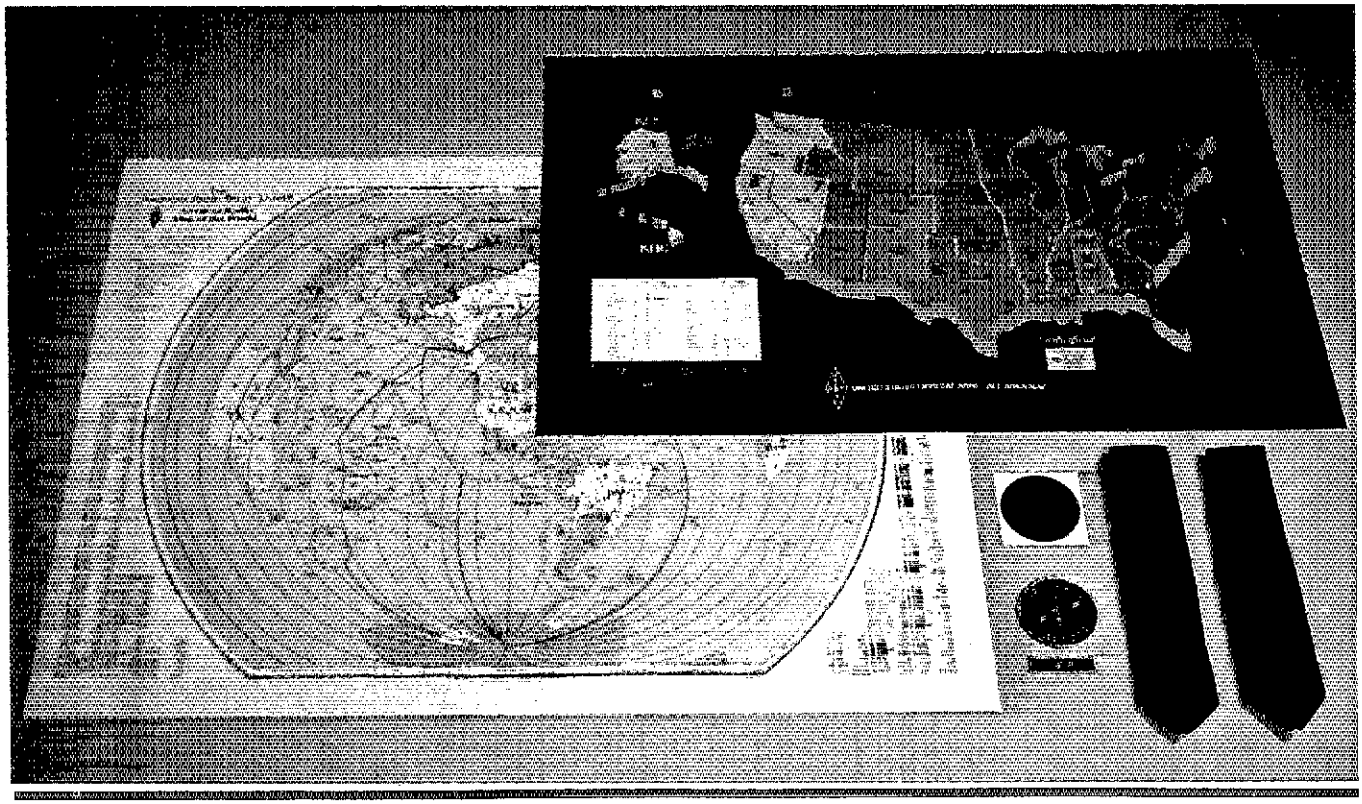
THE LEAGUE EMBLEM

Adopted by the ARRL Board of Directors in 1920.

PIN Gold Border and black enamel background for regular members. League officials and appointees should specify title so that pin with the proper colored background can be provided. $2.50

REPRO PROOF of various size emblems, $2.00 **RUBBER STAMP** or **LOGOTYPE 5/8″** high $2.50 **PATCHES** 3″ high $1.00, 5″ high $2.00.

5/8″ **CHARM** $2.50



MORE MEMBERSHIP SUPPLIES

ARRL WORLD MAP A great circle map centered on the U.S. which shows country boundaries, prefixes, radio districts, and ITU boundaries. Printed in 6 colors by Rand McNally. The countries listing is by prefix and shows country, continent and both ITU and CQ zones. Map size is 30 × 40 inches. Copyright 1980. $4.50

ARRL U.S. CALL AREA MAP A big 24 × 37 inch, full color map that is a show piece for your ham shack as well as a useful operating aid. ARRL divisions and sections are clearly indicated as are time zones, state lines, state capitals and call areas. Also has a useful checkoff list for the 5-band Worked All States Award. Copyright 1977. $3.00.

ARRL TIE Available in either blue or maroon. $12.00.

ARES-THE AMATEUR RADIO EMERGENCY SERVICE EMBLEM Available as a 3-1/2 inch patch for $2.50 or decal; 2 for $0.50 or 5 for $1.00.

LIFE MEMBERSHIP Small patch $1.00, Large patch $1.25. Can be used in conjunction with the ARRL diamond patch. **Replacement pins are available for $2.50. Replacement plaques are $25.00** with a 10 to 12 week delivery.

The American Radio Relay League, Inc.
225 Main St.
Newington, CT 06111

IMPORTANT ORDERING INFORMATION

CHECK WITH YOUR LOCAL RADIO OR BOOKSTORE *FIRST* BEFORE ORDERING. MANY HAVE A COMPLETE STOCK OF ARRL PUBLICATIONS. IF YOU LIVE OUTSIDE THE U.S. YOU MAY FIND ARRL PUBLICATIONS AT YOUR FAVORITE BOOKSTORE, RADIO STORE, OR AVAILABLE FROM YOUR IARU SOCIETY.

Please add $1 per title for each book ordered to help offset postage costs.

Remittance must be in U.S. FUNDS in the form of a check drawn on a bank located in the U.S. or a money order. (Outside the U.S. use an international money order.) VISA or MASTERCARD also accepted.

Orders are normally shipped within 6 working days from receipt. Since orders with remittance are shipped postpaid please allow 3 to 4 weeks time for delivery within the U.S. and up to 12 weeks where orders are shipped via international parcel post or printed matter.

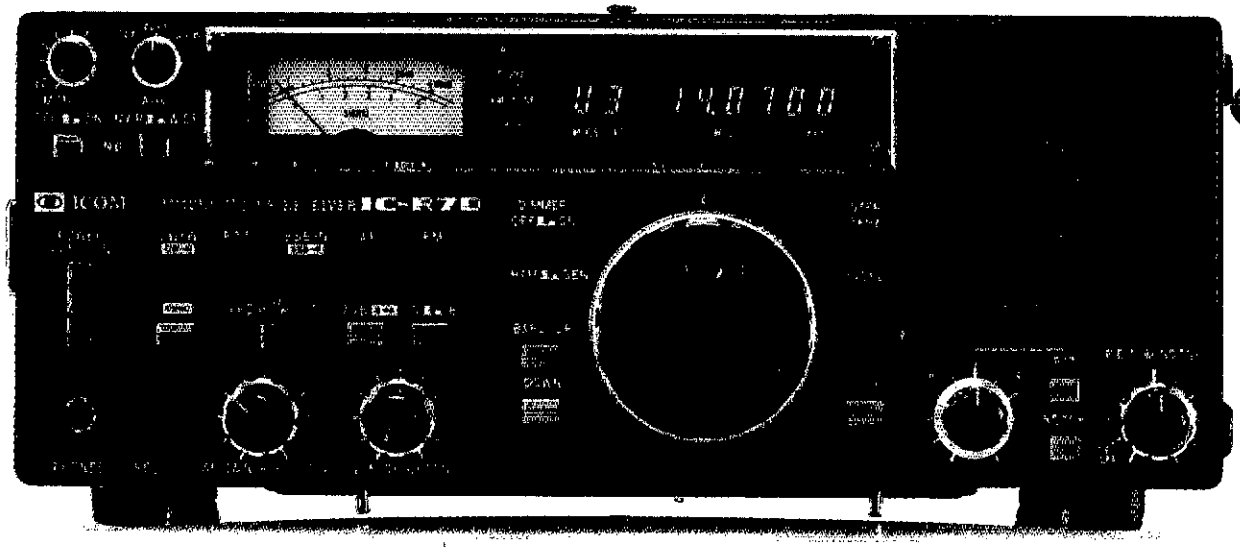
All prices shown are valid until December 31, 1982. Please consult the current issue of *QST* magazine or the order form supplied with the catalog version of the *ARRL BOOKSHELF* for current prices.

Because of the uncertainty of rates, we do not publish the additional cost of shipment via 1st Class, UPS Blue, or Airmail delivery. Please contact us for additional charges for these special services.

IC-R70

NEW!

The Commercial Grade Communications Receiver that everyone has been asking for.....at a price you can afford!



GENERAL COVERAGE RECEPTION AT ITS BEST

Listen to the world of HF with the R70, a 100KHz to 30MHz commercial grade receiver designed by ICOM Incorporated, the leader in advanced receiver design. Built from knowledge gained by designing receivers for commercial, marine, and amateur use, the R70 surpasses other receivers on the market...even receivers costing more than twice as much.

Utilizing ICOM's DFM (Direct Feed Mixer), the R70 is a receiver which in normal usage is virtually immune to intermodulation distortion or cross modulation, yet still maintains superior sensitivity. Whether you are a SWL (short wave listener), Ham (amateur radio operator), maritime operator or commercial user, the R70 provides the features you need.

DESIGN

The R70 incorporates an UP conversion system, utilizing a direct feed mixer proven to be the best design for minimizing interference from strong adjacent signals. A preamp is provided for making the weakest of signals readable. High grade filters in conjunction with the built-in PBT (pass band tuning) system and notch filter, provide the ultimate in interference rejection. Selectable AGC (fast/slow/off), noise blanker (wide or narrow), and tone control improve readability under the worst conditions. An AGC derived squelch, operative in all modes, adds to operating ease.

Dual VFO's with three tuning rates provide quick QSY (frequency change), memory for an important station, or by equalizing the VFO's (A=B), a digital RIT. 13.8 VDC operation is provided as an option, 117 VAC is standard.

HAM'ING

The R70 is an ideal general coverage receiver to complement any ham shack. Use it with your existing transmitter or transceiver to provide dual receiver capability.

The R70's built-in monitor system lets you listen to your own transmitted audio and a mute input automatically protects the R70's receiver from your signal.

An option for FM allows listening to the 10 meter FM activity.

As an additional plus to ICOM IC-720A owners, the R70 has an optional interface that will allow the R70 to control the transmit frequency of the 720A for the ultimate in hamming versatility.

SWL'ING

For the short wave listener, the readout section of the R70 gives all the information for logging a station to be returned to at a later time. Frequency, mode, VFO, signal strength are all displayed. A dial lock prevents accidental loss of a signal.

A front mounted speaker provides 3 watts of crisp clear audio. A record jack allows easy attachment of a tape recorder.

ICOM SYSTEM

Like all ICOM HF products, the R70 fits into the ICOM system concept of accessories allowing you to use previously purchased accessories such as the HP1 headphone, SP3 external speaker, and AH1 auto bandswitching antenna.

PRICE

Check with your local ICOM dealer for pricing on the R70. You will be amazed.

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155**/3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780.**

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

The Dynamic Duo

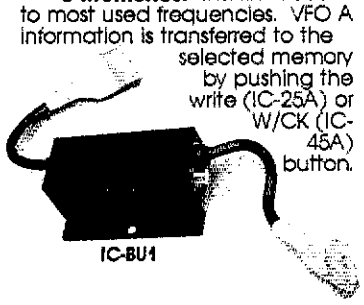
ICOM's 2 Meter and 440 MHz FM

25 watt/5 memories/2 scanning systems in a 2"H x 5½W x 7"D package is what has made the easy-to-use IC-25A the most popular 2 meter FM mobile transceiver ever. Now ICOM presents the second half of its mobile duo...IC-45A. The IC-45A covers 440-449.995 MHz. Both transceivers are supplied with touchtone® microphones standard.

Dual VFO's. Dual VFO's give an extra stored frequency for scanning (memory scan scans 5 memories plus 2 VFO's) and each VFO has a different tuning rate for easy QSY.

	VFO A	VFO B
IC-25A	5 KHz	15 KHz
IC-45A	5 KHz	25 KHz

5 Memories. Instant access to most used frequencies. VFO A information is transferred to the selected memory by pushing the write (IC-25A) or W/CK (IC-45A) button.



Priority Channel. Any memory channel may be monitored for activity on a sample basis, every 5 seconds, without disruption of a QSO conducted on a VFO frequency.

LED Bar Meter. Shows strength of received signal as well as relative transmitter output from the fully protected final RF amplifier. APC (automatic power control) is used to detect SWR and adjust the power output to a safe level.

Simplex/Duplex Operation. Standard 600 KHz offset initializes into radio at turn on. Offset may be changed by pressing the priority button while in VFO operation. Rotating the main tuning knob will now change the offset up or down and the offset will be displayed on the frequency readout.

Adjustable Power Levels.

	Hi Pwr	Lo Pwr
IC-25A	25 W	1 W
IC-45A	10 W	1 W

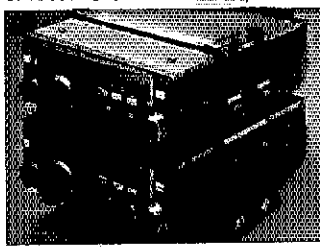
Pulling the squelch knob out places the unit into low power. Both the high and low power may be independently set to accomodate your simplex/repeater requirements or amplifier input characteristics.

Nor/Rev Capability. Use of this button on the IC-25A or the W/CK button on the IC-45A, in the duplex mode, allows one touch monitoring of the repeater input frequency. If simplex operation is possible you will know instantly.

Scanning. Pushing the S/S button initiates the scan circuitry. With the mode switch in a memory position the unit will scan all 5 memories plus the 2 VFO frequencies.

With the mode switch in a VFO position, the unit will scan the entire band or the portion of the band defined by memories 1 and 2. Full band scan or program band scan is selected from the front panel in the IC-25A, internally on the IC-45A.

Both units have internally switched scanning choices of adjustable delay period after a carrier is received then resume scan, or resume on carrier drop.



The Most Compact FM Mobiles on the Market. Fits in the smallest of places. Stackin matching Mobile Mounts for complete mobile communications for your car.

Memory Backup. When th optional IC-BU1 backup power unit is installed on the back of the IC-25A or IC-45A, memory will be maintained while transferring the unit from powe source to power source. If the unit is not removed from powe it will maintain memory even when turned off with or without the IC-BU1.

ICOM

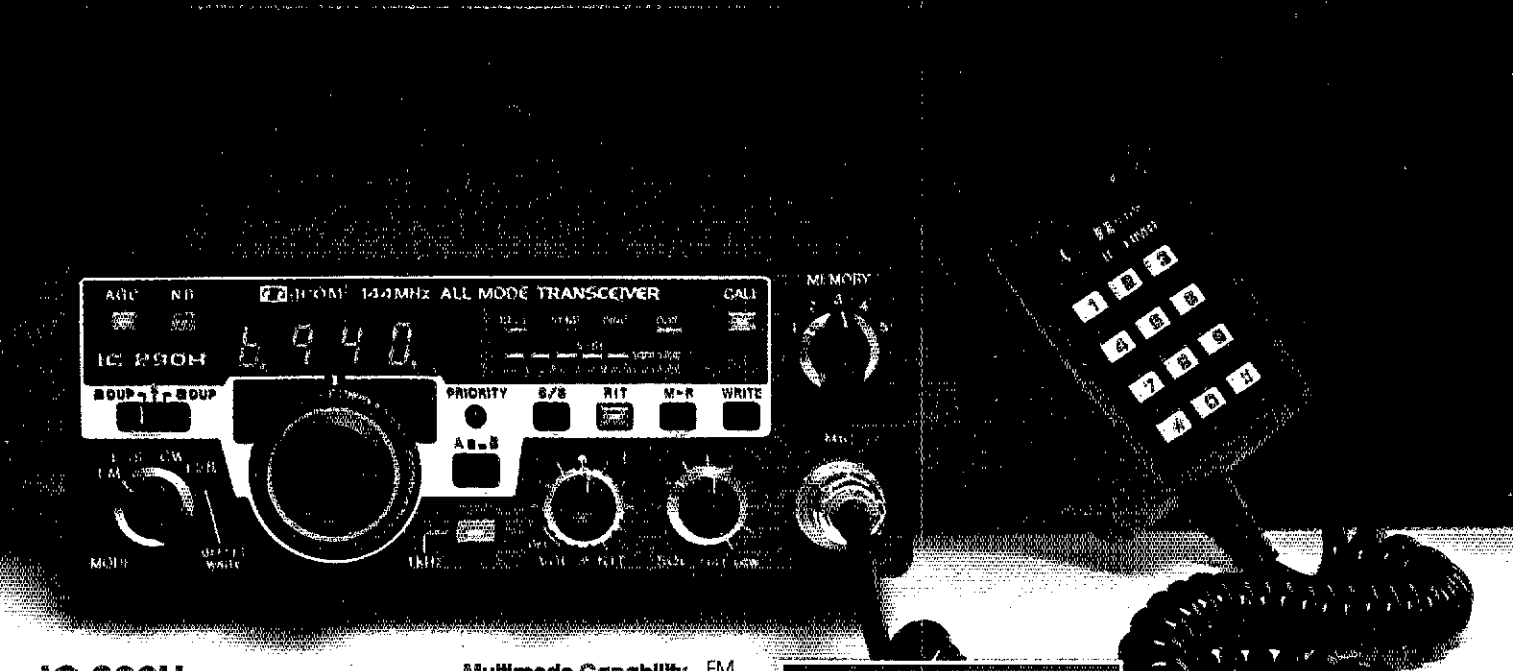
The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 (206)454-8155/3331 Towerwood Drive, Suite 307, Dallas, TX 75234 (214)620-278

Multimode Mobile Magic

IC-290H & IC-490A

ICOM's latest state of the art 2 meter and 440MHz multimode transceivers.



IC-290H

25 Watts of Power. A full 25 watts in all modes gives extra communication range in the IC-290H.

Green LED Readout. For improved readability in bright sunlight.

Dual VFO's. Provide ease in marking frequencies. Tuning rates are 5KHz in FM, 100Hz in CW and SSB, and 1KHz with the tuning speed button pushed.

Priority Channel. Any memory channel can be monitored for activity on a sample basis, every 5 seconds, without disruption of a QSO conducted on a VFO frequency.

Adjustable Power Levels. Both the hi and lo power levels are independently adjustable for meeting simplex or amplifier input requirements.

Squelch in All Modes. Standard noise squelch in FM and AGC derived squelch for CW and SSB reduce fatigue factors and allow scanning silently while looking for band openings or satellite signals.

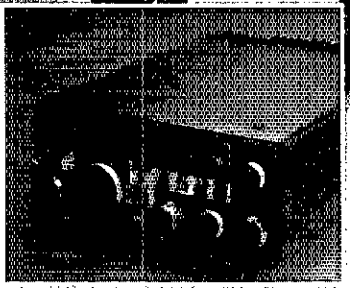
Multimode Capability. FM, SSB, and CW modes provide solid communication modes for repeater, simplex, satellite or the CW enthusiast. Sidetone is provided on CW.

Adjustable Duplex Splits. Offset may be changed from its initial value by pressing the priority button while in VFO mode, then rotating the main tuning knob. The offset is displayed on the frequency readout.

Scanning (S/S). Memory scanning and full or programmable band scan are standard features. Internal switches select busy/empty modes, adjustable delay or carrier operated resume, and full or program band scan.

Memory Backup. The optional, heatsink mounted, BU1 memory backup battery option provides retention of memory when moving the transceiver from one power source to another.

Touchtone® Microphone Supplied. Each unit comes with a touchtone® microphone as the standard unit microphone.



IC-490A

The operational characteristics of the IC-490A are the same as the IC-290H except for the features outlined in the following chart.

		IC-290H	IC-490A
Freq. Range (MHz)		143.8-148.199	430.0-439.999
Power	Hi	25	10
	Lo	1	1
Memories		5	4
Initial Offset		600KHz	5MHz
1MHz Up Button		Not Req'd	Yes
Normal Tuning Rates (KHz)	FM1	5	5
	FM2	Not used	25
	SSB	0.1	0.1
	CW	0.1	0.1

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

The ultimate team...the new Drake "Twins"

The TR7A and R7A offer performance and versatility for those who demand the ultimate!

TR7A Transceiver

• **CONTINUOUS FREQUENCY COVERAGE** — 1.5 to 30 MHz full receive coverage. The optional AUX7 provides 0 to 1.5 MHz receive plus transmit coverage of 1.8 to 30 MHz, for future Amateur bands, MARS, Embassy, Government or Commercial frequencies (proper authorization required).

• **Full Passband Tuning (PBT)** enhances use of high rejection 8-pole crystal filters.

New! Both 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity are standard, plus provisions for two additional filters. These 8-pole crystal filters in conjunction with careful mechanical/electrical design result in realizable ultimate rejection in excess of 100 dB.

New! The very effective NB7 Noise Blanker is now standard.

New! Built in lightning protection avoids damage to solid-state components from lightning induced transients.

New! Mic audio available on rear panel to facilitate phone patch connection.

• **State-of-the-art design** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provided a no tune-up, broadband, high dynamic range transceiver.

R7A Receiver

• **CONTINUOUS NO COMPROMISE 0 to 30 MHz frequency coverage.**

• **Full passband tuning (PBT).**

New! NB7A Noise Blanker supplied as standard.

• **State-of-the-Art features** of the TR7A, plus added flexibility with a low noise 10 dB rf amplifier.

New! Standard ultimate selectivity choices include the supplied 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity. Capability for three accessory crystal filters plus the two supplied, including 300 Hz, 1.8 kHz, 4 kHz, and 6 kHz. The 4 kHz filter, when used with the R7A's Synchro-Phase a-m detector, provides a-m reception with greater frequency response within a narrower bandwidth than conventional a-m detection, and sideband selection to minimize interference potential.

• **Front panel pushbutton control** of rf preamp, a-m/ssb detector, speaker ON/OFF switch, i-f notch filter, reference-derived calibrator signal, three agc release times (plus AGC OFF), integral 150 MHz frequency counter/digital readout for external use, and Receiver Incremental Tuning (RIT).

The "Twins" System

• **FREQUENCY FLEXIBILITY.** The TR7A/R7A combination offers the operator, particularly the DX'er or Contester, frequency control agility not available in any other system. The "Twins" offer the only system capable of no-compromise DSR (Dual Simultaneous Receive). Most transceivers allow some external receiver control, but the "Twins" provide instant transfer of transmit frequency control to the R7A VFO. The operator can listen to either or both receiver's audio, and instantly determine his transmitting frequency by appropriate use of the TR7A's RCT control (Receiver Controlled Transmit). DSR is implemented by mixing the two audio signals in the R7A.

• **ALTERNATE ANTENNA CAPABILITY.** The R7A's Antenna Power Splitter enhances the DSR feature by allowing the use of an additional antenna (ALTERNATE) besides the MAIN antenna connected to the TR7A (the transmitting antenna). All possible splits between the two antennas and the two system receivers are possible.

Specifications, availability and prices subject to change without notice or obligation.

DRAKE

See your Drake dealer or write for additional information.

COMING SOON: New RV75 Synthesized VFO Compatible with TR5 and 7-Line Xcvrs/Rcvrs

• Frequency Synthesized for crystal-controlled stability • VRTO (Variable Rate Tuning Oscillator*) adjusts tuning rate as function of tuning speed. • Resolution to 10 Hz • Three programmable fixed frequencies for MARS, etc. • Split or Transceive operation with main transceiver PTO or RV75

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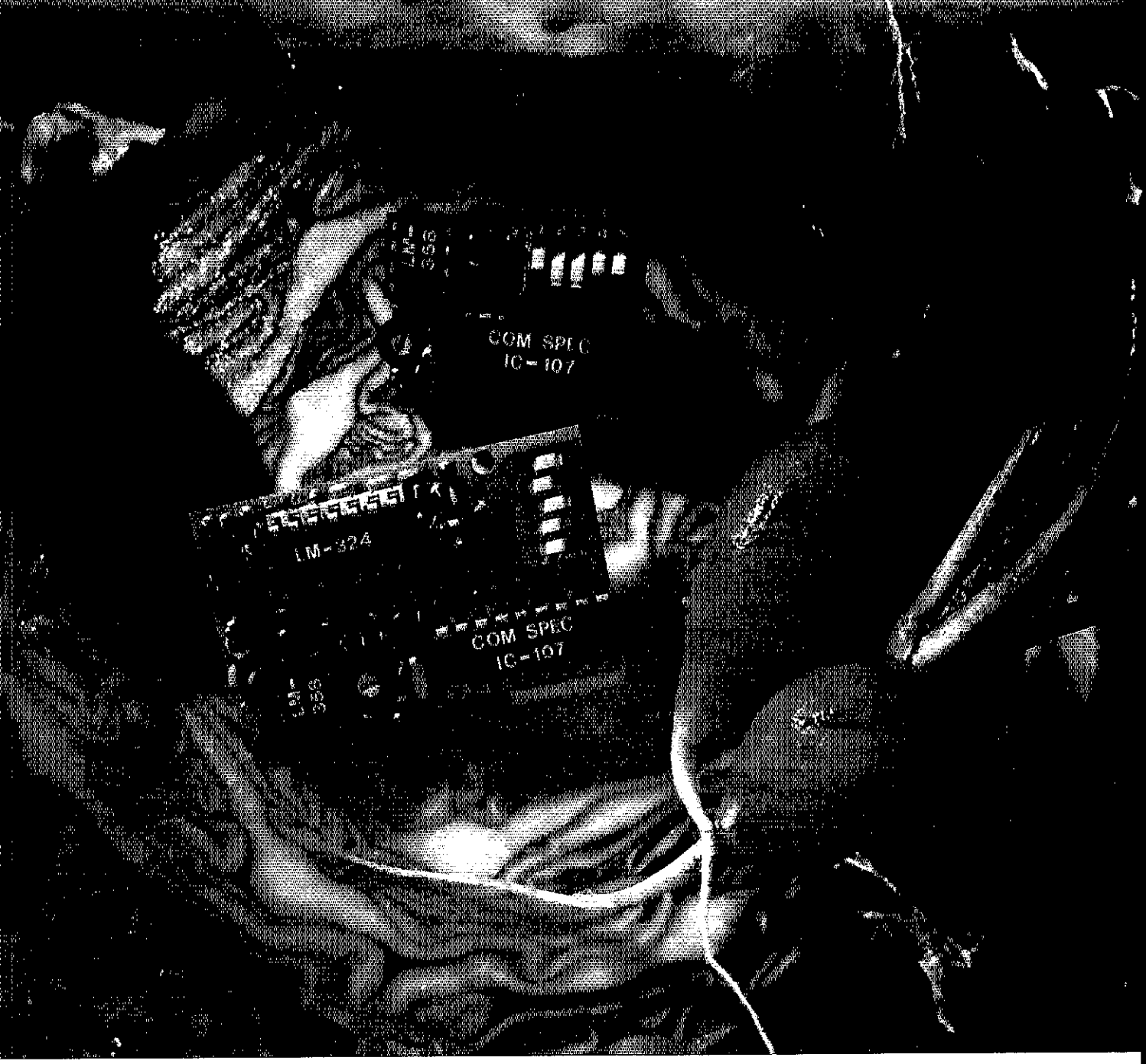
* Patent pendin



A fresh idea!

Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is astonishing ±.1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our TS-32 encoder/decoder may be programmed for any of the 32 CTCSS tones. The SS-32 encode only model may be programmed for all 32 CTCSS tones plus 19 burst tones, 8 touch-tones, and 5 test tones. And, of course, there's no need to mention our one day delivery and one year warranty.

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SS-32 **$29.95**, TS-32 **$59.95**

It's Hard To Be Humble When You're Number One On 2 Meters!

KDK

We wish we could take about ten pages in this magazine and reprint the stacks of rave notes that come back in with the warranty cards from our happy KDK owners. Then again, we wish we could take the space to go on and on about how the many thousands of KDK owners have put us in the number one spot in two meter FM equipment.

Better still, we think that just to show you the picture and give you the specifications and then slyly suggest you ask any KDK owner about the radio, will convince you. If that won't convince you, well, you just can't be convinced of anything!

FM2030

$309

INTRODUCTORY PRICE!
Includes Tone Pad Microphone and all accessories. Shipping: $5.00 eastern U.S.A. $7.50 western U.S.A.

- KDK continues the tradition of being the ultimate in VHF FM mobile operations. We make maximum use of multiple function, multiple shaft controls and only three sets of knobs are located on the front panel. Still many new features have been added, such as digital RIT, reverse button, memory channel readout number and more!
- The new KDK 4 bit microprocessor chip has in-house developed software which makes all these new features possible.
- Modern styled front panel with dials intelligently arranged so you can best utilize the multi-function, easy to handle controls. We gave it a very heavy textured paint finish that is highly resistant to scratching!
- Frequency coverage 143.005 - 148.995 mhz. S/N better than 35 db at 1 uv input. Better than .2 uv at 12 db SINAD. Squelch sensitivity better than .15 uv. Bandwidth at −6db: ±6khz, at −60db: ±16khz. Image ratio better than 70db. Double superhetrodyne. Transmitter uses variable reactance frequency modulation with maximum deviation set at ±5khz.
- RF power is a good, clean no spurious signal of 25 watts on high and 5 watts (adjustable) on low.
- Good audio with the famous KDK audio output capability of 1.5 watts . . . you can't blow out our audio IC!
- Nicads for memory retention built in, nothing extra to buy. Disconnect the FM2030 from the power source and the memories remain!
- Easy to use mobile mount with instant disconnect knobs for fast, simple removal. DC Cable and mounting hardware, spare fuse, external speaker plug and complete simplified instruction book includes circuit diagrams and even complete alignment instructions! No extras to purchase!
- 10 memories in 2 memory banks of 5 each (A&B). Any memory can be changed instantly.
- Control functions: Select memories, show memory channel number, or select memories and show frequency of channel, or dial frequencies with two speed selectable control. Instant choice of either 5 or 100 khz tuning steps. Programmable band scan limits and memory scan.
- Frequency shown in 5 bright LED digits. LED indicator shows when signal is received (unsquelched), LED indicator shows transmit. Modern LED bar meter shows signal strength of received signal and on transmit shows relative output power.
- Microphone includes tone pad, and up and down buttons to change dial frequency or memory channels.
- A standard microphone with up-down buttons only is available separately.
- The FM 2030 is basically as easy to use as a crystal receiver with rotary switch frequency selection for full "eyes-on-the-road" mobile operation.
- And, in case we forgot to mention it, we are proud to continue our famous KDK quality and ruggedness!
- Smaller case size: 55mm (2 3/16") high, 162mm (6 3/8") wide 182mm (7 3/16") deep.

KDK OWNERS! We maintain the only authorized service center for ALL KDK PRODUCTS!

NOW YOU HAVE JUST SOME OF THE FEATURES . . . IT'S UP TO YOU TO DECIDE!

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Your "someday" has come. JRC presents the transmitter/receiver system you have *been waiting for.* A commercial-grade package, it combines advanced radio design with state-of-the-art digital technology. The result: a new standard of excellence in performance, reliability, quality. The exterior elements are designed for efficient operation. The interior components make the real difference.

PLL Digital VFO: Variable Frequency Oscillators (VFO) consist of PLL synthesizers and photo-type rotary encoders.

For frequency stability and accuracy, digital frequency synthesizers are phase-locked with reference crystal oscillator.

Digital Tuning System: The frequency is controlled by pulses generated by rotation of the tuning dial. Up/down switch allows for automatic tuning to a desired frequency while an electrical lock prevents frequency deviation.

Solid State: All circuits use the newest transistors. Integrated circuits assure high reliability and low power consumption.

Modular Design: Plug-in printed circuit boards insure uniform quality, improved reliability. Simplifies maintenance and service.

Built-in Accessory Circuits: All circuits and functions necessary for amateur station operation are provided.

NRD-515 RECEIVER:

Continuous Coverage, All-mode Reception: Continuously covers an extensive range of 100 KHz and 30 MHz and receives in any of the AM, LSB, USB, CW and RTTY modes. Filter/tuning circuits permit reception of LF/MF bands below 1.6 MHz.

Up-Conversion Type Double Superheterodyne: Converts frequencies of 100 KHz to 30 MHz into the first intermediate frequency of 70.455 MHz. Features demonstrate marked improvement on multi-signal and nearby interference characteristics.

Effective Pass-Band Tuning: IF filtering is switchable in 4 steps of bandwidth. This eliminates interference with adjacent frequencies in CW and SSB reception. CW reception is received with a variable BFO.

96-Channel Frequency Memory Unit (option): NHD-18 stores up to 96 channels. Memory manipulation and frequency changes are easily performed. When a channel is selected, the receiver automatically tunes to it.

NSD-515 TRANSMITTER:

When paired with the NRD-515, the transmitting frequency band is automatically selected. Quick transmission also available from frequencies stored in memory unit.

No-Adjustment of All Bands: To eliminate adjustments, the transmitter uses wide-band power amplifiers, low-pass filters, and double-tuned band pass filters extensively.

New Amateur Bands: The transmitter is designed for compatibility with new amateur bands approved by the WARC.

VOX System: Incorporated VOX system is capable of automatically switching to SSB transmission and reception, semi break-in operation in CW mode and CW key monitoring.

Over-Mod Indicator: When over-modulation occurs, LED indicator lights up and alerts operator.

Speech Processor: RF-limiter speech processor uses a crystal filter to eliminate splutter and interference with adjacent channels.

Options: Built-in Antenna Coupler, Power Supply Unit, Microphones, and key.

The NSD-515 Transmitter and the NRD-515 Receiver can be purchased individually or as a complete system. For more information or the name of your local dealer, call our toll-free number: **800-327-5470.**

FLEETMARINE

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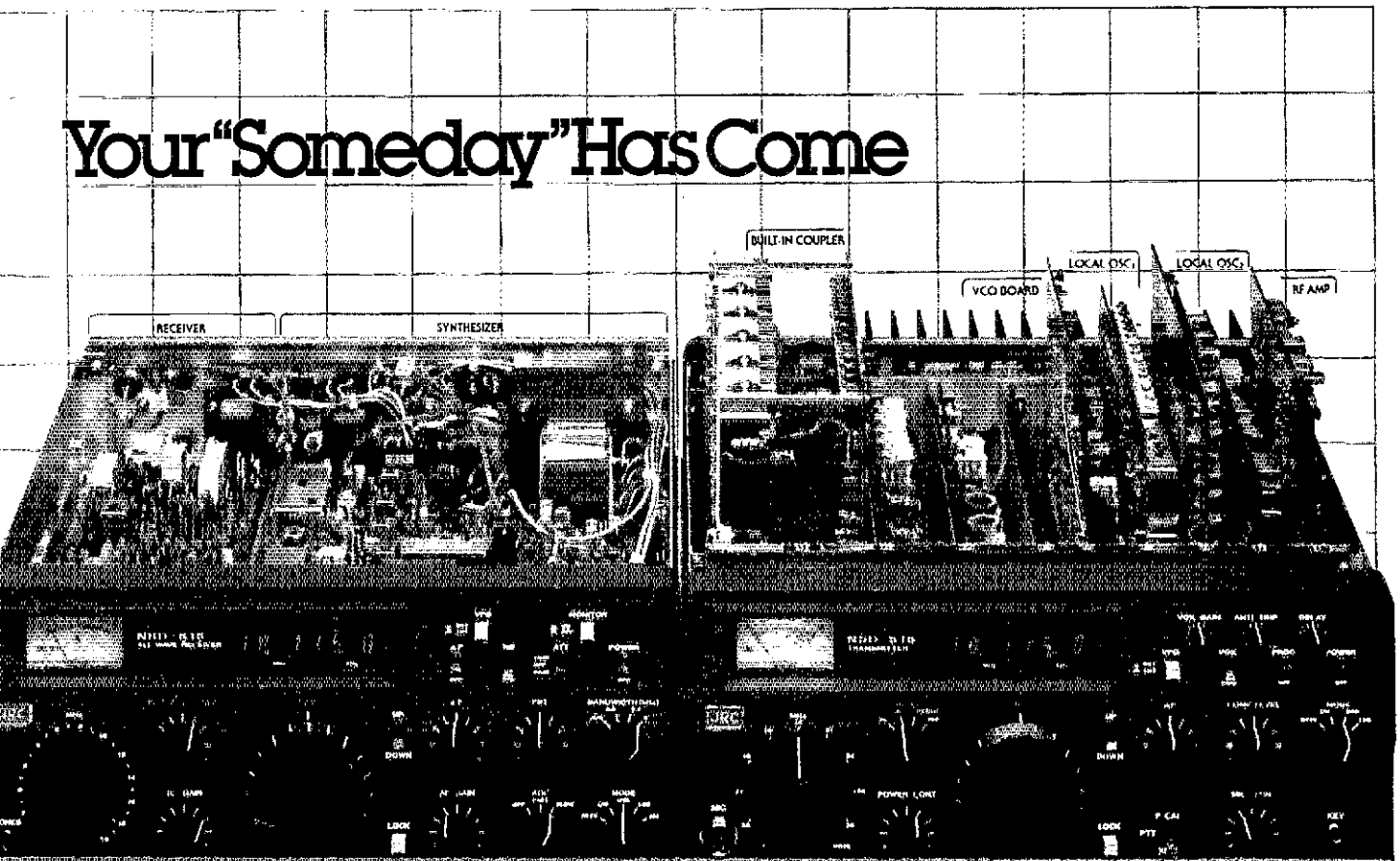
Your "Someday" Has Come



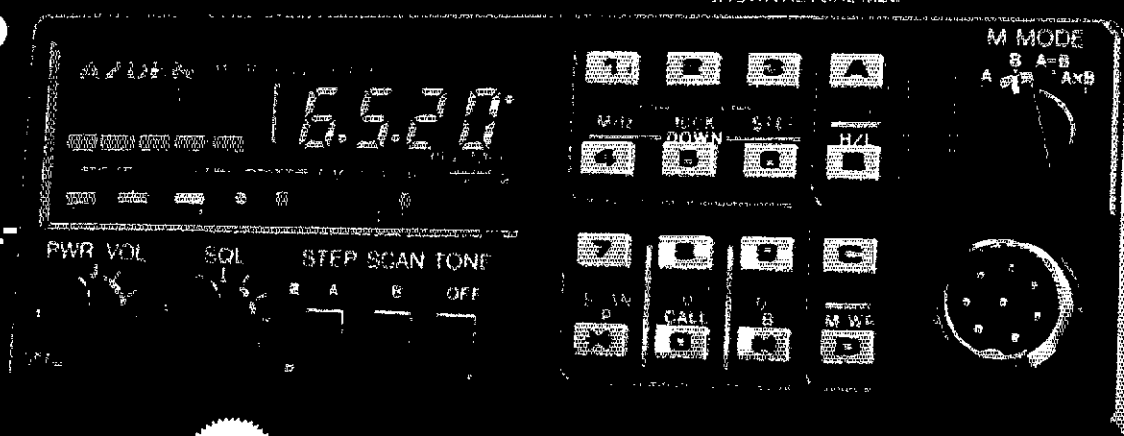
New!

AZDEN PCS-4000

Small-yet so Sophisticated.... so Advanced-there is No Comparison

FEATURES SO UNIQUE AND OF SUCH SUPERIOR COMMERCIAL-GRADE QUALITY, THAT...

SHOWN ACTUAL SIZE



IT CARRIES A 1 YEAR LIMITED WARRANTY!

- **8 MHZ COVERAGE, CAP/MARS BUILT IN:** 142.000-149.995 MHz in selectable steps of 5 or 10 kHz. **COMPARE!**
- **TINY SIZE:** Only 2" H x 5.5" W x 6.8" D! **COMPARE!**
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NON-STANDARD SPLITS:** Ultimate versatility for CAP/MARS. **COMPARE!**
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard offset.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. **COMPARE!**
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. **COMPARE!**
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency.
- **TWO PRIORITY MEMORIES:** Either may be instantly recalled at any time. **COMPARE!**
- **NICAD MEMORY BACKUP:** Never lose the programmed channels!
- **FREQUENCY REVERSE:** The touch of a single button inverts the transmit and receive frequencies, no matter what the offset.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting.
- **PL TONE:** Optional PL tone unit allows access to PL repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and fidelity.
- **25 WATTS OUTPUT:** Also 5 watts low power for short-range communication and battery conservation. (Transmitter power is fully adjustable)
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV for 20-dB quieting. Audio circuits are designed to rigorous specifications for exceptional performance, second to none. **COMPARE!**
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! **COMPARE!**
- **OTHER FEATURES:** Dynamic microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses and hardware are included.
- **ACCESSORIES:** CS-6R 6-amp ac power supply. CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE-YEAR LIMITED WARRANTY!**

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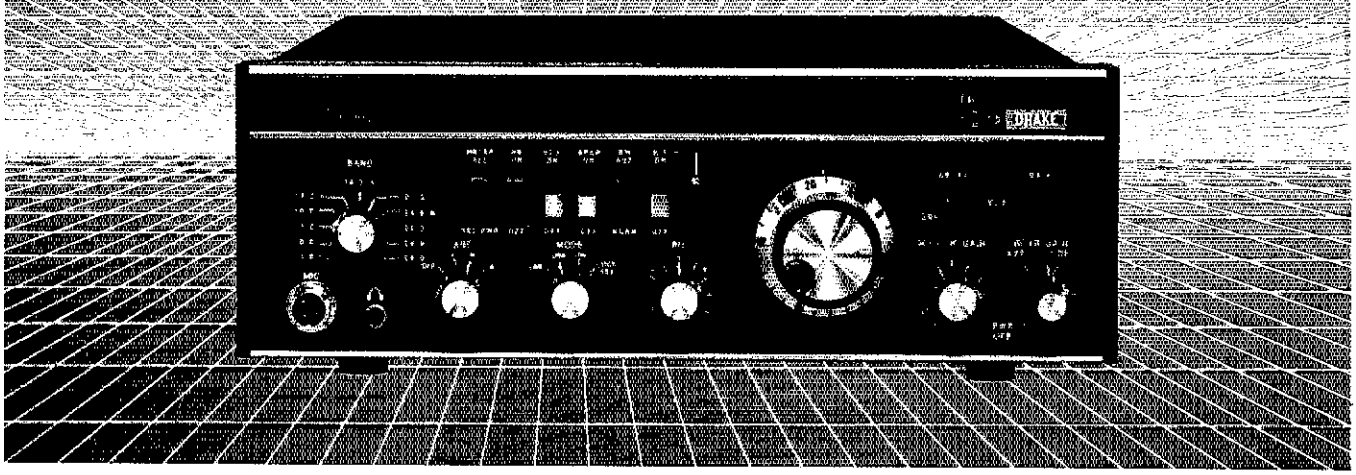


A NEW DIMENSION IN PERFORMANCE

• U.S. Made • Competitive Price • All Solid State • 12V DC • SWR Protected •
• Broadband • No Tune Up • Full Break-in CW • 150 Watts PEP, SSB or CW Input •
• High Dynamic Range • Excellent Sensitivity/Selectivity • Digital Readout •
• 160-10 Meters Plus WARC Bands and MARS Coverage* •

Front panel switching allows independent MODE and optional crystal filter selection.

A passive double balanced mixer is employed in the receiver front end. This stage is preceeded by a low noise high dynamic range bipolar rf amplifier to provide good, strong signal performance and weak signal sensitivity.

Accurate digital readout of operating carrier frequency is displayed to 100 Hz.

A rugged, solid-state PA provides continuous duty in SSB and CW modes. A cooling fan (FA7) is available for more demanding duty cycles, such as SSTV or RTTY. The PA also features very low harmonic and spurious output.

VOX GAIN, VOX DELAY, VOX disable, QSK, selectable AGC time constants, RIT and noise blanker selection are front panel controlled for ease of operation.

The TR5 is designed with modular construction techniques for easy accessibility and service.

GENERAL

Frequency Coverage: 1.8-2.0*, 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 18.0-18.5*, 21.0-21.5, 24.5-25.0*, 28.0-28.5*, 28.5-29.0, 29.0-29.7* MHz. (*With accessory range crystal).

Modes of Operation: Usb, Lsb, Cw.

Frequency Stability: Less than 1 kHz drift first hour. Less than 150 Hz per hour drift after first hour. Less than 100 Hz change for a ± 10% line voltage change.

Readout Accuracy: ± 10 ppm ± 100 Hz.

Power Requirements: 13.6 V-dc regulated, 2 A. 12 to 16 V-dc unregulated, 0.8 V rms maximum ripple, 15 A.

Dimensions:
Depth: 12.5 in (31.75 cm), excluding knobs and connectors.
Width: 13.6 in. (34.6 cm).
Height: 4.6 in. (11.7 cm) excluding feet.

Weight: 14 lb. (6.35 kg)

TRANSMITTER

Power Input (Nominal): 150 Watts, PEP or Cw.

Load Impedance: 50 ohms.

Spurious and Harmonic Output: Greater than 40 dB down.

Intermodulation Distortion: Greater than 30 dB below PEP.

Carrier Suppression: Greater than 50 dB.

Undesired Sideband Suppression: Greater than 60 dB at 1 kHz.

Duty Cycle:
Ssb, Cw: 100%.
Lock Key (w/o FA7 Fan): 30%, 5 minutes maximum transmit.
Lock Key (w/FA7 Fan): 100%.

Microphone Input: High Impedance.

Cw Keying: Instantaneous full break-in, adjustable delay.

RECEIVER

Sensitivity: Less than 0.5 uV for 10 dB S + N/N except less than 1.0 uV, 1.8-2.0 MHz.

Selectivity: 2.3 kHz minimum at – 6 dB. 4.1 kHz maximum at – 60 dB (1.8:1 shape factor).

Ultimate Selectivity: Greater than – 95 dB.

Agc: Less than 5 dB output variation for 100 dB input signal change, referenced to agc threshold.

Intermodulation: (20 kHz or greater spacing) *Intercept Point:* Greater than 0 dBm. *Two-Tone Dynamic Range:* Greater than 85 dB.

I-f Frequency: 5.645 MHz.

I-f Rejection: 50 dB, minimum.

Image Rejection: 60 dB, minimum below 14 MHz. 50 dB, minimum above 14 MHz.

Audio Output: 2 watts, minimum @ less than 10% THD (4 ohm load).

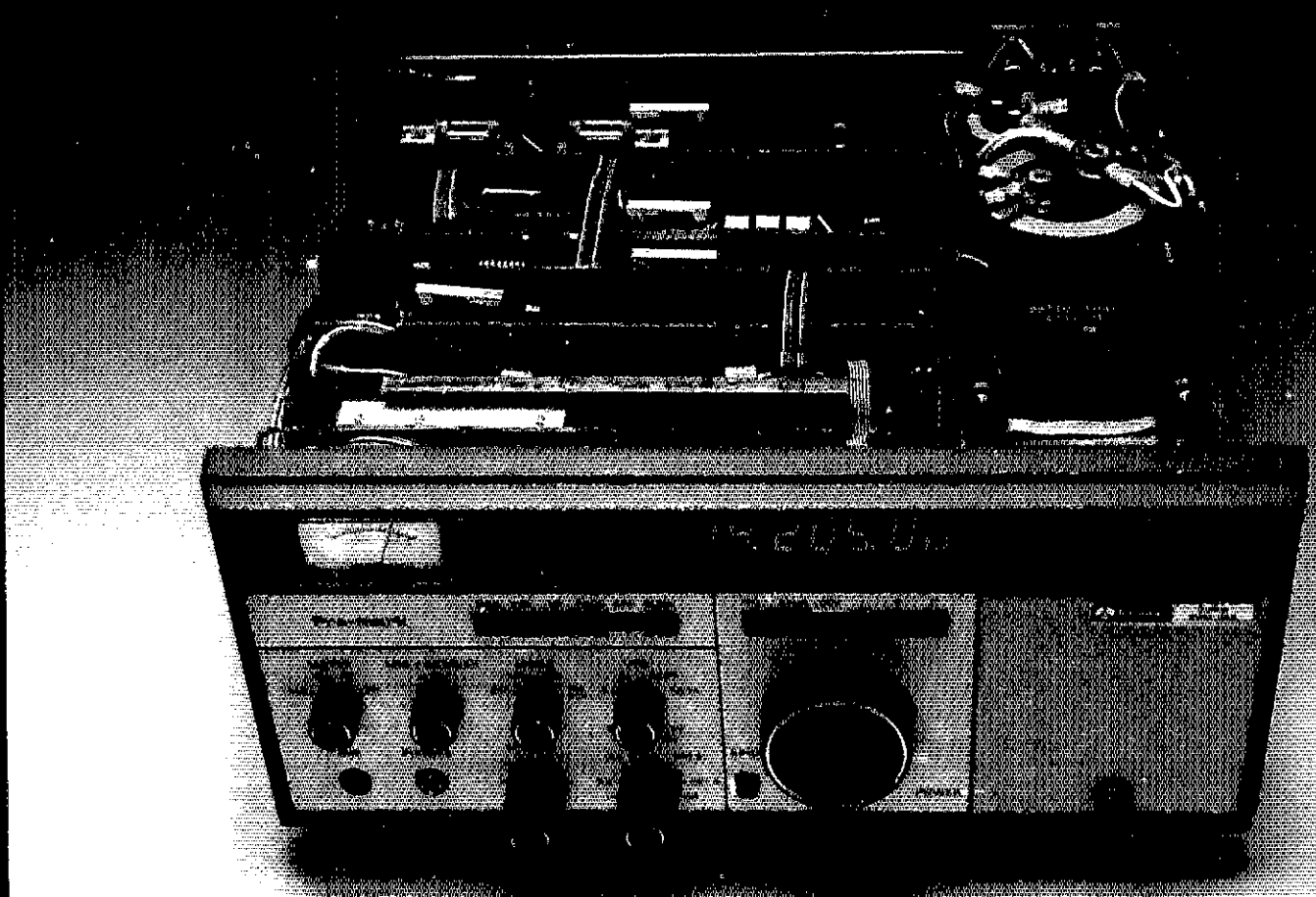
Spurious Response: Greater than 60 dB down.

ACCESSORIES AVAILABLE

Model 7021 SL300 CW Filter	Model 7026 SL4000 AM Filter	Model 1531 MS7 Speaker
Model 7022 SL500 CW Filter	Model 7024 SL6000 AM Filter	Model 1507 CW75 Keyer
Model 7027 SL1000 RTTY Filter	Model 1570 PS75 AC Power Supply	Model 1558 NB5 Noise Blanker
Model 7023 SL1800 RTTY Filter	Model 1545 RV75 Synthesized Remote VFO	Model 7077 Microphone

R.L. DRAKE COMPANY
DRAKE
540 Richard St., Miamisburg, Ohio 45342, USA

The real beauty of the Collins KWM-380 is behind the panel, not on it.



At Collins, we know serious amateurs don't settle for less than professional performance. So we build every KWM-380 to commercial rather than amateur standards. For example, our PC boards are connected by ribbon cables with gold-plated pinfield connectors. The boards themselves are all glass epoxy, and virtually

unaffected by temperature and humidity which cause intermittents in the more commonly used phenolic boards.

Once built, every KWM-380 undergoes 24-hour burn-in, then is aligned and tested to meet or exceed every spec on the data sheet. Which makes us very confident about warranting your KWM-380 for one full year.

The result is a radio with superior performance and lasting quality, not front-panel glitter. Frequency stability is just one example of its beauty: typically, drift is as low as 10-12 Hz per hour for normal ham shack environments. Other companies haven't matched our performance because they don't match our quality behind the panel.

Add some real beauty to your station. See the KWM-380 at your nearest authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, IA 52498. Phone (319) 395-5963. Telex: 464-435.

Rockwell International

...where science gets down to business

RIGHT AWAY YOU CAN SEE THE DIFFERENCE

With a suggested retail price of $[illegible] the Ameritron AL-80 is one of the lowest priced kilowatt amplifiers in America. Stop at your dealer's and take a look. You will instantly see the kind of features that make the AL-80 so different.

- Extremely compact size measures 12" W x 6.8" H x 11.8" D.
- For CW and traffic enthusiasts the AL-80 is the only amplifier in its price range to offer QSK full break-in.
- The AL-80 incorporates the most rugged amplifier tube, the 3-500Z.
- Individually tuned pi network, broad-banded tuned input providing a perfect 50 ohm resistive load to the transceiver.
- Complete coverage of the new WARC bands.

With the lower sunspot activity, now more than ever your signal will need a shot of adrenalin from the AL-80. *It can actually make legal limit exciting!*

AL-80 Specifications and Features:

Frequency coverage: 1.8-21.5 MHz amateur bands.

QSK: full break-in CW

Drive requirements: Typically 65W PEP on SSB and [illegible] on CW

Input impedance: 50 ohms, [illegible] network type.

Output impedance: adjustable pi network, matches 50-100 ohm loads with SWR of 2:1 or less.

Intermodulation distortion products: in excess of −35 dB below PEP

Power requirements: 240 volts 50/60 Hertz 10 amperes or 120 volts 50/60 Hertz 20 amperes

Tube: one 3-500Z, tube included with amplifier.

Dimensions: 12" W x 6.8" H x 11.8" D.

Weight: [illegible] lbs.

One Year Limited Warranty

Specifically exceeds FCC regulations.

Suggested retail: $[illegible]

AMERITRON inc.

18 Maple Drive

[illegible]

LRN 3587.5 6:30 P.M. Sn W5GHP
Traffic: W5LQ 243, W5GHP 229, K5TL 218, KA5HDT 184, KC5SF 163, W5VMY 101, WD5JFY 40, WB5LBR 40, AC5R 33, N5ANH 22, KD5MA 13, K5WOD 12, WD5CWK 10. (July) W5VMY 55, WD5JFY 21.

MISSISSIPPI: SCM, Paul Kemp, KW5T — SEC: N5DDV. STM: KB5W. Congrats to upgrades: Tech KA5OSH, Gen. N5EUE. New calls: KA5EDW now NA5Y, N5EPF now NA5P, K5GVG appointed DEC for Southern District. JARC in Jackson needs comm support to aid Red Cross with comms at the ballgames in Memorial Stadium. For details contact KW5T AD5O or N5DDV. This is a chance to develop techniques and see the football games. N5DDV requests anyone interested in working in areas of emergency comms to contact him. CAND (W5KLV) 31 sess., 825 QTC. DRN5 (WB5YDD) 31 sess., 367 QTC. MTN (K5OAF) sess. 31, QNI 161, QTC 67. MSBN (N5DSK) sess. 31, QNI 2179, QTC 71. CAEN (KA5AGD) sess. 5, QNI 128, QTC 2. GSEN (KB5W) sess. 22, QNI 407, QTC 26. MSN (N5ERX) sess. 18, QNI 122, QTC 7. MTN/2 (K5OAF) sess. 22, QNI 23, QTC 30. Traffic: KB5W 432, N5AMK 324, K5OAF 185, N5RN 60, W5HKW 41, W5WZ 40, W5LSG 31, KT5Z 20, N5XA 1.

TENNESSEE: SCM, John C. Brown, NO4Q — STM: K4YOL. SEC: K4TKQ. Looks like the section has been a bit lax in covering the DRN5 net. Note that we just had a representation of 84% for the period. We usually run about 100%, so if you would like to be a DRN5 rep, contact your STM or SCM. If you meet the net and the scheduled rep is not on freq., pick up the traffic and not let it be held over for the next schedule. A review of the fall issue or supplement of the 1982 Callbook reflects a lot of activity on recruiting new amateurs and upgrading as has been indicated before. There was a total of 573 actions, of which at least 80% were the calls of new amateurs. That is the result of some hard work on the part of some instructors in the various clubs and also of some singular efforts. Keep up the very fine work and many thanks for the FB effort. Hope many will decide to swell the ranks of the ARRL by a like amount. The additions to the new section staff, or at least part, will be named in the next report. The TSN Honor Roll for this period is N4EFB NG4J N4GJX KA4PWU WA4UCE NS4X NO4Y & W4ZJY. Congrats and keep up fine work. The TSN is getting a new net manager, WC4M, as N4EFB is to devote full time as a student, which is FB action when that time is about. The TN section of RTTY net will be back on 3.625, and is looking for lots of action if you are so inclined. Traffic: NG4J 791, W4WXH 434, W4ZJY 410, NO4Y 168, W4DDK 144, K4WOP 81, K4VM 46, KE4XA 45, KA4BSG 33, W4TYV 27, NS4X 24, NM4W 23, KE4OL 19, W4PFP 18, K4ON 15, W4EWR 8, KE4EO 2, KA4USF 2, W4DPO 1.

GREAT LAKES DIVISION

KENTUCKY: SCM, Dave Vest, KZ4G — STM: KA4GFU.

Net	Freq	Time/Day	QNI	Tfc	Sess.	Mgr.
KRN*	3960	0630 M-F	448	33	27	WA4IUW
MKPN*	3960	0830 Dy	1147	108	31	WA4JTE
KTN*	3959	1900 Dy	1039	108	31	WD4BSC
KNTN	3727	1900 Dy	422	99	40	KB4OZ
KTN*	3600	2000 Dy	204	89	31	K4JLX
KSN*	3600	2200 Dy	232	82	31	KC4WN

Other public service nets reporting: KEN, BARES, CCEN, CARN, 13ARES, 11ARES, 5ARES, 4ARES, 3ARES, KYPON, PAWN, PAEWTN, SEKEN, TSTMN, WARES, LCAN. Totals: Sess. 135, QNI 1634, QTC 191. D9RN 100%. PSHR: KA4GFU KA4SAA KB4OZ KA4BCM KD4TY WD4BSC WA4JTE KA4MTX. WA4JDJ & K4AVX have new Novice class in Hazard. WA4IUW new ORS. New officers RCARA: KM4Q, pres.; WB4TAT, v.p.; KA4MGN, secy.; KA4MBF, treas. WA4JTE is new manager of D9RN. Happy Thanksgiving. Traffic: KA4GFU 163, KA4SAA 149, WA4JTE 137, WA4YPQ 122, KA4MZY 110, KB4OZ 87, WD4IYI 76, NV4Z 74, WD4BSC 68, K4MHL 66, KA4BCM 62, W4WQV 53, WB4NHO 41, KS4V 40, K4JLX 38, WA4GAL 27, N4GD 27, K4HOE 27, KA4MTX 25, WA4AVV 22, KD4TY 20, W4PKX 19, WB4AUN 14, NW4P 14, WD4CJO 13, WD4COF 12, K4DZM 11, NZ4L 10, KA4GBZ 9, W4RHZ 9, WA4JAV 8, WA4SWF 8, KZ4G 7, K4AXE 6, NN4H 6, WB4PSP 5, WA4SAC 3, K4AVX 2.

MICHIGAN: SCM, James R. Seeley, WB8MTD — ASCM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. DECs: K8BTH N8GUH WD8IXZ WD8MBB W8VWY. NMs: WA8DHB N8DSW K8LNE K8KMQ WD8LRT WA8PIM W8SCW KV8U WB8YDZ W8YIQ K8ZJU.

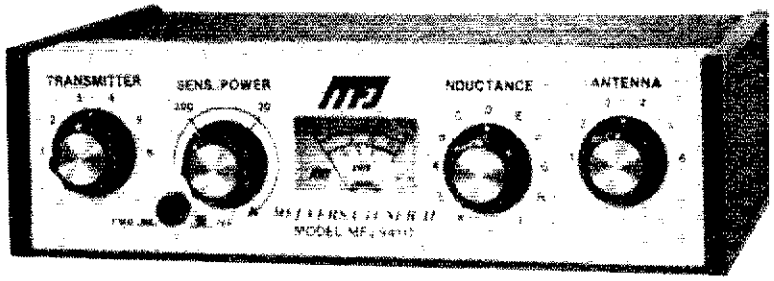
Net	Freq	Time/Day	QNI	Tfc	Sess.	Mgr.
MITN*	3953	1900 Dy	672	420	31	WD8LRT
QMN*	3863	1800 Dv**	1003	281	62	WA8PIM
GLETN	3932	2100 Dy	1168	154	31	WD8IBY
MNN*	3722	1730 Dy**	389	132	62	N8DSW
MACS*	3953	1100 Dy**	505	108	31	K8LNE
UPN*	3922	1700 Dy	582	101	36	WA8DHB
WSSBN	3935	1900 Dy	464	35	31	WB8SUR
TASYL	3922	1900 M	13	5	5	KM8E
BR	3930	1730 M/S	—	—	—	WB8SUR
MEN	3930	0900 Sn	—	—	—	WB8SUR

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn 1300. Vhf nets, 7 rpts, QNI 388, tfc 21, sess. 32, mgr. WD8RHU. 3932 is MI emer. freq. ARES net Sn. 3932, 1730. Traffic Workshop Sn. 3953, 1600. Silent Keys, with deep regret: K8ODS W8SM K8DTG. OO reports: WB8IKJ AC8Y. Enjoyed my first time ever at the 5-county swap in Flint. Now I know what I've been missing! This was the summer for change. WD8LRT has resigned as manager of our fine MITN after 32 months of superb service. He's a tough act to follow, but I'm sure K8KQJ, who takes over the net in Sept., is equal to the challenge. We also are losing the services of WB8YDZ as liaison manager, a post he has held for over four years. He is deserving of much thanks for his efforts. The job will be taken over by the STM temporarily. For any who wonder how those traffic totals are achieved or how to get started in traffic handling I recommend our Traffic Workshop, a weekly on-the-air seminar held each Sunday on 3953 kHz at 4:00 P.M. local time. Basics and fine points alike are covered, and, as our STM keeps saying sincerely, "there's no such thing as a dumb question" in these sessions. I note that some other sections are picking up on this idea, with good results. Another longstanding weekly service activity is our statewide ARES net, also Sundays, 3932 kHz, 5:30 P.M. This is a favorite meeting place for ECs and others whose interests are in emergency and public service operating. Again, a lot of questions can be answered, much benefit gained from the experience of others. Traffic: WB8YDZ 359, KA8CPS 350, AF8V 310, K8KQJ 233, N8DSW 200, WD8LRT 186, WB8MTD 174, K8KMQ 163, W8QHB 137, W8VPW 118, N8BNC 107, KE8X 106, WD8RHU 105, WA8PIM 102, WD8EIB 98, WA8DHB 84, WD8MJB 81, KA8NCR 79, W8IHX 69, K8OCP 54, WB8PDP 53, WB8WKQ 47, K8GXV 41, N8DTZ 38, WB8YIQ 35, KV8U 33, KU8H 32,

MFJ ANTENNA TUNERS 16 MODELS

MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.



Ham Radio's most popular antenna tuner. Improved, too.

$89.95 (+ $4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.

Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

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.

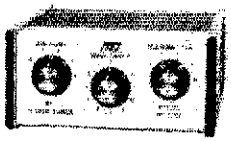
Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+ $4), like 941C less balun. **MFJ-945, $79.95** (+ $4), like 941C less antenna switch. **MFJ-944, $79.95** (+ $4), like 945, less SWR/Wattmeter, **MFJ-943, $69.95** (+ $4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER



MFJ-900 **$49.95 (+ $4)**

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $59.95 (+ $4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+ $4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B **$139.95 (+ $4)**

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun, 300W, 50-ohm dummy load, SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962 **$229.95 (+ $10)**

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), wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+ $10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV

MFJ-984 **$329.95 (+ $10)**

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

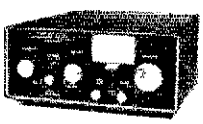
18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $239.95 (+ $10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+ $10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+ $10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V



MFJ-989 **$329.95 (+ $10)**

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf 6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

Built-in lighted 2% meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

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- **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).**
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MFJ ENTERPRISES, INCORPORATED

Box 494, Mississippi State, MS 39762

K8LNE 32, W8ECK 31, WB8SYA 31, W8VIZ 31, WA8EFK 26, K8BYY 23, WD8OEP 22, KT8G 20, W8JXJ 20, W7LVB 19, KI8Q 16, KA8JFM 15, KS8P 15, K8UPE 15, WB8YRY 14, N8BRY 12, WB8SIW 11, WD8IXZ 10, KB8GT 9, WD8IYA 9, W8LDS 9, WB8ITT 8, W8CUP 7, K8ZJU 7, WD8ITS 5, KF8M 5, W8RNQ 4, W8VWY 4, WD8ROK 3, KA8AEE 2, W8LOU 2, W8YY 2, K8DD 1. (July) W8ECK 31.

OHIO: SCM, Allan L. Severson, AB8P — ASCM: W8MOK. SEC: K8AN. STM: K8OZ. NMs: WA8BUW WA8DYX W8EK WA8GMT KF8J WD8KFN WB8YTD.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	504	527	62	6:45/10 P.M.	3.577
BNR	181	54	30	6:00 P.M.	3.605
ONN	—	—	—	6:30 P.M.	3.708
OSN	291	214	31	6:10 P.M.	3.577
OSSBN	2535	1488	93	10:30 A.M., 4:15 & 6:45 P.M.	3.9725
OSSN	188	121	31	6:45 A.M.	3.577
O6MN	555	17	31	9:00 P.M.	50.160

Has anyone else noticed how many local and state fairs are featuring (at least I like to think that they are featuring) amateur stations for demonstrations and, mainly, traffic purposes? Latest report comes from N8COU, EC Monroe Co., who had 14 operators from Switzerland of Ohio ARES at the Monroe Co. Fair. That's 14 out of 19 amateurs in the co. K8JE (513-825-8234 nights and weekends) reports from Cincinnati that plans for the third annual Ohio ARRL Convention are well underway. Dates are Feb. 26 and 27, 1983, with a two-day program of forums, meetings, commercial exhibits, a flea market and women's programs. Also a banquet, hospitality suite and a Wouff Hong ceremony the evening of the 26th. You don't want to miss this if fun, hospitality and good fellowship are your bag!! Massillon ARC elected: KB8LH, pres.; WD8PCG, v.p.; N8ATZ, secy./treas.; Appts: WD8NWH, EC Adams Co.; N8EFA, EC Defiance Co.

Local Nets	QNI	QTC	Sess.
BARF	98	20	20
BRTN	364	192	31
COARES	121	22	4
CNWOARES	496	141	50
MASER	114	6	4
Medina Co.	325	37	31
NCTW	24	73	24
NEON	116	35	27
RARA	65	1	4
TSRAC	1098	75	33
VWCEN	33	4	5

Traffic: K8OZ 588, W8PMJ 553, K8NCV 544, WD8KFN 540, WD8MIO 525, KV8Q 503, W8GGX 473, WB8MZZ 456, N8CWU 420, WB8JGW 341, WB8KKI 311, KF8J 283, WA8HGH 280, K8BYR 238, W8QZK 237, WA8GMT 236, N8BQK 225, N2NS 205, K8DL 171, AB8P 170, N8AUH 152, N8DSU 149, KA8GJV 142, W8WEG 138, WB8UBR 123, WD8KBW 122, K8YUW 120, KA8DJZ 112, WB8DMF 112, N8EES 109, K8JDI 87, KB8YS 84, KA8IUK 81, WB8QHU 81, WB8YYS 76, N8CMN 75, W8MTU 73, WB8YTD 65, WD8IKC 64, KA8IAF 62, WD8DYW 58, WB8QHV 57, W8EK 56, WD8RGS 52, W8SKP 47, K8AN 45, W8KKK 45, K3RC 44, N8BZC 43, KA8MEB 43, WD8NEC 41, KC8JI 39, WD8MLN 39, WD8ODV 37, KB8VE 35, WA8SSI 35, WD8AYI 34, W8TXV 34, WD8JAJ 33, WB8QXN 31, WB8VOA 31, W8MOK 30, WB8SIQ 26, WA8QYJ 25, K8VOY 25, WD8AYH 24, KG8P 24, WA8ZID 23, WA8TWM 22, W8CXM 21, WD8IQJ 21, WB8NTR 21, KA8GRH 20, N8AEH 19, WD8RZG 19, K8CKY 17, N8CGM 16, WB8KQJ 15, KA8GGZ 14, AF8O 14, WD8DOS 10, W8OOL 10, KA8LNA 9, W8MGA 9, N8BHQ 8, KA8DGO 8, KA8HUZ 8, W8QEM 8, KA8GMF 7, WD9HDZ 7, WB8AWM 6, N8CW 6, WD8EKI 5, WB8NHV 5, N8AJU 4, KA8PHB 4, W8RG 4, W8LZE 3, KA8HVN 1. (July) W8MTU 333, N8JR 46, N8CJS 31, WD9HDZ 15, W8DYF 2.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Paul S. Vydareny, WB2VUK — SEC: KB2KW. STM: WA2SPL.

Net	Time/Day	Freq.	NM
EPN	2300	3902	WB2MCO
ESS	2300	3590	W2WSS
NYS	0000/0300	3677	N2APB
NYS/M	1500 M-S	7077	WB2EAG
NYPON	2200	3913	K2KQC
NYSPTEN	2300	3925	KA2O
NYS RATT	2330	3625	W2ODC
CDN	2330	146.34/94	WB2ZCM
HVN	0030 S,M,T	144.535/135	N2BDW
HVN	0030 W-S	146.37/97	N2BDW
SDN	0230	147.66/06	K2ZVI
SCRN	0100	147.735/135	WB2HDU

Club news: Albany ARA has new member, W2IHK. Rip Van Winkle ARC running AR courses at Community College. WECA busy again with public service activities. KA2KVZ advises of new Novices in Red Hook, KA2PUW and KA2QGL. By the 1st of January, we will have a new Hudson Division Director and Vice Director and a new set of appointees under the new Section Manager plan. BPL: KA2KVZ WA2SPL. PSHR: WA2SPL K2ZM WB2EAG WB2ZCM KV2U WB2MCO W2YJR KB2KW W2BIW K2ZVI AK2E KA2KVZ WA2YBM. Traffic: WA2SPL 1053, WB2EAG 371, KA2KVZ 224, WB2MCO 183, KV2U 137, K2ZM 134, AG2X 113, WB2ZCM 99, WA2JBQ 87, K2ZVI 86, KB2KW 80, WA2JQL 66, AA2Y 66, W2BIW 58, AK2E 58, W2YJR 57, WA2YBM 56, K2MI 28, N2BDW 24, WB2SON 24, N2CPX 13, WB2OHR 9, N2CSX 5.

NEW YORK CITY — LONG ISLAND: SCM, John H. Smale, K2IZ — SEC: WA2KKJ. STM: K2GCE.

NLI CW*	3630	1900/2200	W2LWB
NLIPN*	3928	1815	KS2G
NLS*	3720	1930	WB2EUF
NCVHF	6.04/64	2100 MWTh	N2BZL
SCVHF	4.77/5.37	2030 M-F	WA2ARC
BAVHF	7.915/315	2030 M	N2BQD
LIMARC	6.25/85	2100 F	N2BZL
ESS	3590	1800	W2W6S
NYS	3677	1900/2200	N2APB
NYS	7077	1000 M-S	WB2EAG

*Denotes section nets. Please try and help out by checking in whenever you can. All times are local. On behalf of the XYL and the 4 harmonics I want to wish everyone a Happy Thanksgiving. LIMARC will be holding their 1st Winter Indoor Hamfest, Feb 20, 1983 at the Electricians Hall, Pinelawn Rd., Melville. Contact K2LJH and WB2ALW for more info. Suffolk Co. VHF Traffic Net now has a training net. It meets Sat. at 2000 local on 145.21 rpt. Any stations having questions regarding traffic handling can check in. Suffolk Co. ARC held their annual flea market in Sept. Their Explorer Post also sponsored a trip to ARRL Hq. If any clubs need material for their meetings, WA2DHF has put together a slide show on the NYC Marathon, with almost 200 hams involved.

WIRE & CABLE

RG-213 mil. spec.	27¢/ft
RG-214 mil. spec.	1.25/ft
RG-8U foam, 95% braid	23.5¢/ft
RG-8X foam, 95% braid	11.5¢/ft
RG-58U mil. spec.	10.5¢/ft
RG-174 micro. mil spec.	8.5¢/ft
RG-11U foam 95% braid	19¢/ft
RG-11A/U mil spec	24¢/ft
RG-59U foam	11.5¢/ft
RG-59U mil. spec.	11.5¢/ft
300 ohm ladder line poly ins.	6¢/ft
450 ohm ladder line poly ins.	8¢/ft
450 ohm ladder line bare, 100 ft	$11.00
8 conductor rotor cable	15¢/ft
4 conductor rotor cable, 100 ft	$5.50
14 Ga. Stranded Copperweld, 70ft roll	$4.95
14 Ga. Stranded Copperweld, 140 ft roll	$9.00
12 Ga. Solid Copperweld 50ft multiples	8¢/ft
14 Ga. Solid Copperweld 50ft multiples	6¢/ft
18 Ga. Solid Copperweld 50ft multiples	4¢/ft
14 Ga. Stranded Copper	8¢/ft
8 Ga. Solid Aluminum 50ft multiples	8¢/ft

ANTENNA ACCESSORIES

Amphenol silver plate PL-259	75¢/ea
Ceramic dogbone insulators	65¢/ea
Ceramic strain insulators	40¢/ea
Coaxial lightning arresters	$3.75
Coax seal, roll	$1.95
W2AU balun 1:1 or 4:1	$14.25
W2AU END-sulator	$1.35
W2AU traps 10,15,20 or 40 mtr	$18.95/pr
W2AU traps 75 or 80 mtr	$50.40/pr
VAN GORDEN Hi-Q 1:1 balun	$8.95
VAN GORDEN Center insulator	$5.75
B&W Traps 40/80-10 mtrs	$26.75/pr
B&W 375 or 376 coax switch	$19.25
B&W 593 coax switch	$17.95
B&W 595 coax switch	$22.50
B&W 5KW balun 1:1 or 12:1	$36.00
B&W 5KW balun 4:1 or 6:1	$45.00

ANTENNAS AND ROTORS

HY-GAIN AR-22XL	$58.95
HY-GAIN CD-4511	$102.75
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KDK-FM2030 2mtr transceiver	$275.00

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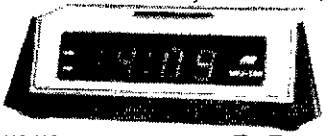

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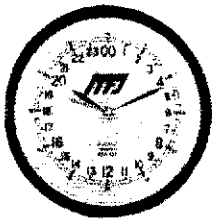

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There's sure to be someone from your club that was involved and that would like to see what went on. LIMARC had the Town of Hempstead Presiding Supervisor as a visitor to their Field Day site after presenting the club with a certificate proclaiming Amateur Radio Week. Need some DF practice? Come out on the Nassau Co. hidden xmtr hunt. Contact WA2SUH 516-223-4611 for further info. W2DBQ is now a Technical Associate for SOWP. K2AIQ received the Silver Beaver Award from the Boy Scouts. KA2PBT upgraded to Tech. KA2KOX is now co-editor of the Great South Bay Compass. WA2AWE replaced WA2CSR as treas. of the Great South Bay ARC. WA2TQT donated a Mosley MCQ3B quad antenna to the Grumman ARC. WAG (Worked All Grumman) awards were announced for WB2TFA and WA2HGK for the open class and W2ZZE for 24 hf QSOs. Traffic: W2AHV 191, W2GKZ 112, W2LWB 106, N2AKZ 104, W2TZO 74, WA2ARC 52, K2GCE 44, KS2G 29, K2IZ 26, W2DBQ 24, KA2NMA 18, KA2OXK 14, KV2O 4, KR2B 3. (July) W2GKZ 104. (May) N2AKZ 105.

NORTHERN NEW JERSEY: SCM, Curtis R. Williams, W5DTR/2 — SEC: WB2VUF. STM: W2XD. NMs: W2CC AG2R N2BNB N2BOP KA2GSX KA2HNQ WB2IOJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJPN	3950	6 P.M. Dy 9 A.M. Sn	36	441	173
NJN/E	3695	7 P.M. Dy	31	456	152
NJN/L	3695	10 P.M. Dy	31	361	127
NJSN	3735	6:30 P.M. Dy	31	235	60
OBTTN	72/12	8 P.M. Dy	31	497	111
TCETN	855/255	7:30 P.M. Dy	31	160	48
NJVN	49/49	10:30 P.M. Dy			
NJRTTY	147.51	Autostart			

Congrats to KA2HXU on earning an OBTTN net certificate, and to KA2GGM on upgrading to Extra. WA2FZJ has been appointed an Official Emergency Station. WB2QMP has been appointed Official Relay Station. Westlink information tapes are sent each Thursday night at 8 P.M. on the main Cherryville rptr 147.375 on the ARES/RACES Net. K2SHY operated as ZF2FM from Grand Cayman and made 810 contacts during the week's vacation. KA2JMH passed 20 wpm code. (Now for that theory!) N2DPC and N2DSZ upgraded to Tech. KB2N and KA2NTS have a new daughter. Congrats! Cherryville RA member provided comms for the annual Hampton run. Congrats to the ATG ARC in Basking Ridge on becoming affiliated with ARRL. The Ramapo Mountain ARC had an outstanding entry in the uhf contest using their club call WA2SNA from a new location in West Milford. The Jersey Shores ARS Traffic Net meets daily at 7:30 P.M. on the Toms River rptr on 146.91. NM WA2HEB reports good results but would welcome others to join and help in the coverage area. Your local and state nets need your support. Can you spare a few minutes to be NCS or a liaison once a week? PSHR: W5DTR KB2HM W2XD KA2JMH AG2R K2VX N2XJ N2BOP KA2GSX N2DPV WB2QMP. Traffic: KB2HM 368, AG2R 187, K2VX 160, W2XD 146, KA2JMH 97, N2XJ 86, N2BOP 71, W5DTR 71, WB2QMP 63, KA2GSX 50, WB2KLF 35, N2BNB 30, N2DPV 21, W2ZEP 12, N2SU 11, KC2MM 10, WA7DPK 8, W2CC 4. (June) KC2MM 24.

MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, K0CY — SEC: WA4VWV. STM: KA0X. NMs: W0YLS WD0HND WA0AUX WB0AVW. Now is certainly the time to be sending reports. Please note that the new SEC is WA4VWV, who has replaced W0RPK. W0RPK will work as ASCM for governmental affairs. WB0TWW was cited for his outstanding contributions to the 75 Meter Net at the annual picnic. WB0JFS was awarded the W0AUL award at the DSM hamfest. N0BGI was awarded the ARNS scholarship of $500. He will attend Coe College this fall. Special congrats and good luck. W0RPK obtained BPL owing to National Balloon Races station. The Mt. Pleasant crew again with a very sucessful Old Threshers Reunion. Again many thanks to all who participated in RAGBRAI. CVARC participated with "Eldertest" at Kirkwood CC. WB0FBP WB0SBL WB0HMZ and WB0QCC assisted with fire at Pleasant Valley. New OBS is WB0JJX Ames; New OO is N0DYN Davenport. New officers in Marshalltown: KA0D KA0CND N0CFJ WD0EIF. What happened to CIDXA?

Net	Freq.	UTC	Day	QNI	QTC	Sess.
75M Phone	3970	1830-0000	M-S	1951	138	46
TLCN	3560	0030-0400	Dy	370	182	62
ICN	3713	0100	TTh	58	54	12
ITEN	3970	2230	Sn	58	7	4

Traffic: WA0AUX 547, W0RPK 262, W0SS 254, K0GP 203, KA0LUZ 125, W0YLS 109, KA0JOG 103, WD0HND 65, KA0ADF 60, K0CY 47, KA9GBG 46, W0BW 30, WD0FWB 22, KB0OZ 20, WB0AVW 19, W4JL 17, KE0Y 17, K0EVC 8, KC0I 8, K0ZQ 8.

KANSAS: SCM, Robert M. Summers, K0BXF — STM: W0OYH. SEC: W0KL. Congrats again to WA0LBB, who received the Kansas Amateur of the Year award at the Concordia hamfest. I have received a few more items of correspondence the past couple of months asking about a missing report. WELL, the May report got sidetracked/delayed or something in the mails and arrived at Hq. 2 days after the deadline. After being promptly notified by the League, I jotted down a reminder to combine the June and May reports. I did just that, then picked up the carbon copy of May report and mailed it thinking it was the right one. When I started my July report, in looking back, I found what I had done. To top this all off I got a call from Hq saying that their mailroom opened my July report in the wrong way, cutting out one whole line and they needed fills. In the meantime I made an eye doctor appointment to get my bifocals changed again, HI. Aug. Net reports: KSBN 1051 QNI, 161 QTC. KPN 325/33. KWN 798/520. CSTN 1387/80. QKS 218/102. QKS-SS 43/1. June reports: KSBN 1080/153. KPN 425/48. KWN 856/420. CSTN 1196/111. QKS 260/98. QKS-SS 27/3. WHO HAS INFO ON THE TENURE OF ANY OR ALL KANSAS NETS??? Traffic: W0FRC 252, WB0ZEN 164, W0OYH 127, W0HI 122, W0AM 86, KA0CUF 70, W0QMT 65, W0FIR 59, WA0LBB 52, K0BXF 30, W0CHJ 30, WB0YLP 29, W0FDJ 22, KA0E 10, K0GSC 15, N0BDG 15, W0PB 14, W0RT 9, W0RBO 6, WA0OWH 5, W0KL 4, AC0E 3.

MISSOURI: SCM, L. G. Wilson, K0RWL — ASCM: W0OTF. STM: KM0L. SEC: N0AJI. Congrats to the following new licensees: Novice-KA0OGR KA0OHC KA0OJB KA0OJC KA0OSE KA0OSF KA0OUV KA0OWV; Tech-KA0NMI; General-KA0NSM; Advanced-N0DPL. The SEC is looking for EC applicants for the following areas: St. Joseph, Ft. Wood, Lake of the Ozarks, Branson, Hannibal. Interested persons should contact N0AJI. Congrats on another successful station at the Missouri State Fair. Thanks to all those who took part in manning the station. While KC0CL is home from the hospital and

recuperating nicely, NØAQZ is in the hospital in Springfield.

Net	QNI	QTC
HBN	339	23
MEOW	374	153
MON	152	146
CMEN	82	3
MON 2	107	47
MOSSB	523	186

WØJLC is now sporting a KT-34 at 52 feet as well as a new Butternut vertical. KBØX and WØFI are also sporting new Butternut verticals. WBØPJS is sporting a new IC-730. The Kansas City DX Club has begun production of its new extravaganza for the Hamvention in Dayton next April. Looks like it's going to be a winner. Traffic: KCØAS 824, NØAJI 358, KØSI 251, WØBMA 160, KØPCK 127, KUØG 78, WBØSSB 69, WØNUB 55, KGØL 54, WØOUD 53, KMØL 28, KØRWL 6.

NEBRASKA: SCM, Shirley M. Rice, KAØBCB — SEC: NØAIH. STM: WDØBOG. Best wishes for a fast recovery to KAØJLH, EC of Chadron. He was seriously injured in a cycle accident. He was able to call for help using a horizontal ant. on 146.28/88 atop Laramie Peak, WY. Our TNX to Great Plains Rptr. Assn. for such a fine rpt. Congrats to KAØCRI & XYL on adopting a new baby BOY! Upgrades: Extra-KAØDKP; ADV-KAØGMY; GEN-KAØLQC NØDGM. NØAJU had a very BUSY vhf report for Aug. We were pleased to have NE hams visit us this month. WAØWRI WØIOO & WBØSIP cked in with us while they visited relatives. It rained all day they were here, with little since, so hurry back! WØERW & XYL attended Scotts Bluff ARES Picnic. ARRL Pres. W4KFC & WA4PAE "broke sopapillas" with us while touring the Pan Handle. Loving, caring people! Will be Howling Broom Mobile on Oct 31. Happy Thanksgiving. 161. Traffic: KØDKM 86, WBØGOB 41, KAØBCB 16, WØNIK 12, WBØGMO 6, WAØOQX 4, KAØIOM 2, KØODF 2, WAØPCC 2, KØTUH 2.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, Pete Kemp, KA1KD — STM: K1EIC. SEC: K1WGO. ASEC: KA1AMK K1AH.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2200	255	376	K1EIR
CPN	3965	1800/1000 Sn	89	252	W1OD
NVTN	28/88	2130	---	---	WA1ELA
WCN	78/18	2030	59	373	W1DPR
RTN	13/73	2100	64	295	WB1ESJ

Appt: OES-N1ABY. Upgrades: Extra-KB1AM KA1QA; General-KA1GSY N1BXO KA1IIL; Novice KA1JDD. Call change: WA1TNK/KA1ZG. N1BYX to DL-land for the next two years. W1HEO has moved to TX and will be missed. WA1GNA has just completed WAS/RTTY. Glad to have WB1DSB & K1WGO back after stints in the hospital. K1BCI active at Goshen State Fair. Norwalk ARC busy at the Oyster Festival. CARA sponsored Connecticut QSO Party, Dec 4/5. Details to KA1ECL. Be sure to register your rptr by Nov 1. WR1AIE provided comms for the annual Stamford-Denmark Friendship Yacht Race. A BIG TNX to KJ1B WB2OSY & WB1ABV for their aid to the CT Wing of CAP finding a downed aircraft in Danbury Aug 2. A SPECIAL CONGRATS to K1DR & WA1TDC for their life saving rescue of four drowning fishermen in Long Island Sound. Despite personal danger, they located the men clinging to life preservers and brought them back to shore. With their boat taking on water from overcrowding, they used the autopatch of WR1AIE and managed to coordinate the rescue with Stamford's emergency services. A job well done in the true spirit of Amateur Radio. Don't forget the section reorganization goes into effect Jan 1. Dec reports from section appointees go to: STM-K1EIC; SEC-K1WGO; OO/RFI-KA1ML; SGL-K1AH; Clubs-K1UOE; PIO-WB1AIU; OBS-WA1DWE; Tech-W1HAD. WA1MNS and his South Killingly Bulletin Board are on line. Call 779-0445, 300 baud. SMAG has been busy homebrewing 2-meter beams. EI9ADB visited SARC to talk about 2-meter activity in Eiland. Welcome to W1NJM on his asst dir. appointment. Traffic: W1EFW 295, WB1PJU 213, WB1GXZ 190, W1NJM 145, K1UQE 114, WB9IHH/1 69, WB1ESJ 68, K1AQE 66, KA1BHT 51, WA1WQG 7, W1QV 6, W1CUH 5, N2BOA 4, K1XA 4.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — STM: WA1TBY. SEC: WA1BLG. ASCM: K9HI.

Net	Mgr	Freq	Time(loc)/Dy	QNI	QTC
EMRI	N1GQ	3.658	1900/2200/Dy	579	579
EMRIPN	KA1ON	3.949	1730/Dy	297	309
EM2MN	N1BNI	23/63	2000/Dy	82	370
NEEPN	K1BZD	3.945	0830/Sn	66	32
HHTN	KA1MI	04/64	2230/Dy	640	284
EMRISS	N1BHH	3.715	2030/Dy	129	65

By the time you read this HR5008, or its equivalent, will have been signed by the president, and Amateur Radio will face some long sought after challenges. Amongst other things this legislation will allow the FCC to use volunteers for administering all license exams. Of primary concern, of course, is establishing and maintaining a high level of integrity throughout the process, whatever the details of that may be. The ARRL has also responded to the FCC's request on phone band expansion with a proposal to modestly expand the 75- and 15-meter bands, expand the 10-meter phone band by a whopping 200 kHz and to leave the 40-meter band alone. All expansion would be down in frequency, but details of the plan show virtually no impact on cw. In fact a survey taken in the *Crossbander* indicated that many hams who operated mostly cw favored the concept of phone band expansion in recognition of the crowding. Remember that previous action by the Board of Directors petitioned for expansion of the 20-meter band, which is perhaps our most crowded phone band. N1BBT/MM operated from the training ship "State of Maine" during July and August, and many hundreds of third party messages were handled via Eastern Mass hams into the National Traffic System. This really picked up the volume of traffic during the normally slow summer months and at the same time provided a service to the cadets and crew. Thanks to all the hams who helped, and I hope this will be the beginning of a tradition between Mass maritime and the hams of East MA. W1GXT reports outstanding DX on 6 meters via aurora. PAWA of Taunton running Novice and Advanced classes. Wellesley club members active in vhf and uhf contests from Mt. Equinox. Billerica club had a tour of the Honeywell Computer Center. Framingham club had its annual barbeque at WA1IGL's QTH and WA1UEH says a good time was had by all. SSRA had a talk by WA1CDO on operating aids for the handicapped. Traffic: N1BBT 1010, WA1TBY 828, KA1DB 577, N1BHH 374, WA4STO 338, W1IDK 298, N1BGW 245, KA1GBS 194, KA1GEK 180, N1AJJ 161, KA1ON 148, K1BA 147, KE1U 124, WA1LPM 113, KA1BBU 108, KA1MI 93, W1BNS 60, KA1AE 52, WA1DXT 46, WA1FNM 43,

K1BZD 40, N1CDI 38, KA1KF 34, W1CE 27, N1BYS 15, K1LCO 12, W1CZB 9.

MAINE: SCM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. New OO appointees include W1KX and K1PV. Good response to new reorganization: three appts including PIO K1NIT, OOC W1KX, ACC KA1EIW. Thanks. Under leadership of K1NIT, ARRL hamfest at Windsor a resounding success, with W1RU and W1HHR conducting the forum on ARRL activities.

Net	Sess.	QNI	QTC	Mgr
AEN	5	82	1	WA1YNZ
CMEN	9	135	14	W1WCI
SGN	24	899	165	K1GUP
PTN	53	468	202	W1HDC/N1BJW

Traffic: AK1W 256, N1BJW 115, WB1BYR 85, KA1TJ 75, KL7IJG 58, W1RWG 57, KA1AVU 56, WB1EIL 45, W1HDC 45, KA1EIW 44, W1BMX 31, N1BCE 22, W1JTH 20, W1KX 16, W1WCI 15, W1CTR 14, K1PV 14, N1BME 11, WA1YNZ 8, KA1ENL 7, W1OTQ 7, WA1ZJL 7, K1BUC 6, KA1ENM 6, KA1FTL 6, KA1CNG 4.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH — SEC: AK1E. STM: W1TN. NMs: N1NH K1OSM W1VTP. Greetings again from the Kancamagus highway. Ham radio is even here with AF1V in next campsite on 40 cw. KA1ISL received 30 wpm sticker. Thirty five attended the Nashua club's outing at the much improved Benson's wild animal farm. WA1PEL is new AEC for Strafford Co. My thanks to all the NH tfc handlers. Because of their efforts we are up on top with the best in the US. W1LQQ needs one more for DXCC Honor Roll. K6UXO/1 now Extra. W1AQO/R now on 145.11 in East Hampstead. WB6YEP/1 now in Greece for a year. NH was well represented at Charlotte, VT hamfest. KW5K visited KB1A AK1E & KA1HUW. FRN certificates issued to K1IM K1OSM N1ALM W1CUE AK1E KA1BJ and W1TN. Retired postman K1NOR enjoying ham radio and new computer. Nashua club's 1982 mall show was featured in QST's "Club Corner." Happy Thanksgiving to all. Traffic: KI1M 160, W1TN 157, W1GUX 146, W1VTP 105, KA1CJI 82, K1OSM 78, K1YMH 77, AK1E 67, KA1BJ 57, N1ALM 46, KI1R 46, W1ALE 37, KA1FKM 32, KB1A 30, K6UXO 30, KA1FFX 22, N1BOF 11, W1CUE 9, KA1ISL 8, KA1HUW 7, WA1PEL 5, K1ACL 3.

RHODE ISLAND: SCM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: KC1G. KA1FPP upgraded to Extra and N1BEE to Advanced. Newport Co. RC active in Lions Club Road Race and in Battle of RI reenactment. SubSig Club at Raytheon is planning a permanent operating location at the plant in Portsmouth, which will include a new tower. Sorry to report that W1QR became a Silent Key. He was one of the iron men of traffic in Rhode Island in the 60s. OSARG and ARES provided comms for the North Central Air Show under direction of EC AE1S and SEC KA1EHR. RIEM2MTN, WA1OSL NM, 22 sess., 168 QNI, 37 QTC. RI Tele Net, KB1G NM, 8 sess., 24 QTC. Traffic: W1EOF 618, WA1CSO 51, KA1FPP 42, KA1EHR 34, W1YNE 31, KC1G 23, KB1G 15, AE1S 14, KA1SO 10, N1BEE 8, N1RI 6.

VERMONT: SCM, Bob Scott, W1RNA — SEC: WB1ABQ. STM: N1ARI. By the beginning of the year, you will have a new SCM; I am not running. I wish to thank those who have cooperated with this office in promoting the main areas of public service; in particular, the SEC, STM, net mgrs, NCSs and DECs. I trust your selection of a new SCM will be one who has demonstrated active work along the same lines on & off the air. VSSB 31/577/130; VFMN 31/407/111; VTN 27/85/42; GMN 28/371/34; Carrier 26/541/28; RFD 5/84/14; VPN 5/84/5. W1KOO rptr emergency use: 8/25 WB2YVC reported via VFMN to W1RNA power lines down across road. Info called into pwr co. & VT State Police. Traffic: KA1GIB 144, W1RNA 141, K1BQB 130, AE1T 96, N1ARI 79, WB1ABQ 58, W1KRV 40, W1KJG 16.

WESTERN MASSACHUSETTS: SCM, William J. Hall, W1JP — SEC: WB1HIH. STM: W1UD. ACC: W1YI. Amateur Radio is coming back to life in W. Mass. WB1ABF W1JP KA1T W1ZPB KB1W and KA1CDC attended 1RN picnic in Dublin NH. W1QYY proposed an interesting idea on clearing intersection traffic in the same evening. Clubs came out of hibernation too in September. Much was discussed at meetings in the way of June's FD and VHF contest. Plans are underway for section-wide participation in the October SET exercise. Net schedules and emergency scenario were established in August. The U. of Mass ARS members looking for a suitable site for W1PUO. A dorm site on Orchard Hill is likely, pending RFI measurement results. As a possible source of income for the club, members are developing a beam heading program to be sold through ham publications. The Mt. Tom ARA, with 30 new members in July, is planning its annual raffle. Prizes are Kenwood all-mode 2M rig, an Icom 2AT or cash. KA1BNN regretfully resigned as club v.p. for reasons of health. K1HTS temporarily fills slot. WB1HKN W1TZZ W1SPB provided comms for championship pony race. K1s IJU & IJV happily recovering from son's wedding. PSHR: WB1HIH K1JHC. Traffic: KA1T 107, W1UD 102, WB1HIH 87, W1KK 68, KA1CDC 56, K1JHC 54, K1IJV 53, KB1W 34, W1JP 16, W1ZPB 15, W1BVR 4, WA1MJE 2.

NORTHWESTERN DIVISION

ALASKA: SCM, Richard Henry, AL7O — ASCM/SEC: AL7AC. STM: WL7H. DEC: KL7JFT AL7AW. August saw Alaska's first QSO party with stations from the third and fourth districts out in force. Stations from the first and second districts were noticeably absent. KL7NQ reporting moonbounce activity on 220 MHz. Arctic ARC supplied communication support for the Yukon 800 marathon river boat race. Owing to medical reasons I have had to leave Alaska. Will be in the Tacoma area at least through the Spring of 1983. AL7AC and I will continue to do our best to represent and serve you. MARA reports a new rptr active in the MAT valley. Traffic: KL7LA 58.

IDAHO: SCM, Dennis L. Hall, KK7X — It is a pleasure to be writing my first section column for QST. As the new SCM for Idaho, I welcome any and all ARRL members to apply for an official station appointment. I welcome monthly reports from all affiliated clubs with an update of your activities. Emergency communications is my number one priority for our section, especially for the more sparcely populated areas of the section which would be entirely cut off in the time of an emergency. Thank you to the Idaho Amateur Radio population for this opportunity to serve you on behalf of the American Radio Relay League. Traffic: W7JMH 72, AC7P 61.

MONTANA: SCM, Les Belyea, N7AIK — New Section Traffic Manager is KF7R replacing WB7DZX who resigned. W7BQE from Sidney reports that he and his XYL enjoyed the CRRL/ARRL Midwest Saskatoon Convention. The Havre annual picnic was held Aug. 21 at Beaver

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Creek. The Hi-Line ARC installed a new 80 - 10-meter antenna on the Hill Co. court house to be used for civil defense. W7DB continues to do a fine job sending ARRL bulletins on the traffic net. A Field Day highlight was when KA7EFT from Butte had a QSO with a Swedish station on two meters, most of it conducted in German. A new rptr was installed on Red Mtn using the call of WA7KZF, replacing the WR7ABY machine that had logged over 2 1/2 million transmissions in the past 6 years. KB7BJ & N7BJS made a ten-day trip to KL7-land. Out-of-state visitors were K7MB & N7AMJ. PSHR: WB7WVD. BPL: W7TGU.

Net	Sess.	QNI	QTC	Mgr.
BSN	13	98	3	WB7UTJ
IMN	22	187	54	K7JV
MTN	22	599	76	K7TQM

Traffic: W7TGU 665, WB7WVD 50, N7AIK 42, W7DB 2, W7LBK 2.

OREGON: SCM, William R. Shrader, W7QMU — STM: W7VSE. SEC: K7WWG.

Net	Time/Day	Freq.	QNI	QTC	NM
OSN	0230/0600Z Dy	3587	695	824	KA7ELI
BSN	0145Z Dy	3908	959	49	W7FO
SOFM	0330Z T	146.64	156	4	W7FDU
LBLARES	0330Z Dy	146.79	1140	30	K7ZQU
WCN (July)	0300Z Dy	3702	404	116	WB7RKU
WCN	0300Z Dy	3702	352	122	WB7RKU
OARES	0115Z Dy	3993.5	509	79	W7HLF

Upgrades: Tech-KA7MTY KA7EFJ; Adv-N7CZH N7DJE N7CRP KC7WX KC7YC; Extra-K7UK K7TDX. DXCC for KN7B. KV7F new DEC for Portland area. WB7RPJ new OBS for McMinnville. K7ZFG completed WAS on 6 meters and QRP at same time. WB7TIJ won first place in "Rusty Key" night with OTVARC. WB7TKY will study at MIT this fall. A real hearty CONGRATS to all the above. Salem ARC held a "coffee break" again at the Santiam rest stop on I-5. They also had a booth at the state fair. Both fine ways to show off to the public. If you want to learn the American Morse Code, listen on Mon/Wed/Fri at 2030 PST (0330Z Tue/Thu/Sat) on 3587 kHz for practice at 10 to 55 wpm. OSN racked up new record traffic month. Douglas Co. ARES helped with Scottsburg Fair boat races. Traffic: W7VSE 594, KN7B 411, WA7LGN 306, KA7ELI 184, K7NTS 176, W7ZB 165, KV7F 154, W7LNE 73, KT7X 48, WB7OEX 47, KA7AID 27, N7BGW 21, W7LT 6. (June) W7DAN 2.

WASHINGTON: SCM, Joe Winter, WA7RWK — ASCM: KD7G. SEC: K7SH. STM: W7GB.

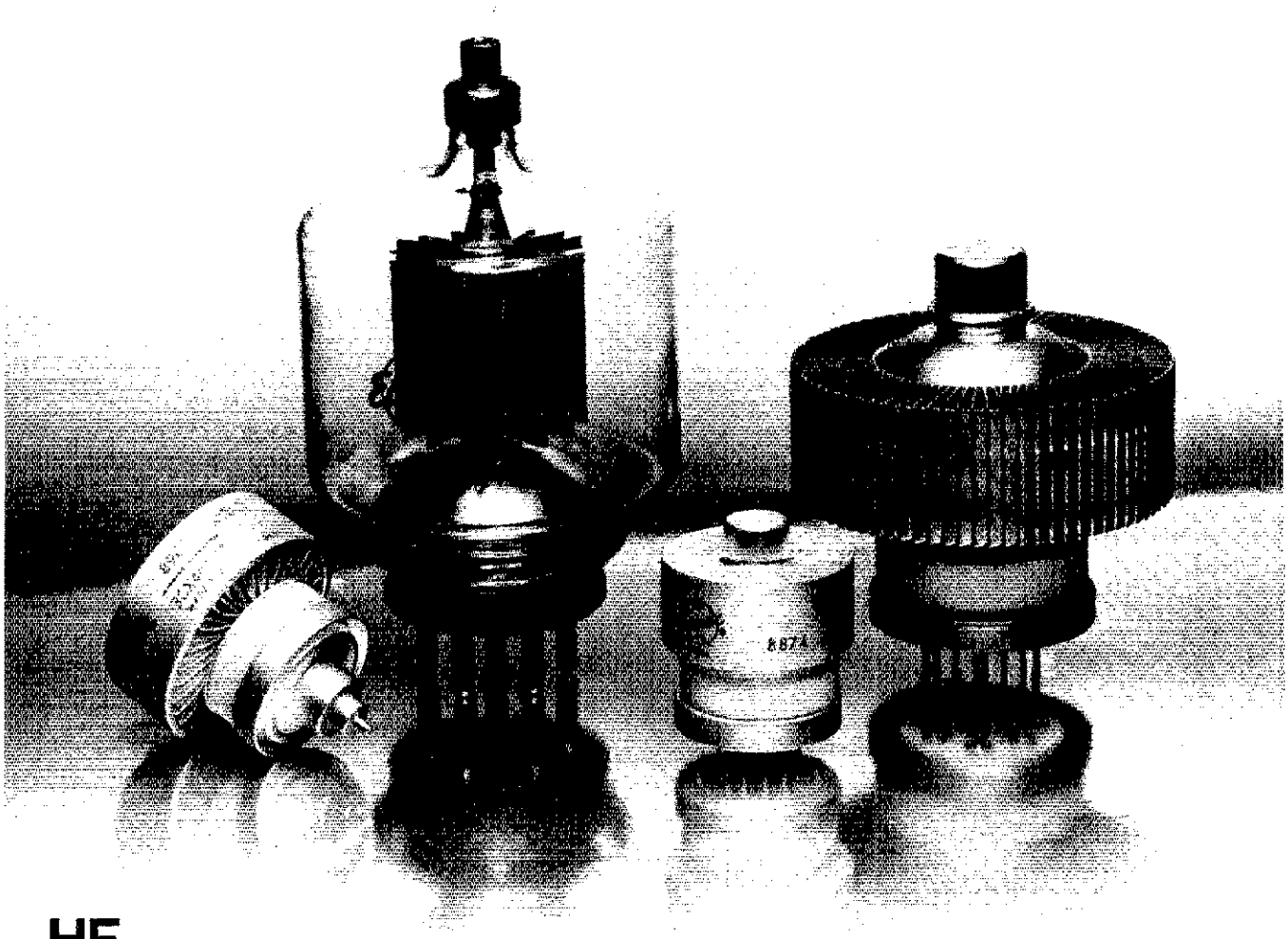
Net	Freq.	Time(Z)	QNI	QTC	Sess.	Mgr.
WSN	3590	0145/0445	609	218	62	W7GB
WARTS	3970	0100	2887	256	31	W7SFT
NWSSB	3945	0130	723	49	31	W7JHR
EWTN	146.64	0030/0430	68	70	40	WA7CBN
NTN	3970	1830	931	50	31	W7VL
PSTS	145.33	0030/0530	133	106	62	W7IEU
SCARES	147.18	0230 (W)	23	2	4	KA7AML

W87VSZ Inland Impire ARC EC rpts 7 hams wked Vietnam Veterans Run & Parade. Clallam Co. ARC and Victoria, BC, Int'l Picnic was huge success with 169 attending. Tnx to N7DHY & Donna. W7LG rpts Clallam Co. has new emerg. stn in courthouse, TR7 & Kenwood 2-mtr rig with more to come. Island Co. EC KB7LR rpts successful DES chem. spill test. Fifteen ARES mbrs responded DEC KC7FA says Kitsap Co. surprise test got 17 (42%) of group out in the field. WWDXC plans mini-DX convention next summer. N7AIF is chairman. Congrats to AF7T K7EV & K7LYT on joining the DXCC family. BEARS rptr chmn KA7COD says 220 rptr & AP is almost ready to go. The 145.33 machine is on & doing fine after major rebuild. Clark Co. ARC set up ham display at Tower Mall for AR Wk. headed by KU7G. Great, we need more of this. CCARC had 32 upgrades so far this year, eleven are women. Congrats, Clark Co. ARES EC WB7TKZ plans to have hams at all 9 com. ctrs. in Clark & 1 in Skamania Co. during DES test. DEC KC7SZ rpts 50 Tri-City ARC/ARES mbrs provided excellent comms for many agencies during Columbia Cup '82 hydroplane races. Good PR on this. N7EIK hosts picnic for Chellis Valley ARS mbrs. 23 checked in on the fun. Mt. Baker ARC & Whatcom Co. ARES responded to SAR mission for 3 boys. Eleven ops did fine job. N7DJR observed 17 ft. boat with 3 people aboard, no power & broken-thru hull floating. Took them in tow to Sequim WA with no further incident. W6VRM on shore handled comms for CG, which sent helicopter that was not needed. Radio Ams. of Skagit Co. heard talk on DF equip. by W7ZEG. KB7XH heads comms for Skagit Flats run with 300 runners. KB7NR heads comms for 140 team Slow Pitch Tournament. RC of Tacoma Hamfair '82 was again a great success. AD7S Headed booth at WW Fair but broke leg & OM WA7ZZA pitched in to set up booth. AD7S still active handling work list. Sorry abt the leg. RCT rptr comm raised big bucks & started on new 220 machine. Traffic: WB7TQF 644, W7DZX 589, WB7WOW 304, K7GXZ 231, N7DNG 225, N7CSP 209, N7ANE 150, KS7I 141, W7HNA 120, W7LG 94, W7GB 87, K7CTP 86, W7GIP 81, W7IEU 74, W7BUN 68, K7VW 39, N7DDP 37, WA7BDD 33, WA7JEB 24, KR7F 22, WA7LQV 22, W7APS 15, K7BFL 14, KD7G 11, K7OXL 7, N7CT 2, K7RBT 2.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — ASCMs: W6ZF N6DHN VE2AQV/W6. SEC: W6LKE. STM NI6A made BPL again. FB job. New CAC member WB6DSV seeks your views on contest matters. Write to him at his Callbook address. OOs K6ARE and N6OP both finding fewer poor quality cw sigs. K6ARE rcvd the 25 wpm endorsement for his Code Proficiency Award. MDARC starts their Novice training class in Sept. Their members K6DEJ and WA6KDA are on the Injured list; the latter recently passed his General test while bed-ridden. I just rcvd the Dec. '81 issue of the LARK *Newsletter* in the mail! I know the P.O. will do better this year! Their Aug. "Klutz of the Month" was W6RGH, and they have changed meeting days to Friday, with the first one falling on the 13th! EBARC planning a trip to the WWII Liberty Ship "Jeremiah O'Brien." Traffic: NI6A 585, W6VDM 103, K6APW 83 (July) W6VDM 88.

PACIFIC: SCM, Army Curtis: AH6P — STM: KH6HIJ. SEC: KH6B. ECs: Hawaii-AJ6K; Kauai-KH6S; Maui-KH6H; Oahu-KH6NP. We have a STM! Thanks very much to KH6HIJ, we now have a start on getting traffic under control once again into and out of the Pacific Section. But please, he cannot do it alone. He is going to need a lot of help and you can help. Please contact him or me and ask how. Have you checked out the Hawaii Afternoon Net yet? August saw over 265 checkins. Look for it on 7290 kHz every day at 4:00 P.M. The latest ARRL bulletins are sent just before the net starts, so you can catch up on the latest news and meet a great group of



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SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: N6AUB. ASCM: KI6T. The Shasta-Cascade ARS VIP unit provided comms assistance for the CA Division of Forestry during fire near Fall River Mills. Telephone and CDF rptrs failed, and all comms had to be run on Amateur Radio. N6AUB has been appointed to the ARRL Emergency Advisory Committee. K6FO has been appointed to the Advisory Committee for club activities. W6YKU has been reelected by the YLRL to serve as their disbursing treas. WA6ZGM will serve as their 6th Dist. chairman. WA6IHX gave a presentation on RFI to the Aug. meeting of the Yolo ARS. Congrats to KA6VLA, new Novice in the Chico area. The GEARS have noted the passing WA6TNB. Traffic: KE6NO 12, N6EPG 6, K6MLW 4, W6RSP 4.

SAN FRANCISCO: SCM, Bob Smith, NA6T — SEC: N6BLN. STM: K6TP. SFRC activated the VA club station and now needs operators. KB6KM has EME computer programs available. SCRA has new mobile camping group going. If you like to camp and go mobile, see WA6ACX. MARC now has the antennas in place, including a dish for 1296 MHz. See N6AQY or K6LRN about operating from HAFB. W6RNL had a nice writeup in RAIN. K6LRN and WB6TKD were awarded Certificates of Merit for their contributions to Amateur Radio and public service. Congrats from the San Francisco section. Section ECs: Don't forget the SF Admin. Net, 3920 kHz, 8 P.M., on first and third Tuesdays. Don't forget the SET on October 16-17. PSHR: W6RNL. Traffic: WB6RTE 12, NA6T 9, W6GGR 6, WA6QXV 2.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB, STM: N6AWH. ASCMs: W6TRP K6YK NF6K. New appt: W6VMB, EC for W. Kern Co. W6QHA and W6QEP are SILENT KEYS. Contact W6BYH for info on the Central CA DX Club. The Fresno-Madera Chapter of the Northern CA DX Club meets for breakfast at Denny's, near First and Shaw on the first Saturday of each month, except during the ARRL DX test. Contact W6XP for info. Club newsletter editors are asked to be sure to include the director, vice director and SCM on the mailing list. WB6ZCJ is Extra. N6DQE is Advanced. WB6QYF and WB6VDX are General. KA6VTA is Novice. KA6GDS is N6HEW. N6BNW has TR7850. KD6BE has TS930. WB6EHH has FT230R. KA6SDH has IC3AT. WB6QDN has TR7500. KE6CZ has TS530S. WD6GJL has an A4 tribander. Happy Thanksgiving to all. Traffic: N6AWH 169, WA6YAB 32, W6DPD 11, WD6FRS 11, WA6JDB 6, W6SX 5.

SANTA CLARA VALLEY: SCM, Ross Forbes, WB6GFJ — STM: W6ZRJ. SEC: KA6R. Welcome to the new SEC, KA6R, who has been meeting with ECs in each county. We can look forward to a section-wide emergency plan being developed. W6ZRJ is contacting all tfc stations to survey new ideas. If you are interested in an ORS appointment, be sure to contact W6ZRJ! Congrats to PAARA, who received the Field Day plaque as the winner for this year's CCRC competition. New AEC for Mt. View is KE6ZA. For a list of all club and general interest nets in the section, drop an s.a.s.e. to SCM. Don't forget to send a copy of your club's bulletin to the SCM. News and info for this column should be received by the first of each month; my address is on page 8 of *QST*. New DEC for Santa Clara Co. is W6PLT. Any Novice or Tech who wants an RCC should contact WA6HAD, who also transmits bulletins on the low end of Novice bands. N6XI getting active again after changing QTH. K6PU now QRV from Great Britain. Any station in the section with a home computer and modem, please contact the SCM. BBS possibility! New members of the San Mateo RC are N6GWS and KA6VRO. Santa Cruz CARC is happy with their new rptr. W1PW/R is back on the air on 146.895. New members of NPSARC include KK1D W3KBI and KA1JBO. KB6GV is enjoying his new tower and antenna. WB6IZF is commuting between W6 and SU (Egypt). The San Jose S & R portable rptr saw activity in the VIP activities. Effective January 1, 1983, this section WILL convert to the new section structure. K6AYB active as OO and chasing some DX. WB6GFJ busy cleaning up after fire damage to property; house all OK! Traffic: W6KZJ 130, WB6SVS 30, W6ZRJ 30, WA6HAD 12, KE6ZA 6, WB6GFJ 2, N6XI 2.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ian C. Black, WD4CNR — STM: W4EAT. SEC: NB4L.

Net	Time	Freq.	Sess.	QNI	QTC
CMN	1145	3.927	31	467	190
CN	2300/0200	3.574	61	580	352
JFKN	2230	3.923	31	867	185
THEN	2330	3.923	31	839	205

Alamance ARC announced sponsorship of the NC QSO Party and also of the Pig Pickin' Contest, not necessarily in that order, but both coming soon. Pig Pickin'? I'd like the results of that one. Rcvd copy of interesting letter to Hq. from N4UE. He suggests a fund to be set to which all of us could contribute, but which would be monitored by the League, for use by smaller rptr clubs. The funds would be used to defray legal expenses caused by anti-ham local govt. action. An obvious question is how to decide whom to help. It is noted that practically every Board meeting attacks the problem of how best to use the legal power of the League in defense of our hobby. N4UE's point, a good one, is if the League administered the funds, at least we'd know it wasn't a hoax we were contributing to. Shelby Hamfest attended and enjoyed again this year. Possibly the best weather ever for a mainly outdoors event. Fellowship at an all time high; dealers doing good business, and a lot of smiles on the faces of the tail-gaters. Poolside activity noted: WA4OBR trying to rescue a young thing who appeared able to swim OK to me; K4IWW completely uninterested in our conversation-action on the balcony had his attention. Wonder what she did do with all that ice? Note to Hq.: The item "47 cups of coffee" on NB4L's expense sheet is fraudulent. Actually, he lost the bet concerning Loretta's and Dottie's ability to finish the bottle. Admittedly, these are "in" type stories, but if they have you wondering, join us next year round the pool at Shelby. Traffic: K4GCN 581, WD4CNQ 431, WB4WII 238, W4EAT 192, WA4FKY 164, KD4PJ 143, NJ4L 101, AB4S 88, WB4N 78, WD4LRG 70, WD4CEB 68, KA4KJI 62, WA4OBR 60, WA4SRD 60, NT4K 54, K4IWW 50, WD4LOO 49, NE4J 45, WB4CYN 43, KZ4A 31, WB4CES 28, KA4DHP 14, NN4P 14, NB4L 13, W4EHF 12, W4RVE 12, WD4BCX 10, KA4LKF 10, N4UE 7.

SOUTH CAROLINA: SCM, Jimmy Walker, WD4HLZ — ASCM: WB4UDK. SEC: K4SUG. STM: W4ANK. NMs: K4PFC KC4LA NJ4L AB4S. Congrats to NT4W for receiving "100 Nations Award." National Weather Service is

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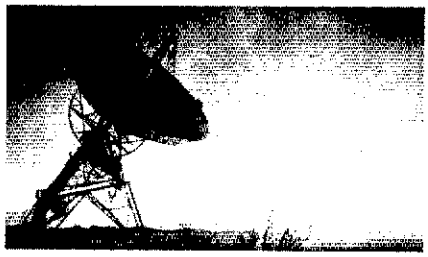

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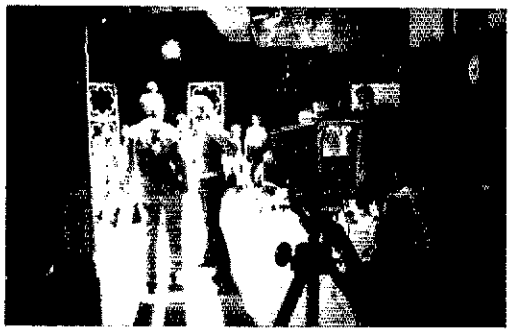

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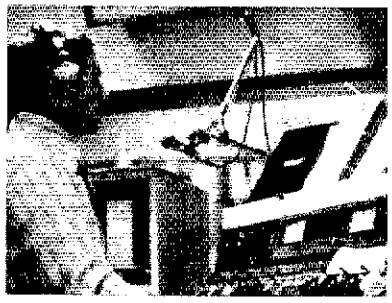

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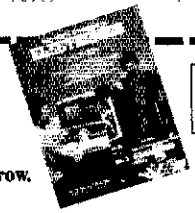

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beginning SKYWARN training for 1983. Contact NWS Columbia if your club is interested. October is the time to elect an SCM for next 2-year term. W4OCX and WD4HLZ will be on the ballot you will receive from the ARRL. Don't forget to mark your ballot and return before November 1. Have you noticed the change in this column over the past few months? I have been devoting more space to other activities besides traffic. Additional space could be provided if traffic and nets are combined quarterly. Send me your ideas and comments. SCSSB 1087/107. SCNT 405/61. CSN 189/39. Blue Ridge 2279/92. Greater Pee Dee 1134/124. Western Carolina 391/30. Newberry 62/3. Carolina State Line 58/4. Traffic: K4ZN 249, W4NTO 138, KA4AUR 111, W4ANK 97, KE4QZ 47, W4FMZ 45, KA4LRM 42, K4FRX 39, WD4FJP 35, KE4WC 33, KC4LA 29, K4ZB 25, WA4MIY 21, WB4UDK 20, N4ATO 12, W4DRF 9, WD4PLB 6.

VIRGINIA: SCM, Phil Sager, WB4FDT — ASCM: K3RZR. SEC: WB4UHC. STM: KY4K. Chief OBS: K3RZR. Chief OO: W4HU.

VNTN	Noon	7260/3905	WD4FTK
VSBN	6:00 P.M.	3947	W4NWM
VSN	6:30 P.M.	3680	K4VWK
VN	7:00 P.M.	3680	K4JST/W3ATQ
VN	10:00 P.M.	3680	K4JST/W3ATQ
VLN	10:15 P.M.	3947	WD4ALY
VRN (RTTY)	7:30 P.M.	3630	KA4ERP

After over a year, the Virginia Slow Net (VSN) has moved out of the Novice band back to its former frequency, 3680 kHz. VSN manager K4VWK says the move is owing to the lack of any Novice or Technician participation. Congrats to WA4CCK, whose traffic total earned him a BPL this month, only the third awarded to a Virginia amateur over the last 6 months. WB4FLT, WB4KSG AF4O N4DR and WB4FDT were present at N4YE's bachelor party. Understand WB2RBA will be working in 2-land during the winter months. Virginia ARES getting a workout in September with a mock nuclear power plant disaster. SVEN reports 47 OTC and 486 QNI. WA4CCK K4JST NN4I KY4K WD4ALY KA3DTE K4VWK KA4ERP WB4UHC NW4O and W4LXB all earned PSHR awards this month. K3RC new ORS appointee. K4TSJ now living in Sterling Park. KY4K and WB4FDT gave a talk on NTS and the Virginia Traffic net system at a meeting of the Mount Vernon RC. WB4KIT traveling in Texas. Virginia will switch to Section Manager position in January. I am looking for a state-wide club coordinator and a local and State Government Liaison. I will discuss this change in depth next month. Traffic: WA4CCK 510, K4JST 434, W3ATO 345, WA4LJI 340, WD4FTK 298, NN4I 255, KY4K 194, WD4ALY 193, KA3DTE 163, WB2RBA 153, WB4FLT 136, W4NWM 130, K4KDJ 108, K4VWK 87, NT4S 77, KB4PW 73, KA4ERP 72, KA4IUM 71, WB4UHC 69, NW4O 68, WB4FDT 67, N4YQ 55, KB4OG 52, KC4HN 51, W4JIR 50, W3BBN 45, N4FNT 45, NT4U 41, K3RZR 40, W3BBQ 34, K4MLC 31, WB4ODZ 26, N4EPO 25, WB4KIT 22, WB4RWY 22, KI4W 22, W4CFV 20, W4LXB 19, W4PVA 19, WB4RKN 19, W4UQ 19, K4RC 16, K4DHB 14, W4KXE 13, AA4AT 12, N4FTN 12, WB2OMZ 11, N4BJX 6, WB4DQZ 6, N4LE 6, W4OKN 6, K3RC 5, WA4TVS 3, WD4DUU 2, N4YE 2, N4DW 1, W4TZC 1. (July) N4YQ 78, W4PVA 8.

WEST VIRGINIA: SCM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. Rptr Coord. WD4KHL. WD4GRF is now Adv. KA8OAV is now Gen. KA8PNK is now Tech. Congrats to all who have upgraded. WB8KUU is now KV8T. KC8CG is now KV8S. Interested in 160 mtrs? Listen for WV hams on 1835 and 1850 around 7:00 P.M. Bluefield hamfest was nice affair again this year. WB8VAZ was wed on Aug. 25. Congrats.

Net	Freq.	Time	QNI	QTC	Sess	NM
WVN	3567	7:00	108	55	27	W8LYV
WVFN	3990	6:00	565	125	31	N8AJC
WVMD	7235	Noon	479	52	31	W8FZP
WVNN	3730	6:15	32	20	20	WB8TJN
HILLBILLY	14290	Noon Sn	179	47	4	W8YP
KARC 2Mtr	28/88	8:30 Sn	94	2	5	WD8AEW
KFC 2Mtr	87/47	8:30 M	84	5	4	WD4KHL

Traffic: W8JWX 80, KA8GHF 69, K8QEW 61, K8KT 56, KC8CR 38, W8HZA 38, N8AJC 37, WA8YLW 15, KV8T 12, WB8ZMX 12, N8CFY 7, N8DLK 7, WD8MJE 2, WB8WEZ 2.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Lawrence E. Steimel, WØACD — SEC: K3PUR. STM: WDØAIT. NMs: WDØAIT WØHXB WØLAE WAØRYL. With the passage of HR 5008, the radio amateur fraternity has passed another milestone as many times as in the past. However, with the FCC directing their staff to write a proposal for creation of a No-Code amateur license, we again will be faced with a decision. We as radio amateurs should be prepared to submit our comments at the proper time. The Northwest and Rocky Mountain Division convention at West Yellowstone was well attended with over 500 registrations. There were several League Officials as well as eight SCMs from the two divisions there. It was a good convention, thanks to the organizers. With the ARRL Board's approval of the new Field Organization as recommended by the LRPC, the new system will be implemented in the Colorado Section on 1 Jan. 1983. This will change the reporting channels for some of the positions and will create four new positions. This will in no way replace the ARES or National Traffic System, as handling of traffic will always be of major importance to the ARRL. Keep up the good work and don't forget to report your activities. HNN sess. 26, QNI 1443, QTC 108, inf 213, QNF 1327. Colombine sess. 25, QNI 912, QTC 81, inf 146, QNF 1095. Colombine (July) sess. 27, QNI 956, QTC 81, inf 199, QNF 995. Traffic: NØBQP 2266, WAØHJZ 1705, WØACH 678, WØACD 607, KØJAN 540, KØDJ 245, NØCXI 166, WØLAE 137, NØACW 118, WØEJD 57, KBØZ 40, KØCNV 12.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. STM: KV5U. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 3.583 at 1930 local and handled 245 msgs with 238 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3.939 at 0100 UTC and handled 114 msgs with 858 stations in. New Mexico Breakfast Club meets daily on 3.939 at 0830 local and handled 94 msgs with 915 checkins. Yucca 2 Mtr. Net, 78/18 & 93/33, handled 12 msgs with 459 checkins. Caravan Club 2 Mtr. Net 66/06 handled 12 msgs with 459 checkins. W5JVX/5 operated from Duck Downs, the world's richest duck race, Deming, NM Aug 21 & 22 handling over 100 msgs. W5JVX KV5U W9OBV K5DUV W5GMO N5DGE WAØOYI & others helped. Traffic: KV5U 300, K5DUV 217, W9OBV 176, W5JOV 148, W5DAD 144, W5ENI 64, WA5MIY 36, KB5LI 30.

UTAH: SCM, Leonard M. Norman, W8PBV — — SEC: WB7BZJ. STM: W7OCX. W7OCX is not retiring from Amateur Radio, just turning the helm over to younger

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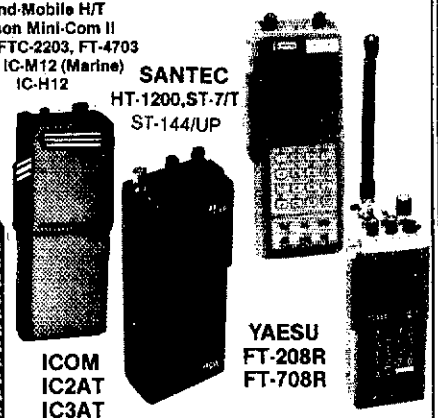

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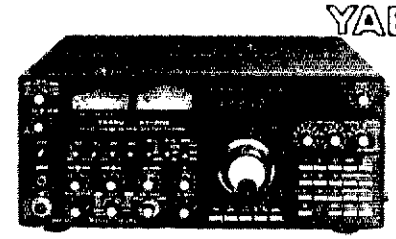

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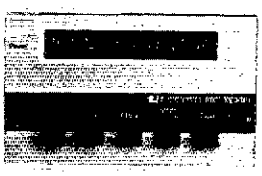

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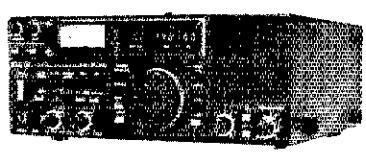

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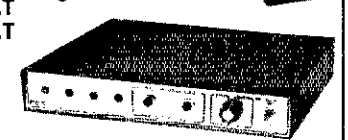

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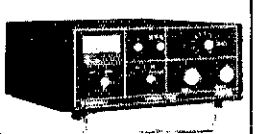

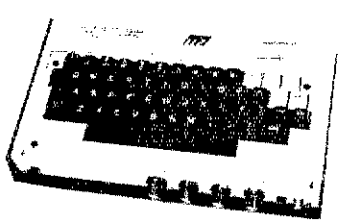

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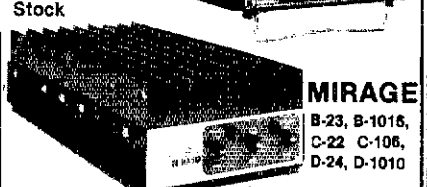

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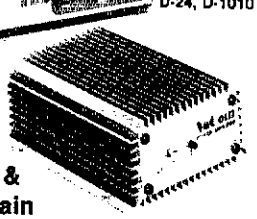

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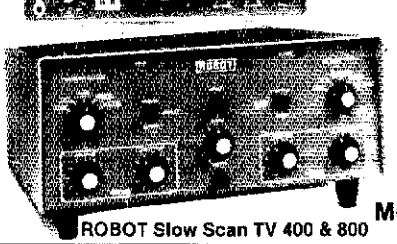

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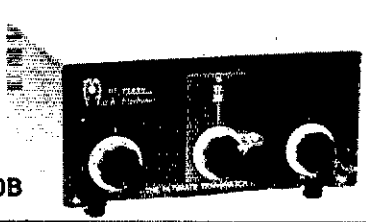

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guidance after a quarter century of faithful public service to Amateur Radio. WA7MEL enjoying QSOs with W7EM/Ø, KC7QA new NCS on Beehive net. KC7ZH had upgraded to Advanced. WA7HMS is out of the hospital and on the road to recovery. KA7LUK has upgraded to Advanced and is looking for DX. K7DWB has a new handheld. UARC and OARC each put on a FB steakfry, which was enjoyed by many including your SCM. W6PHF/7 working DX from Beryl. Traffic: WA7KHE 91, WA7MEL 74, KN7U 41, WB7UJP 32, K7CKF 24, W7OCX 14, W7RO 10, W7PBV 8, KO7H 6.

WYOMING: SCM, Dick Wunder, WA7WFC — SEC: WB7EIN. STM: WØOGH. Had a very enjoyable time at the WIMU Hamfest at West Yellowstone, MT. The WIMU group was the sponsors for the Rocky Mtn & Northwestern Division ARRL Convention. Our thanks for everything. It was my pleasure to visit with our new president, Vic Clark, W4KFC, and his lovely wife. The next year is going to be full of changes with the new ARRL organization going into effect and the additional responsibilities for the Field Organization. Your input and help are most welcome. WTN held 12 sess. with 37 QNI & 12 QTC. Cowboy Net held 22 sess. with 487 QNI & 16 QTC. Jackalope Net held 20 sess. with 325 QNI & 0 QTC. New Novice is KA7OGI. Cokeville rptr. 147.90/30. Traffic: WØOGH 176, WB7NHR 116, KA7FKT 78, K7SLM 44, W7SQT 8.

SOUTHEASTERN DIVISION

ALABAMA: SCM, H. H. Wheeler, W4IBU — SEC: N4DMA. STM: WA4PIZ. ASCMs: N4DRV KA4WVU. Amateurs who have graduated from Auburn are requested to contact WA4LJU, prez of the Auburn ARC. The Huntsville Hamfest was an outstanding success. The committee and assistants are commended for their efforts. Don't fail to give your opinion, by letters to the officials, concerning the so-called no-code license contemplated by the FCC. The Amateur Radio bill is now awaiting the President's signature. This may cause many changes in the way things are done, so study it well. Congrats to the many who upgraded at the FCC testing site in Montgomery. The ARRL Info Net on Tuesday nites after the "M" net is now getting more activity. Members and non-members are invited to participate. Give and receive information of interest! N4SO and W8IM have received their 1st Class Radiotelegraph tickets. A poll is being taken to determine the advisability of a cw training net being established within the section. Direct your opinions to WA4PIZ or W4IBU. 145.695 has been recommended as a national emergency alerting frequency. This would require the cooperation of the entire amateur fraternity. The SEC is conducting tests! DRN5 represented 100% on CAND by W4CKS and W4IBU. Alabama represented 100% on DRN5 by W4IBU W4WJF WA4JDH W4CKS & WA4RAJ. Traffic: WA4JDH 758, W4CKS 140, K4AOZ 84, WA4LXP 74, W4IBU 48, N4HIR 21, KA4IJT 18, WB4IXA 10, K4GXS 8, WB4TVY 8, W4DGH 7, WA4OEA 2, WA4SLZ 1.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — SEC: WB4HXE. ASEC: K4SWJ. STM: W4WXA. Chief OBS: W4BIA. KB4IT reports winners of the Atlanta RC Trust Fund Memorial Scholarships as follows: K4AEJ award to WB5MJK, who will enter Rice Univ.; KJ9I, winner of the W4IO memorial, plans to attend Milwaukee Sch of Eng.; Georgia's own KS4Q, (1st GA winner) recipient of the N4YO scholarship, will study at the U. of Dallas. Congrats to all the winners & our hats off to the sponsors. WB4ZVX is the 1982 Georgia Amateur of the Year. This award is sponsored each year by the GA SSB Assn. Receiving "Certificates of Merit" during the GA State Convention at Warner Robins were the Central Georgia ARC, W4HON & KF4EH (ex-WD4ADV). The section's 1982 hamfests concludes with the Stone Mt. Famvention on Nov 6th & 7th. The 1982 SET is now history. All results are due into the ARRL by Jan 31, 1983. If you need forms let me know a.s.a.p. Colquitt Co. HRS again successful with "Expo '82." The citizens of the Sunbelt really get exposed to Amateur Radio at work. K4VN received WAS certificate for ssb. 2-letter Extra Class calls on 75. Bill Gremillion RC again out in full force at Powers Crossroads Festival. Been licensed 25 yrs or longer and want to join QCWA? Contact W4JWO or K4JNL for info. Spalding Co. ARES Net meets each Mon eve (local on 144.79/5.39. Join them. The Thronateeska Chapter of 10-10 is sponsored by the Albany ARC & meets Sat at 1900 UTC on 28.550 MHz. It's election time for most clubs in the section. Please send me a list of your new officers. This is the month of Thanksgiving. Hope all have nice family gatherings. Traffic: W4WXA 149, K5TF 118, WB4NTW 100, W4FIZ 39, W4HON 39, K4EV 35, K4JNL 32, KA4ATM 31, K4NM 29, W4BIA 20, W4AAY 18, K4BAI 8, N4BIM 6, K4PIK 4, N4UZ 3, W4IZI 2.

NORTHERN FLORIDA: SCM, Billy F. Williams, Jr., N4UF — SEC: W4UEA STM: WD4HIF. ASEC: KE8O. NM: WA4QXT NY4E KA4MGQ KA4MGR KF4U. New district (East Central) has been formed. KB4LB has been appointed as DEC. This includes East Volusia, West Volusia and Seminole Co. New EC for Bradford Co. is K4SRA, while WB4UBK takes over EC duties for Putnam Co. WN4IIV has resigned as NFPN net mgr., and is replaced by KA4MGQ who previously served as asst. mgr. The Gulf Coast ARC chose WC4E as recipient of its scholarship award. N4EDQ very busy handling traffic for the Int'l Communications For Christ (ICFC) net which serves missionaries. Through the use of RTTY system and computers, this system handles 10,000 pieces of formal written traffic monthly. Novice class instructors are busy this fall with training new hams. Congrats to NS4V & KC4N (Tal), W4DTV (Orl), K4DDY KW4T (Jax), KE8O & AA4FG (NPR) & N7SD (Daytona) for their services as instructors. In Gainesville WA4HFR & KA4NGX built an emgcy power supply charger for the K4DPZ rptr, which is being reinstalled at full power on the Ch. 5 tower. SEC W4UEA is working on updating the N. Fla emergency plan. BARS rcvd nice newspaper writeup on their race coverage in marathon. Greater Jax Hamfest attendance up considerably over last year. Tnx to committee for first class event. Enjoyed meeting many members there. Sunday NCS on FMTN is now WD4RIQ. Send correspondence and reports to me at P.O. Box 9673, Jacksonville, FL 32208. Traffic: N4EDQ 2749, WD4HIF 555, N4PL 434, WA4QXT 315, WA4EYU 185, KB4LB 119, W4MGO 107, WB4TZR 104, WB4GHU 98, KD4QZ 97, N4EDH 76, WB4ADL 73, WD4HBP 62, KA4MGQ 53, N4ADI 52, KB4T 49, WB4FJY 45, N4UF 44, WD4IIO 32, WD4RIQ 31, WB4DTS 21, W4DTV 21, WA4STZ 21, KA4OFG 18, KA4RBY 17, W3IDO 15, N4ESM 11, WD4MSU 11, WD4NTO 10, W4LUW 7, KA4NPI 7, KA4RMH 6, WB4YOP 6, WB4HYP 5, WB4OOS 4, WD4NVJ 3, WD4FAB 1, WD4NKA 1, WD4NVI 1. (July)

N4EDQ 1201, KA4MGR 88, KA4MGQ 60, WB4GHU 15. (June) N4EDQ 2148, WB4GHU 31.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — ASCM: W4KGJ. SEC: KB4OW. STM: WA4PFK. This being my last Section Activities writeup, I wish to thank especially the above assistants as well as other LOs, official appointees and active radio amateurs for their contribution making this an outstanding section. I have the greatest of confidence that we can grow to even greater heights under the able leadership of WA4PFK, your new SCM beginning October 1st. He may also become your first Section Manager under the new ARRL reorganization about January 1st or within two years thereafter. Those of you who read your CD Bulletin (QCD) know the OVS appointment has been abolished. There are no more Official VHF Stations. It is hoped that the stations carrying on vhf work will continue to do so and will participate in other ARRL programs. We are a little disappointed that the Official Emergency Station appointment has not caught on more. We have 20 in the section, which is not bad, but we believe there should be more. Each EC especially and most ARES members should hold this appointment. KB4OW is doing an outstanding job as SEC, and has agreed to continue under the new SCM. K4ZK is to take over the STM job on Oct. 1st. We have appointed the first DEC ever for this section. AA4BN is now District Emergency Coordinator for Hendry and Glades Cos., thus bringing official ARRL representation to Glades for the first time in many years. Palm Beach Co. has been combined under one EC, WD4BCC, thus abolishing the split into East and West for emergency coordination. With Monroe Co. hams being skittish about not having enough hams to handle a large scale emergency, W4IYT and Dade Co. ARES have agreed to send help if needed. That's the kind of cooperation which makes us proud to be hams and proud of our fine section. On August 16, Palm Beach ARC pulled off a big Simulated Emergency Test in cooperation with CD, Red Cross, CAP Search & Rescue, Sheriff's Posse and National Weather Center. Forty hurricane shelters were activated and over 200 hams took part. Good going, gang. We welcome K4ZK back after a 12-week vacation in Canada. KA4FZI has a new Ten Tec Omni D. Congrats. Most of the nets which moved to 40 meters to avoid summer static are now moving back to 75/80. QFN (3651 at 7 & 10 P.M.), first on the Traffic Hounds list with 585 messages handled, is managed by that very capable YL from Fort Myers, WD4AWN. QFN handles all your out-of-state traffic into the evening cycles of the National Traffic System, sending reps to both 4RN and RN5. FMTN (7247 at noon) does the same for Daytime NTS, with TPTN (3940 at 5 P.M.) being responsible for bringing traffic into state from D4RN and RN5D. I hope everybody is ready for the Simulated Emergency Test, scheduled nationwide for Oct. 16-17. This being the same weekend as the Clearwater Convention (Southern Florida Section Convention), we may postpone our section drill until the following weekend. This is to be considered at the Melbourne Hamfest, Sept. 11-12. Traffic: W3CUL 3027, W3VR 582, WA4PFK 414, K4TH 396, K4SCL 293, K4EUK 229, K4IA 200, K4ZK 194, WA4EIC 190, WD4AWN 185, W4NFK 164, W4GPL 149, KY4U 129, KA4ASZ 108, KE4DA 107, WA4HXU 105, WA4TWD 105, WB4WYG 103, KE4O 97, W4DL 91, WD4CHO 84, KA4FZI 78, WB4AID 74, WB4MPJ 72, W4ESH 71, W3TLV 45, KA4BBA 44, W4IRA 43, NJ4O 39, W4DVO 34, W4LVA 34, KA4AMC 33, K5IHH 32, W4PKP 30, KB4OW 29, KC4QT 28, AA4WJ 28, WB4GCK 23, N2WX 23, WB2OUK 15, W4SMK 15, WB4FVN 14, AA4BN 8, WD9AEP 7, W1DLP 6, WA4LQO 5, KM4G 4, WB4ITH 4. (July) W4IYT 25, WA4LQO 3.

WEST INDIES: SCM, Julio Negroni, KP4CV — KP4EU is new section emergency coordinator, effective Aug. 1. KP4CU left for New York and therefore vacated post. KP4EMX and KP4EU passed Extra Class license exams this month. Congrats! STM informs WINS gave way to win at 13 to 15 wpm starting Sept. 1 by popular demand. Section is beefing up for SET next Oct. 18-19. PSHR: WP4AOH NP4D KP4DJ. Traffic: NP4D 162, KP4DJ 102, WP4AOH 93, WP4AMA 30, KP4ABK 28, WP4BPD 22, NP4L 17.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Erich J. Holzer, N7EH — STM: W7EP. NM: WA7KQE WA7FDN. The month of August has come to an end; it has been a quiet month. I have upgraded the following ECs to DECs: W7KAX N6HJ K7NTG. This should enable ARES within the section to achieve a firmer foundation. N7CSC reports that when the AZ MVD returns your application for amateur callsign plates, your plates are ready to be claimed. W7KMA reports that WB7TOV is the first AZ YL to work 50 countries on 6 meters. AAA5 is planning their participation in the Thunderbird Balloon Race, to be held in November. The July issue of *Squelch Tail* has many fine pictures from Ft. Tuthill of Field Day. ARA will be sponsoring a ham computer swapmeet for Oct. 16. Congrats to W7KOY on being awarded a Certificate of Commendation and Appreciation from the Phoenix P.D. for her public service. It is with regret I report the following Silent Keys: W7AE KA7CEI W9AHV. PSHR: K7NTG W7EP. ATEN: QNI 798, QTC 224. Traffic: W7EP 117, K7NTG 117, W0GMO 63, K7UXB 57, WA7KQE 51, W7AMM 38, K7NMQ 33, KE7W 33, N7CGY 16, N7EH 14, WA7YUL 8, WA7NXL 7. K7GLA 4, N7CVT 3, KQ7Y 2. (July) K7UXB 76.

LOS ANGELES: SCM, Stan Brokl, N2YQ — SEC: N6UK. STM: K5DY. DEC: Northeastern District-WB6MKA; Northwestern District-WA6LAU; Southern District-KE6EF. Congrats to the following new EC appointees: WA6HHA WB6JBQ WB6LOY WB6FRM WA6OZY. This completes the reorganization of the Los Angeles ARES. WB6MKA did a fine job getting these new ECs in his

district. The Tri-County ARC Hamfest at the LA Co. Fairgrounds was a great success. Special thanks to W6ELZ and his committee for a job well done. W6NAZ was recently awarded the George Washington Honor Medal from the Freedom Foundation at Valley Forge. The award was given for individual achievement as a volunteer. The Southwestern Division has just established two new calling frequencies: 3952 kHz nights, and 7275 kHz days. These are primarily for intersectional requests for assistance and cooperation. This does not affect anything presently in place in the Los Angeles section. The solar powered station W6HCS reported into 10 nets this past month. The station operates both hf and vhf bands. Section PR net meets weekly Wed 7:30 on K6QQN/R 147.705, down 600. Appointees net meets Thurs 8:00 P.M. on K6QQN/R 147.705, down 600. OO reports: KD6NL 2; KD6NL (July) 7; K6KA 19. Congrats to N6VI, appted to asst. dir. for tower and antenna litigation. Anyone having information on any recent cases in the Southwestern Division should make it known to N6VI. Traffic: K6UYK 283, N6DZQ 133, KT6D 103, W6INH 84, AD0A 63, WA6OCM 49, K6CL 30, W6NKE 13. (July) AD0A 75, N6DZQ 56.

ORANGE: SCM, Fried Heyn, WA6WZO — ASCM: WA6WZN. SEC: W6UBQ. STM: KN6C. DECs (by counties): K6GGS, San Bernardino; W6LKN, Riverside; WB6JBI, Orange; WB6YZY, Inyo. At the beginning of next year the SCM will become Section Manager and under the reorganization I will need to fill the following six additional section level positions: Official Observer and RFI Coordinator, State Government Liaison, Technical Coordinator, Affiliated Club Coordinator, Public Information Officer, Bulletin Manager. If interested, contact me (SCM). The Orange Co. Council ARO began planning the (Labor Day weekend) 1983 ARRL CW Division convention; WB6QKB will be the chairman assisted by NC6H. Silent Key WB6OSP, a close friend, contributed much to Amateur Radio, will be missed by all. N6CBK appointed OBS. For info on the Radio Communications Monitoring Association (RCMA) contact KA6JCX or N6CRI. For SWL info write American Shortwave Listeners Club, 16182 Ballad Lane, Huntington Beach, CA 92649. For Westlink schedules and rptr directory send s.a.s.e. to N6BVU. The largest monthly swap meet in the division is still put on by TRW ARC the last Saturday at the corner of Compton and Aviation in Manhattan Beach. Irvine Police Dept. has reorganized volunteer comms under the title of Irvine Disaster Emergency Communications (IDEC) Team headed by: WA6TMM, pres.; WB6CFY, v.p.; N6GQP, secy. Bishop rptr WD6EBI/R 146.70(– .6) is now KE6OZ/R 146.88(– .6). West/Coast ARC started additional net Fridays 7:30 P.M. 144.33 simplex. For latest xmtr hunt schedule send s.a.s.e. to K6BMG. Coast Guard Auxiliary has new rptr with an output of 143.825 MHz; info on joining, contact OES WB6ULU or Flotilla Commander K6ZMI. Catalina RA is having a picnic Sunday Nov 7th 11 A.M. at Craig Park in Fullerton. For info on off-road racing comms, contact W6NHX, past pres. Baja AR Racing Assn. Beach Cities Wireless Society rptr W6PMJ/R 146.925(– .6) has disconnected their PL. PSHR: N6GIW W6CPB W6NTN KA6BNW WB6QBZ WA6QCA.

Net	Freq.	Time	QNI	QTC	NM
SCN/1 (20)	3598 kHz	7 P.M. Dy	327	341	K6UYK
SCN/2 (13)	3598 kHz	8:15 P.M.	162	152	K6HAP
SCN/V (FM)	146.045/645	9 P.M. Dy	509	345	WA6QCA

Traffic: W6NTN 316, WB6QBZ 181, N6GIW 125, WA6QCA 100, KN6C 60, W6RE 54, KA6BNW 52, W6TKV 39, W6CPB 36, K6ZCE 26, AE6N 16, W6PNS 12, AI6E 8, WA6WZN 4, WA6WZO 3. (July) AI6E 19.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW. SEC: W6INI. The City of San Diego Office of Emerg Mgmt presented awards to KM6S WA4SHP and W6INI for exceptional service. Success of the city's emergency plans will depend heavily upon Amateur Radio volunteers. In order for ARES to provide adequate support, many more volunteers are needed. Contact W6INI (273-1120) for info on joining San Diego's Emergency Mgmt Volunteers. WB6HMY is new manager for North County Traffic Net. In August, 30 sessions were held and 149 msgs handled. The net meets daily at 2000 on Palomar ARC's 13/73 rptr. YLs may be interested in a net each Tue at 0900 on the 13/73 rptr. N6GGW is the spark plug. Good friends made special arrangements for N6GGW to attend the Palomar ARC picnic. Poway ARS reports good activity on its 10-meter net (Tue 1900, 28.7 MHz). Is your rptr disaster oriented? In addition to emergency power source, rptrs must be anchored to floors and walls to withstand earthquakes. All other loose equipment should be securely anchored. Flimsy tables & unsecure racks are a no-no. Antennas should be guyed to prevent whipping. Traffic: KT6A 741, KM6I 357, KU6D 204, K6HAP 127, W6HUJ 123, N6AT 24, N6GW 4.

SANTA BARBARA: SCM, Robert N. Dyrutt, W6POU — Ever thought of joining the ARRL "team" by taking on a Section-level appointment? Under the new reorganization SECTION MANAGERS will start replacing SCMs, with added functions. You might qualify/perform for the good of the fraternity one of the following: Section Emerg. Coord., Sec. Tfc. Mgr., Dist. Emerg. Coord., local Emerg. Coord. or Ass't, ARES mbr, Net Mgr., Official Relay Stn, Official Emerg. Stn., Gov't Liaison, Official Observer, Interference Coord., Affiliated Club Coord., Public Info Officer, Bulletin Mgr., Official Bulletin Stn., Technical Coord., Rptr. Coord. ARRL/Amateur Radio prospers when you serve. Contact W6POU. New Official Observer W6PNI! Who's next? Six hams joined WB6IIY N6BUY & W6MSG in SLO County-wide area PG&E siren test for nuclear facility. Traffic: K6YD 299, KD6ZM 5.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — ASCM: WA5QFD. STM: W5VMP. SEC: W5GPO. NMs: AE5I KC5FX KA5MAY AA5J WD5JYI. The Lubbock area ARES unit participated in a simulated disaster drill on Aug. 2. The exercise was a mock airplane crash, and involved all area public safety and hospital personnel. Much was learned about the logistics of providing comms for several different agencies simultaneously, under emergency conditions. DEC WB5DUQ and EC WA5RWW were very pleased with the performance of the unit. This is an ideal way to show all local officials our capabilities. I wish all ECs could stage a drill of this type to foster co-involvement in emergency preparedness within our section. DEC WA5KZA reports from Paris that the new EOC is in operation, complete with wall-to-wall carpet! Stations on 2 mtrs and hf have been installed along with the public safety radios and a few scanners. The ARRL Board of Dir. has done away with the Official VHF Station appointment. I wish to

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210X/NB Xcvr 329 w
VX-5M VOX 39 m
PS-110H 12v ps 69 m
RX-110 Ham Rcvr 99 m
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75S-3B Ham Rcvr 450 mc
75S-3B Rcvr (round) 549 f
51S-1 SW Receiver 995 w
51S-1 Rcvr (round) 1195 v
32S-1 Transmitter 275 wfv
32S-3 Transmitter 425 mfc
32S-3 Xmtr (round) 499 f
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DRAKE
2C Ham Rcvr $149 w
2AC Xtal calibrator 12 m
R-4 Ham Rcvr 169 m
R-4A Ham Rcvr 199 mwcv
R-4B Ham Rcvr 269 w
R-4C Ham Rcvr 349 mfc
MS-4 Speaker 19 fv
FL-500 Filter 35 w
FL-1500 Filter 35 w
FL-4000 Filter 35 m
R-7/3 filters SW Rcvr 999 f
R-7/4 filters/NB 1089 e
T-4X Transmitter 199 mc
T-4XB Transmitter 269 mwf
T-4XC Transmitter 349 mf
RV-3 Remote VFO 69 e
TR-4 Xcvr 289 mtcve
TR-4/NB Xcvr 339 m
TR-4C Xcvr 369 mwfe
TR-4CW Xcvr 429 tv
TR-4CW/RIT Xcvr 489 e
TR-6/NB 6m Xcvr 399 m
TR-6/NB/AM filter 429 m
AC-3 AC supply 59 me
AC-4 AC supply 89 all
DC-3 DC supply 49 mf
DC-4 DC supply 85 e
TR-7 Xcvr 989 mwc
TR-7/NB Xcvr 1069 m
TR-7/2 CW filters 1069 m
TR-7/3 filters 1089 f
PS-7 Power supply 199 mwfc
PS-75 Power supply 129 m
MS-7 Speaker 29 m
RV-7 Remote VFO 129 f
SP-75 Speech processor 99 m
C-4 Station console 249 w
WH-7 Wattmeter 79 wc
MC-4 Mobile console 69 w
MN-7 Tuner 129 mw
MN-75 Tuner 169 f
TR-22 2m FM portable 79 w
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IC-25A 2m FM Xcvr 239 f
IC-230 2m FM Xcvr 119 mw
IC-245 2m FM Xcvr 179 mf
IC-245/SSB 2m Xcvr 229 mfc
IC-251A 2m Xcvr 469 fv
IC-255A 2m FM Xcvr 189 mf
IC-290A 2m Xcvr 329 f
IC-502A 6m SSB port 169 v
IC-402 432 SSB port 249 m
IC-3PA AC supply/spkr 39 m
KLM
Multi-2700 2m Xcvr $399 w
2-25B 2m 2/25w amp 59 m
2-70BL 2m 2/70w amp 69 w
10-40B 2m 10/40w 69 m
15-40CL 450 15/40w 89 w
KANTRONICS
Field Day Reader $199 c
Field Day 2 Reader 249 f
Mini-Reader 159 m
KENWOOD
TS-511S/PS-511 Xcvr/ps $299 c
TS-120S Xcvr 449 f
TS-130V 25w Xcvr 429 m
PS-30 Power supply 99 f
VFO-120 Remote VFO 119 m
AT-120 Ant tuner 69 m
TS-520 Xcvr 449 m
TS-520S Xcvr 449 mv
TS-520S/CW filter 479 m
VFO-520 Remote VFO 99 c
TS-820/DG-1 Dig Xcvr 579 w
TS-820S Xcvr 599 mw
TS-830S Xcvr 699 m
VFO-230 Remote VFO 219 w
R-820 Ham receiver 689 m
TS-600 6m Xcvr 449 c
TS-700A 2m Xcvr 349 mwe
TS-700SP 2m Xcvr 449 mwf
VFO-700S Remote VFO 79 w
TR-2200A 2m FM port 99 wf
TR-7200A 2m FM Xcvr 99 f
TR-7400A 2m FM Xcvr 199 wfcv
TR-7625 2m FM Xcvr 199 mwce
TR-7625/TTP mic 229 f
TR-8300 440 FM Xcvr 189 v
PS-5 AC supply/clock 39 f
KPS-7 7A power supply 59 m
MFJ
482 Memory keyer $ 59 m
484 Memory keyer 89 fe
LSP-520BXII Spec proc 34 f
950 Rcv ant tuner 34 w
MACROTRONICS
TA-650 Interface/Apple $299 m
MICROLOG
AKB-1 Keyboard $189 fe
AVR-2 Demodulator 299 mve
MIDLAND
13-510 2m FM Xcvr $189 m
J.W. MILLER (DAIWA)
CNA-1001 Auto tuner $249 m
RF-440 Speech proc 89 me
MIRAGE
D-1010 440 10/100w $199 m
NDI
HC-1400 2m FM Xcvr $149 w
PALOMAR
P-308 AC Rcvr preamp $ 69 v
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TR-930 9" B & W monitor $119 m
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P-1215 AC supply $ 29 m
PSU-5 AC supply 89 mw
PSU-5B AC supply 99 m
PSU-6 AC supply 129 mf
PSU-6A AC supply 129 m
260 Cygnet Xcvr 249 m
270 Cygnet Xcvr 249 wf
14A DC converter 39 m
350 Xcvr 189 mf
500 Xcvr 239 mwf
500C/SS-16 filter 279 m
500CX Xcvr 269 mw
HF-700S Xcvr 289 m
750CW/SS-16 Xcvr 389 m
250 6m Xcvr 169 f
250C 6m Xcvr 229 mw
NS-1 Noise silencer 19 w
117X Basic AC supply 69 w
117XC AC ps/spkr 99 mwf
PSU-3 AC supply 99 c
PSU-3A AC supply 99 m
14X DC module 39 w
412 DC supply 29 m
512 DC supply 29 m
410 VFO 69 m
22 Dual VFO adaptor 19 m
VX-1 VOX 19 mf
VX-2 VOX 29 c
ST-3 Antenna tuner 119 m
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DFD Digital display 89 m
VHF-One Plus 2m FM 169 m
S-2T 220 FM HT/TTP 199 e
HM-5 Speaker/mic 19 e
TEN-TEC
570 Century 21 Xcvr $239 w
540 Xcvr 329 c
262M AC supply/VOX 89 c
545 Omni-A series B 399 w
546 Omni-D series B 499 mc
252M/O Power supply 99 m
255 Deluxe supply 129 mw
243 Remote VFO 119 m
KR-40 Keyer 39 m
645 Keyer 49 m
214 Microphone 19 m
215P Microphone 15 m
216 Microphone 15 m
VOMAX
SBP-3 Speech proc $ 89 m
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FL-101 Transmitter 289 m
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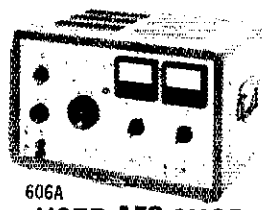
FT-101EX/DC/CW filter 549 m
FV-101B Remote VFO 99 f
FT-101ZD Dig Xcvr 569 mwv
FT-101ZD/CW filter 599 v
FT-101ZD Mk II Xcvr 599 f
FV-101Z Remote VFO 99 w
FT-301S 20w Xcvr 289 f
FT-301 Xcvr 349 c
FP-301 AC supply 99 f
FV-301 Remote VFO 89 e
LL-301 Phone patch 35 w
FT-901DM Xcvr 699 mf
FT-902DM Xcvr 869 m
SP-901P Spkr/patch 55 f
FC-901 Antenna tuner 99 f
FT-ONE Xcvr 1899 m
FT-107M Xcvr 569 m
FP-107E External ps 99 mf
FT-707 Xcvr 529 w
FP-707 Power supply 99 w
FL-2100B Linear 349 f
FRG-7000 SW Rcvr 289 m
FRG-7700 SW Rcvr 369 w
FRG-7700/MU-7700 439 e
FTV-650B 6m Xvtr 149 e
FTV-250 2m Xvtr 149 m
FT-620B 6m Xcvr 269 c
FT-221R 2m Xcvr 369 m
FT-480R/TTP mic 2m 399 f
FT-227RA 2m FM Xcvr 149 m
CPU-2500R 2m FM Xcvr 219 w
CPU-2500RK w/TTP mic 249 f
FT-207R 2m FM HT 149 m
YC-500S Counter 129 wf

9-24-82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thank the NTX OVSs for all their reports, especially the fine job that KE5C has done from Temple. I hope that the OVS appointees will apply for an appointment in some other area of interest. I will be glad to process your requests! PSHR: KA5AZK WD4SIH KC5NN KK5B. D/FW Net: QNI 537, QTC 114/91 in 31 sess. TSN: QNI 392, QTC 53/31. Traffic: KA5AZK 146, KK5B 137, KC5NN 85, W9OYL 82, KC5FX 58, WD4SIH 53, W5ERT 37, N5BT 26, WA5EZT 20, W5PBN 16, K5HGX 12, K5PC 9.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — ASCM: W5REC. Thanks to WB5MPU for code practice on the 88 Tulsa rptr. KD5JR and WB5EGZ are congratulated for their work in trying to update Woodward's weather radar. Some fine exposure in print in August: K5KLX in the Shawnee paper and KD5JR and WB5EGZ in Woodward. Hats off to K5LLZ and all the operators who supported the Great Raft Race in Tulsa on Labor Day. WD5JCE doing a great job as liaison between the Central Gulf Coast Hurricane Net and the 75-Meter Interstate SSB net. Good to see KF5A reporting back on CAND to help WB5ELG. Region Five mgr reports OK represented 100% (as usual) because of the devotion of WB5EAY WB5ELG W5FW WA5IMO WB5OHK K5RZS WB5TFX & KV5X. Have you winterized your antenna system and other gear??? Traffic: W5REC 329, W5RB 247, KV5X 207, KA5CXW 186, W5AS 171, WD5IFB 157, KB5EK 142, K5CXP 133, WB5ELG 119, WA5OUV 94, WA5FSN 56, W5VXU 56, WB5EAY 32, W5SUG 29, W5VLW 28, W5VOR 24, WA5ZOO 24, W5FW 23, K5CAY 22, WB5LSW 21, KC5OU 6, W5JJ 2.

SOUTHERN TEXAS: SCM, Arthur Ross, W5KR — TM/ASCM: N5TC, SEC: WA5RVT, BPL: WB5YDD N5DAA KA5KRI. New EC for San Jacinto Co. is N5AMH. OBS W5KLV made 131 broadcasts of ARRL bulletins. DRN5 Manager WB5YDD reports STX section was represented 100% by W5VLT K5OWK WA5RVT KD5JX WB5YIF N5DFO W5URN KA5EFJ K5WOB KD6ZF K5KJN WB5YDD. Hill Country ARC secretary has her call, KA5ORX; W5NTJ upgraded to Advanced, making the total 1 Extra Class, 4 Advanced class, 1 Technician class and 3 Novice class licensees from the club school. CAND mgr W5KLV says STX section was represented 100% on CAND by W5UYN N5AMH WB5YDD W5KLV K4OWK KD5KQ WA5OCH N5DFO N5CRU, plus TCC helpers K5KJN KB5TC W5CTZ and KV5W. The *Call Letter*, Corpus Christi ARC, reports WB5JJO built his own tilt-over tower. ORS N5CRU has added Hal ST-500 TU to his station. Traffic: WB5YDD 588, W5CTZ 401, N5EFG 323, N5DAA 315, KA5KRI 277, W5KLV 255, K5HZR 250, WB5MMI 160, N5TC 117, N5CRU 82, K5GM 77, WA5RVT 46, W5KR 29, K5RG 23, WB5EFJ 18, WD5GKH 15. (July) N5DAA 94, WB5MMI 40.

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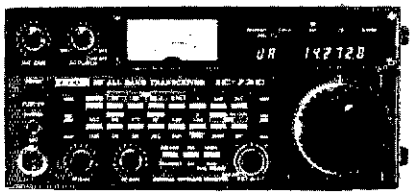

IC-720A 9-band Xcvr (Reg. $1349).. **SALE** $1149.00
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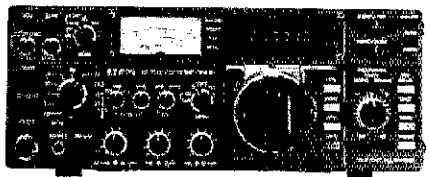
EX-203 150 Hz CW audio filter..... 39.00
EX-205 Transverter switching unit..... 29.00



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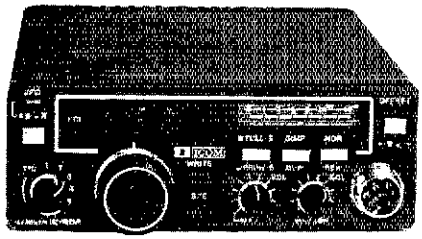
EX-241 Marker unit..... TBA
EX-242 FM unit..... TBA
EX-243 Electronic keyer unit..... TBA
EX-54 9 MHz 500 Hz filter ..... TBA
EX-52 455 KHz 500 Hz CW filter..... TBA
EX-53 455 KHz 250 Hz CW filter..... TBA

Accessories common to IC-720/730/740

PS-15 Power supply (Reg. $149)..... **SALE** $134.95
CF-1 Cooling fan for PS-15 ..... 45.00
EX-144 Adaptor for CF-1 on PS-15..... 6.50
PS-20 20A power supply (Reg. $229).. **SALE** 199.95
CF-1 Cooling fan for PS-20..... 45.00
Adaptor cable; PS-20 to 720/730/740..... 10.00
FL-44 SSB filter; 730/740 (Reg. $159) **SALE** 144.95
FL-45 500 Hz CW filter; 730/740 ..... 59.50
SM-5 Electret desk microphone 39.00
HM-10 Scanning mobile mic; 730/740..... 39.50
SP-3 Base station speaker..... 49.50
MB-5 Mobile mount; 720A/730..... 19.50
Phone patch; specify radio (Reg. $139) **SALE** 129.95
AH-1 Mobile ant./tuner (Reg. $289).... **SALE** 259.95
AT-100 100w auto. tuner (Reg. $349).. **SALE** 314.95
AT-500 500w auto. tuner (Reg. $449).. **SALE** 399.95
IC-2KL Solid-state linear (Reg. $1795) **SALE** $1395.00
IC-R70 Gen. cov. receiver (Reg. $795) **SALE** $699.95

SAVE $$ - VHF/UHF

IC-251A 2m All-mode Xcvr. 144.8-148.1999 MHz. 10w, digital, memories, scan, 2 VFOs 13.8vdc/117vac. 4½"h × 9¾"w × 10½"d, 11 lbs (Reg. $749)... **SALE** $599.95
IC-451A UHF All Mode Transceiver for OSCAR mode B or J & simplex. Models for 430-440 or 440-450 MHz. Similar to IC-251A (Regular $899)..... **SALE** $769.95
IC-AG1 UHF Preamp. (Reg. $89).... **SALE** 79.95
IC-551D 6m SSB/CW/FM* transceiver, 50-53.999 MHz. 80 watts. (Reg. $699)..... **SALE** $599.95
EX-106* FM adaptor (Reg. $125)..... **SALE** 112.95
PS-20 AC power supply (Reg. $229) ... **SALE** 199.95
CF-1 Cooling fan; PS-20..... 45.00
IC-290A 2m All Mode mobile xcvr. 143.8-148.199 MHz, 1/10w, 5 memories, 2 VFOs, T/T mic. 6¾"w × 2½"h × 8¾"d. (Reg. $549) ..... **Closeout** $399.95
IC-290H 25w 2m All Mode (Reg. $549) **SALE** 489.95
IC-490A UHF All Mode mobile xcvr. 430-439.995 MHz. 10w, memories, two VFOs, scanning microphone. 2½"h × 6¾"w × 8¾"d (Reg. $649).... **SALE** $579.95
IC-560 6m SSB/FM/CW mobile xcvr. 10w, digital, memories, scan, two VFOs 13.8vdc/3.5A. 2½"h × 7¼"w × 9"d, 6 lbs. Mic. & mt. (Reg. $489) ... **SALE** $439.95



IC-25A Compact 2m FM mobile xcvr. 25w, 5 memories, scan, priority, 2 VFOs, T/T microphone. 2"h × 5½"w × 7"d, 3¼ lbs. (Reg. $349)..... **SALE** $309.95
IC-45A 440-450 mob. xcvr (Reg $399) **SALE** $359.95
IC-22U 800ch. mobile. 144-147.995 MHz; 1 or 10 watts, thumbwheel frequency selection. 6⅛"w × 2⅛"h × 8½"d, 3½ lbs. (Reg. $299)..... **SALE** $249.95
EX-199 Remote frequency selector 35.00

VHF/UHF Portables:

IC-202S 2m SSB Transceiver. 3w PEP output. Uses "C" cells, optional Nicad pack/charger or AC supply/spkr. With mic., ant. & strap (Reg. $279)..... **SALE** $249.95
IC-20L 2m, 10w ampl. (Reg. $98)... **SALE** 89.95
IC-402 432 Mhz portable SSB Transceiver. Features same as IC-202S above (Reg. $389).... **SALE** 349.95
IC-30L 10w, 432 amp. (Reg. $105).... **SALE** 94.95
BC-20 Nicads & DC-DC chgr for 202S/402..... 57.50
IC-505 6m SSB port. (Reg. $449)..... **SALE** 399.95
EX-248FM module 49.95
BP-10 Internal nicad battery pack 79.50
BC-15 AC charger..... 12.50
SP4 Remote speaker for portables..... 24.95

SAVE $30

IC-2AT Synthesized 2m FM Hand-held with T/T pad. 800 ch. in 5 KHz steps, 144-147.995, selected by thumb wheels & +5 KHz upshift switch; ± 600 KHz offsets. .15 or 1.5w output with supplied nicad pack. Optional packs for larger capacity or higher power. Supplied with 250 ma. nicad pack (BP-3), wall charger, flex antenna, belt clip, strap, earphone and plugs. 6 6"h × 2.6"w × 1.4"d, 1 lb.

Hand-held Transceivers	Regular	SALE
IC-2AT HT w/TTP, nicad & chgr	$269.50	$239.50
IC-2A 2m HT w/nicad & wall chgr	239.50	214.50
IC-3AT 220 HT/TTP, nicad & chgr	299.95	239.95
IC-3A 220 HT/nicad & charger.....	269.00	229.95
IC-4AT 440 HT/TTP, nicad & chgr	299.00	239.95
IC-4A 440 HT/nicad & charger.....	269.00	229.95

Hand-held accessories	Regular
BC-25U Extra wall charger.....	$12.50
BC-30 Drop-in charger for BP-2, 3 & 5	69.00
BP-2* 450 ma, 7.2v nicad pk, 1w output.....	39.50
BP-3 Extra 250 ma nicad pk, 1.5w output.....	29.50
BP-4 Alkaline battery case	12.50
BP-5* 450 ma, 10.8v nicad pk, 2.3w output	49.50
*BC-30 required to charge BP-2 & BP-5	
CP-1 Cig lighter plug & cord; BP-3	9.50
DC-1 DC operation module.....	17.50
FA-2 Flexible antenna for 2A, 2AT (BNC).....	10.00
HM-9 Speaker/microphone	34.50
LC-2A Leather case w/o TTP cut-out.....	34.95
LC-2AT Leather case w/TTP cut-out.....	34.95
ML-1 2m mobile linear (Reg $89) ..... **SALE**	79.95
3A-TTN 16-button TTP front; 2A/3A/4A.....	39.50
Commspec SS-32M 32-tone encoder.....	29.95
IC-M12 12ch. Marine Hand-held.... **Special**	$229.95

Other ICOM accessories:

24PP 24-pin accessory plug.....	$ 4.00
BC-10A Mem. back-up; 25A/720A/730/740.....	9.50
BU-1 Memory back-up; 25A/490A.....	38.75
EX-2 Relay box w/marker; 720A/730.....	34.00
HM-3 Deluxe mobile mic, specify radio.....	17.50
HM-5 Noise canx mobile mic, 4 pin	34.50
HM-7 Amplified mobile mic, 8-pin	29.00
HM-8 Touch-tone mic, 8-pin.....	49.50
HM-10 Scanning microphone	39.50
HP-1 Headphones.....	34.50
SM-5 8-pin electret desk mic.....	39.00

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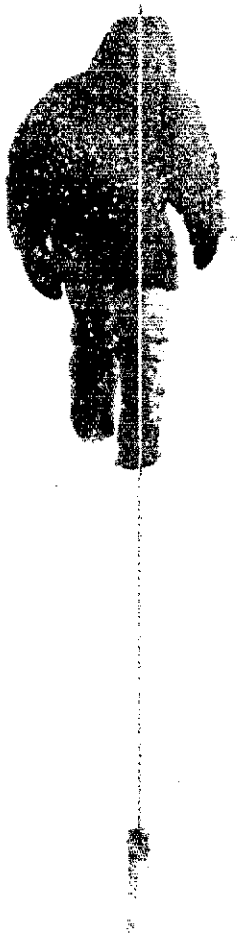

The Canadian Arctic presents some of the world's most difficult communications conditions. And when you're keeping track of expensive equipment recording crucial information, you can't afford to lose it in a snow drift. The need for a reliable antenna is a cold hard fact. It's a long way back to the shop for a replacement whip or coil.

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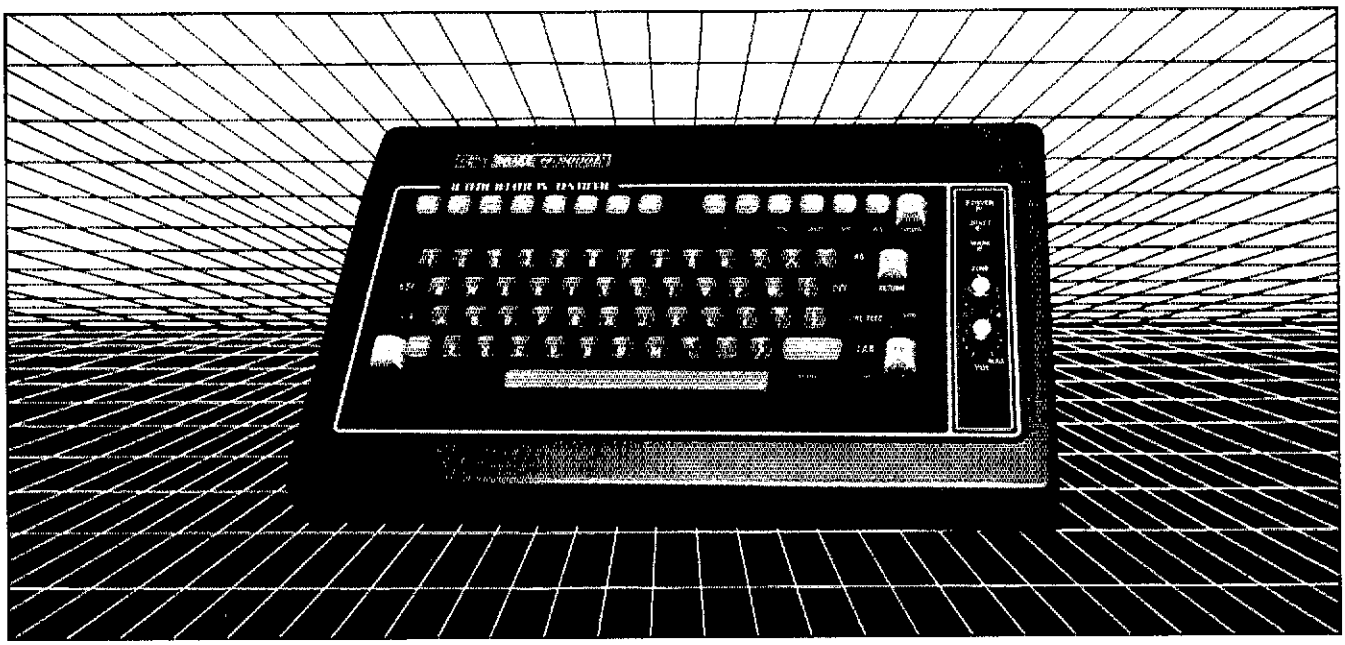
DRAKE COMMUNICATIONS TERMINALS



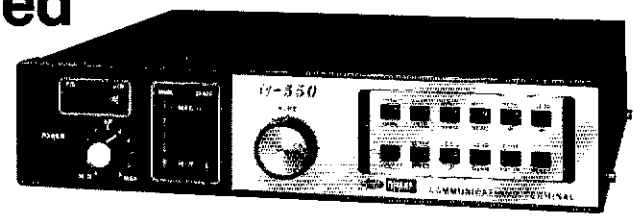
Microprocessor Controlled

DRAKE Theta 9000E

The ultimate in communications versatility, the **Drake Theta 9000E** provides complete transceive capability of CW (Morse Code), RTTY (Baudot), and ASCII. A full computer RS232 interface, cassette tape storage port, selective calling feature with answer-back, light pen graphics, printer interface and word processing software are all standard.

Seven large 256 character memories are backed up with battery power so there is no need to reload information with each use. Memories may also be partitioned providing up to 29 separate storage locations. A type-ahead buffer of 3120 characters makes it easy to compose your response while still receiving. Operator controlled scrolling permits review of up to 10,720 previously received characters. Line length is selectable at 40 or 80 characters, your choice, and all mode and speed indicators are displayed on the screen for instant status recognition. The 9000E has 3 tone groups and 3 shifts which are all keyboard selected.

You won't buy any other communications terminal once you have studied all the advanced operating convenience built into the **Drake Theta 9000E**. It's complete.



DRAKE Theta 550

The **Drake Theta** 550 is a compact receive-only communications terminal and is designed to demodulate and display the three most popular over-the-air modes of data communications: CW (Morse Code), RTTY (Baudot), and ASCII. Any standard TV monitor can be used.

A full-featured microprocessor controlled unit, the Drake Theta 550 has selective calling, battery backed-up memory, audio monitor, and informative L.E.D. tuning indicators. There is also interfacing to permit the addition of a dot matrix printer for "hard" copy and a keyer paddle input to permit CW transmission with full iambic operation.

CW automatically tracks over a speed range of 5 to 50 words per minute and RTTY modes offer nine selectable standard speeds of transmission. 12 volts DC is required.

This unit is ideal for shortwave listeners and hams who have been missing the increasing volume of data communications over the air.

LA7 Line Amplifier

Line output, input levels as low as 15 mV rms (47 kilohm) will result in an output of 1 mW nominal into a 600 ohm balanced line. Output level adjustable by internal preset level control. Interfaces low level audio to RTTY terminal unit or phone line that requires a 600 ohm balanced/unbalanced input. One 36" phono to phono cable supplied.

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DRAKE

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Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permited in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

CERTIFICATE for proven two-way radio contacts with amateurs in all ten USA areas. Award suitable for framing and proven achievements added upon request. SASE brings TAD data sheet. W6LS, 2814 Empire, Burbank, CA 91504.

YAESU OWNERS — join your International Fox-Tango Club — now in its eleventh year. Calendar year dues still only $8 US, $9 Canada, $12 airmail elsewhere. Don't miss out — get 1982 top-rated FT Newsletters packed with modifications monthly, catalog of past modifications, free advertisements, technical consultation, FT Net (Saturdays, 1700Z, 14.325MHz), more. Go Fox-Tango! To join, send dues to FT Club, Box 15944, W. Palm Beach, FL 33406.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a nonprofit organization of communications people founded in 1925, invites your inquiries and application for membership. Write V.W.O.A., 118 River Drive — Bay Ridge, Annapolis, MD 21403.

GLOBECOM '82 Conference sponsored by IEEE Communications Society will be at Sheraton Hotel, Bal Harbour, Florida Nov. 29th to Dec. 2nd. Free admission to Amateur Radio Session on Dec. 2nd from 6:30 PM to 9:30 PM which includes papers on use of computer-controlled and voice synthesizer repeater, satellite communications, and panel discussion on Amateur Radio satellite operations. For free admission tickets to exhibits from Nov. 30th to Dec. 2nd, send SASE to David Talley, W2PF, 10275 Collins Avenue, Bal Harbour, FL 33154.

CINCINNATI ARRL '83 - Hamilton County ARPSC invites all hams to participate in the third annual Ohio State Convention. Two full days of amateur activities; forums, meetings, exhibits, Wouff Hong, flea market, and much more. This all-indoors activity will take place on Saturday & Sunday, February 26 & 27. For further information contact Cincinnati ARRL '83, Committee for Amateur Radio, P.O. Box 46311, Cincinnati, OH 45246. Dealer and exhibitor inquires invited. Registration $4, Flea Market $3.

SAROC Annual Prestige Convention, Aladdin Hotel, Las Vegas, January 13-14-15-16, 1983. Technical sessions, exhibits open Friday and Saturday. Advance registration $17 per person includes admission to meetings, exhibits, ladies to ladies program, Genie Buffet on Saturday and Sunday. Aladdin Hotel room rate $37 plus room tax, single or double occupancy per night call 1-800-634-3424 for SAROC reservations. QSL SAROC POB 945 Boulder City, NV 89005-0945 with registration.

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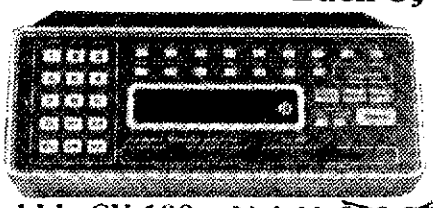

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Memory Channel	16 Channels including Weather Bands.
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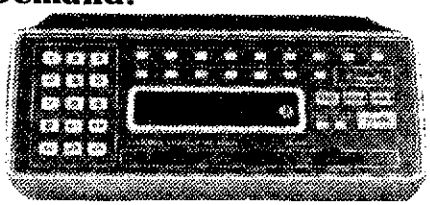

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Specifications

Type	FM & AM	
Frequency Range	a) 26-57.99 MHz	Freq. Space . . . 5 kHz
	b) 58-88 MHz	Freq. Space . . . 12.5 kHz
	c) 108-180 MHz	Freq. Space . . . 5 kHz
	d) 380-514 MHz	Freq. Space . . . 5 kHz
Sensitivity	FM a) 26-180 MHz	0.4 uV S/N 12dB
	b) 380-514 MHz	1.0 uV S/N 12dB
	AM a) 26-180 MHz	1.0 uV S/N 10dB
	b) 380-514 MHz	2.0 uV S/N 10dB
Selectivity	FM . . More than 50 dB at ±25 kHz	
	AM . . More than 60 dB at ±10 kHz	
Power Supply	AC Adapator Output DC 12 V) or DC 12 V Power Supply	

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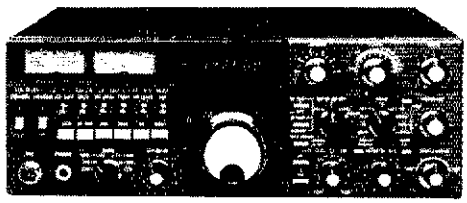

FT-102

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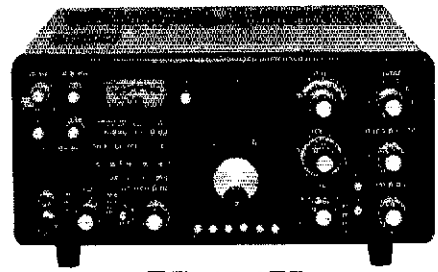
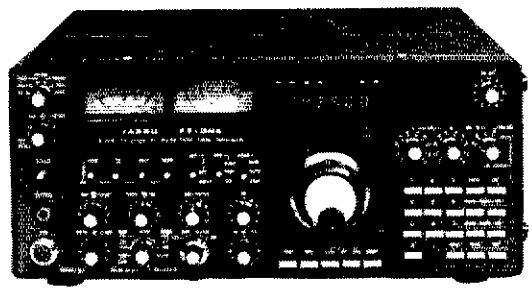
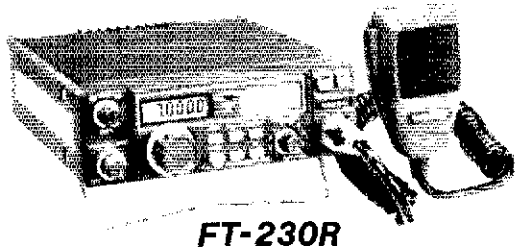


FT-101ZD



FT-ONE



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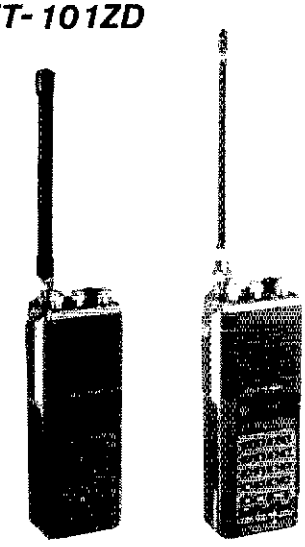

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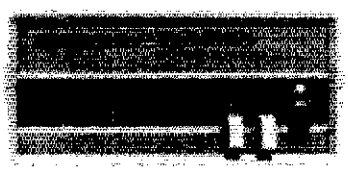

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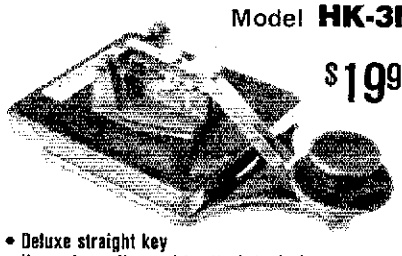

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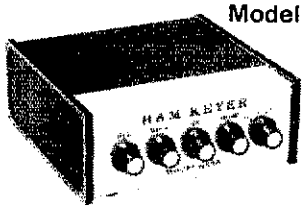

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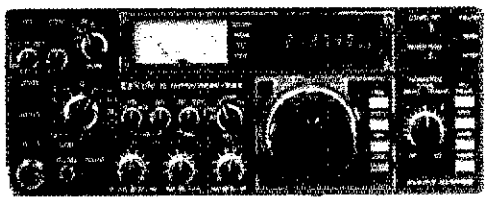

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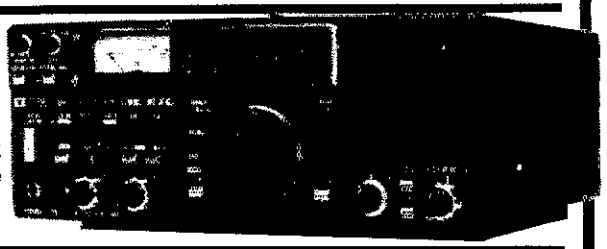

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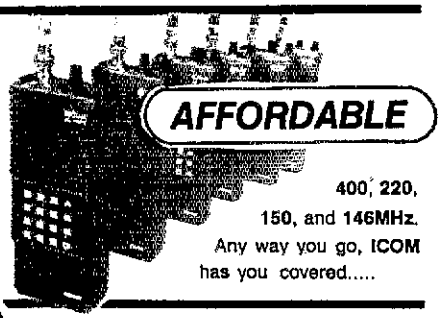

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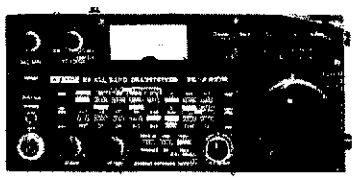

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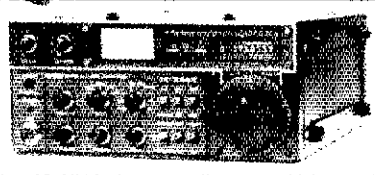

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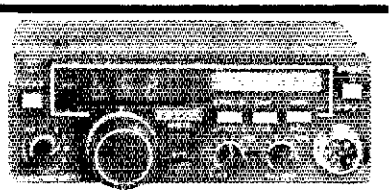

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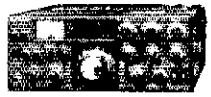

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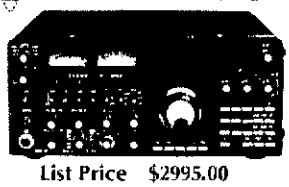

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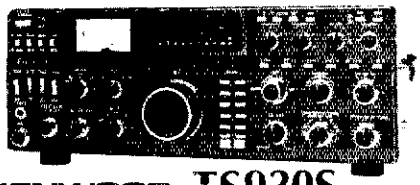

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73, Don

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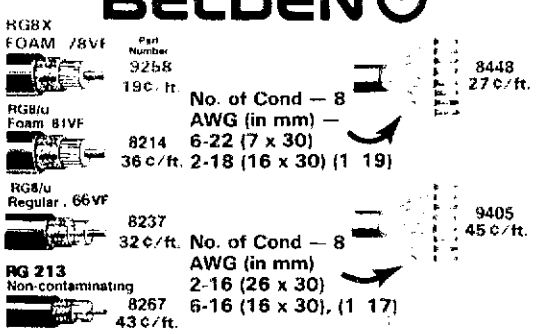

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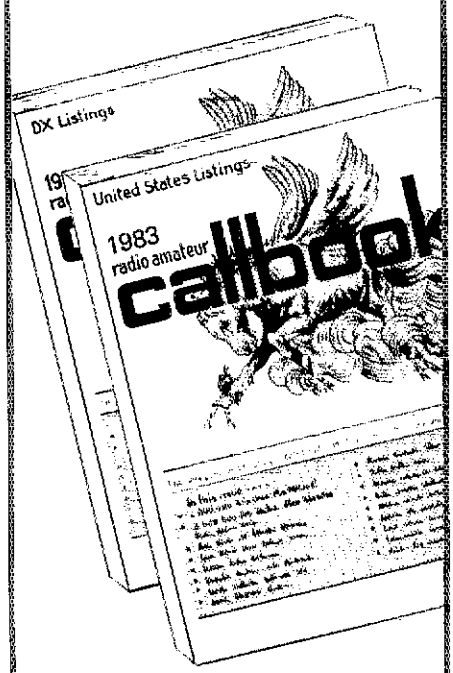

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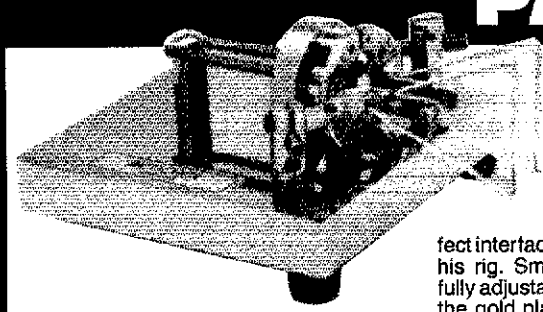

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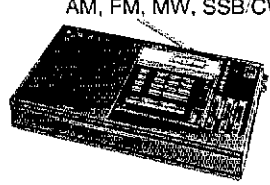

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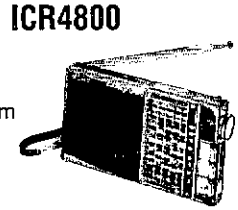

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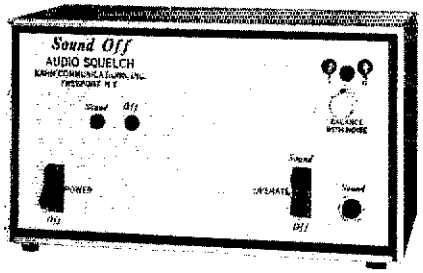

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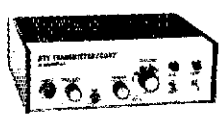

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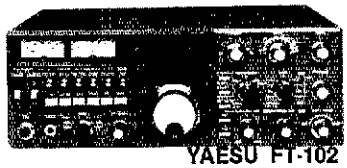
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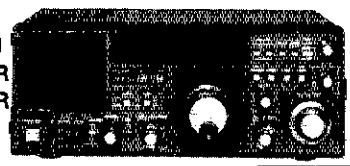
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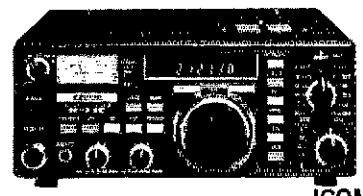
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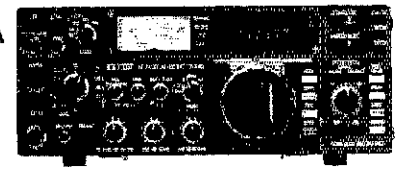

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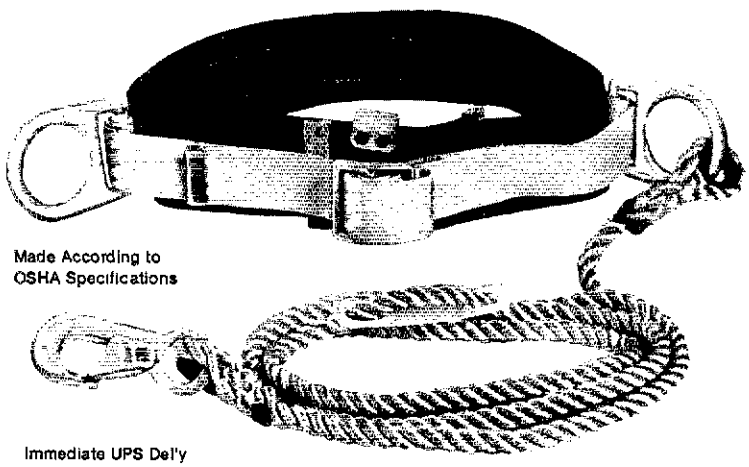

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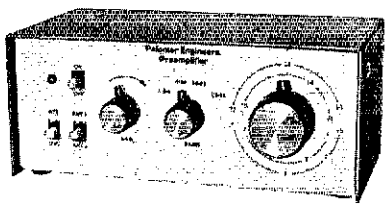

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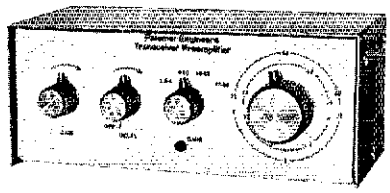

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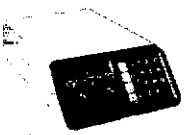

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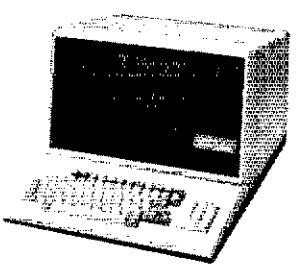

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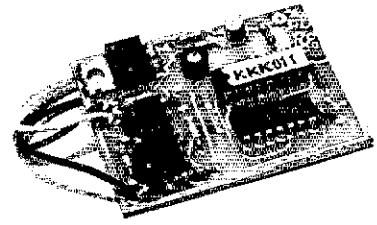

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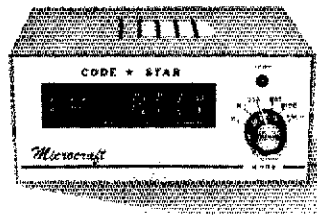

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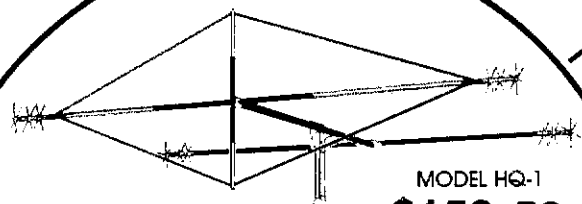

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P-14	C-14	14
OP-18	OC-18	18-20
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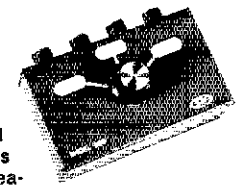
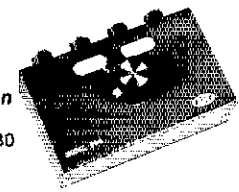


Model 593

- ***Single Pole*** 3 Position with grounding of all unused positions
- ***Crosstalk*** (measured at 30 MHz) is -45db between adjacent outlets and 60 db between alternate outlets



Model 594

- ***2 Pole 2 Position***
- ***Crosstalk*** 45db (measured at 30 MHz)

Specifications for both switches

- ***Power*** 1 KW-2 KW PEP
- ***Impedance*** 50-75 ohms
- ***VSWR*** 1.2:1 up to 150 MHz
- ***Dimensions*** 1¾" high, 5" wide, 3" deep
- ***Weight*** 1 lb.
- ***Mount*** Wall or desk

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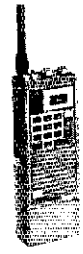

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WANTED: 8877 & 4CX1000 tube. WA4TKW.

TRADE-Hipotronics Precision Laboratory model KV100A AC-DC Kilovoltmeter for Alpha linear amplifier, mint condition. Thomas, 516 Ardmore Lane, Albany, GA 31707.

HEATH HA-202A, $38; Microcraft RTTY Reader, Morse-A-Word, best offer ove $70 each; car stereo, tape player, $18; home brew H.F. linear, $150, 60-mile delivery; preamp P15-450. W2WHK 716-692-5451.

DRAKE: TR-3, RV-3 AC-3. $250. KC9KI, Dennis Quinn, 56 South Gammon Road Apt. E, Madison, WI 53717.

TS520S w/CW filter & remote V.F.O. $565. Heathkit compact kW HA-14 1200W. PEP. $225, Johnson 250W. Matchbox $70, TS520 CW filter $38, MFJ 484 Grandmaster memory keyer $85. WB2DXL 193 E. Devonia Ave., Mt. Vernon, NY 10552. 914-664-7559.

IC-701 w/ps and mike mint condition $675. FT-207R w/leather case spare battery and charger hardly ever used $225. Microlog AKB-1 $160. M. Fein, 132 Locust Lane, Irvington, NY 10533.

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SILENT Key. IC-720A, IC-2KL with p/s, IC-PS15 mint (8 months) $2200. Negotiable. 2100 Old Forge Way, Marietta, GA 30067. Phone: 404-992-9661.

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SWAP: Hallicrafters SR2000, P2000, HA-20 & HA-8 for either S-line or KWM-2. WA9VLK 815-939-1440.

WANTED: Drake R7A, pre-1950 TV sets and old TV Guides. W3CRM, Box 90-Q, Rockville, MD 20850. 301-654-1876.

WANTED: Manual for Globe Scout Model 66 160-10M. J G Swaney, 1570 King Arthur, Streetsboro OH 44240.

TENTEC: Century-21, analog, mint condition, 10m crystals, $200, AA4TG, Honolulu, HI 96814.

MARS is looking for new members. If you would like more information on Army, Navy-Marine Corps or Air Force MARS, send your name, call sign, license class and address to Peter O'Dell, KB1N, 7 Brian Road, South Windsor, CT 06074.

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FOR SALE: Mint Collins 30L-1 $550, 75S-3B $500, 32S-3 $500, 312B-4 console $195, SM-2 microphone $50, xtal pack $195. Collins filters X455KQ200 200 Hz $195, F455FA05 500Hz $75, F455FA08 800Hz $50, F455FA15 1500Hz $50. Heath SB-303 w/all filters $195. Johnson kW Matchbox $145. Call Mitch, W9TZ 217-224-7987.

KLM Echo II, $129; KLM Echo 70CM, $249; Pkg deal $370 — I ship. WB6AWM/7, POB 251, Electric City, WA 99123.

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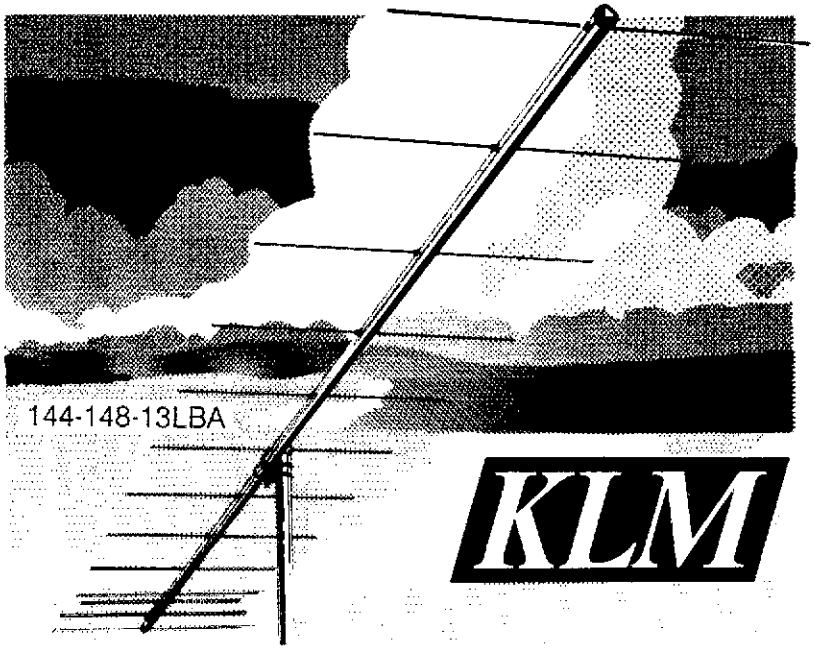

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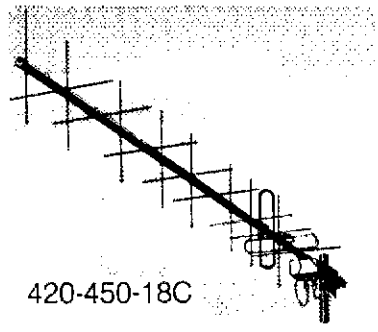

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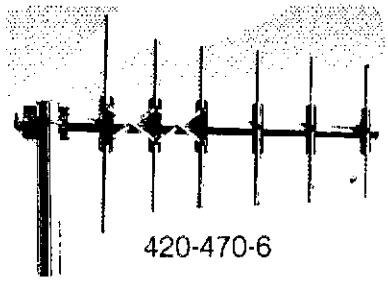

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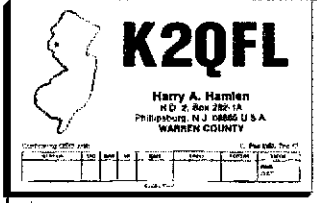

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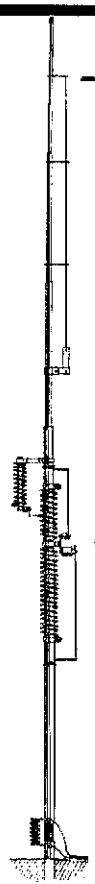

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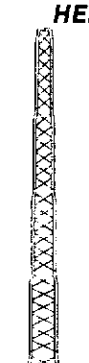

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HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429

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220B	17-El. 220 MHz "Boomer"	$ 75
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ARX450B	450 Mhz "Ringo Ranger II"	$ 38
A147-20T	2 mtr. Vert. & Horiz. 10-El. Beam	$ 53
A144-10T	10-El. 2 mtr. Satellite Antenna	$ 45
A144-20T	20-El. 2 mtr. Satellite Antenna	$ 69
A432-20T	20-El. 432 MHz. Satellite Antenna	$ 45
A14T-MB	Dual Antenna Mounting Assembly	$ 25

MANY OTHER CUSHCRAFT ANTENNAS IN STOCK – CALL!

HYGAIN

V2S	New 2 mtr. Base Vertical	$ 39
TH5MK2S	New Broad Band 5-El. Triband Beam	$319
TH7DXS	New Broad Band 7-El. Triband Beam	$379
TH3MK3S	3-El. Triband Beam	$219
TH3JRS	3-El. Triband Beam	$159
TH2MK3S	2-El. Triband Beam	$139
HY-QUAD	2-El. Triband Quad	$279
402BAS	2-El. 40 mtr. Beam	$199
205BAS	5-El. 20 mtr. "Long John"	$299
155BAS	5-El. 15 mtr. "Long John"	$179
105BAS	5-El 10 mtr. "Long John"	$119
204BAS	4-El. 20 mtr. Beam	$229
203BAS	3-El. 20 mtr. Beam	$139
153BAS	3-El. 15 mtr. Beam	$ 79
103BAS	3-El. 10 mtr. Beam	$ 59
DB1015AS	3-El. 10/15 mtr. Beam	$159
64BS	4-El. 6 mtr. Beam	$ 55
66BS	6-El. 6 mtr. "Long John"	$109
18HTS	80-10 mtr. Hy-Tower Vertical	$339
18AVT/WBS	80-10 mtr. Trap Vertical	$ 95
214	14-El. 2 mtr. Beam	$ 35
2BDQ	80/40 mtr. Trap Dipole	$ 49
5BDQ	80-10 mtr. Trap Dipole	$ 99
BN86	80-10 mtr. KW Balun	$ 19

HUSTLER

3TBA	New 3-El. Triband Beam	$199
4BTV	40-10 mtr. Vertical	$ 79
5BTV	80-10 mtr. Vertical	$ 99
G6-144B	2 mtr. Base Vertical	$ 69
G7-144	2 mtr. Base Vertical	$ 99

HF Mobile Resonators (STD 400 Watt) Super 2 KW)

10 & 15 mtrs.	$10	$15
20 mtrs.	$12	$18
40 mtrs.	$15	$21
75 mtrs.	$17	$32

BUMPER MOUNTS, SPRINGS, FOLDING MASTS IN STOCK CALL!

KLM

KT34A	4-El. Tribander	$309
KT34XA	6-El. Tribander	$469
7.2-1	40 mtr. Rotatable Dipole	$159
7.2-2	2-El. 40 mtr. Beam	$299
7.2-3	3-El. 40 mtr. Beam	$449
7.0-7.3-4A	4-El. 40 mtr. Beam	$629
144-148-13LB	13-El. 2 mtr. Long Boomer	$ 79
432-16LB	16-El. 432 Mhz. Long Boomer	$ 69
144-150-16C	16-El. 2 mtr. Circular Pol. Beam	$ 99
420-450-18C	18-El. 435 MHz. Circular Pol. Beam	$ 59

CALL FOR OUR LOW PRICES ON OTHER KLM PRODUCTS!

MINI PRODUCTS

HQ-1	Mini-Quad Compact 20/15/10 mtr. Antenna	$139

MOSLEY

CL-33	3-El. Triband Beam	$229
TA-33	3-El. Triband Beam	$199
TA-33 Jr.	3-El. Triband Beam	$149
M-402	2-El. 40 mtr. Beam	$279

ROTORS & CABLES

Alliance HD73 (10.7 sq. ft. Rating)	$ 99
Alliance U100 (For small beams & Oscar Elev. Rotor)	$ 45
Ham 4 (15 sq. ft. Rating)	$199
Tailtwister (20 sq. ft. Rating)	$249
HYGAIN HDR-300 (Most HD. Rotor for BIG Arrays)	$439
8 COND (2-#18 GA/6-#22 GA) Rotor Cable	$0.19/ft.
H.D. 8 COND (2-#16GA./6-#18GA.) Rotor Cable	$0.36/ft.

COAXIAL CABLE & CONNECTORS

RG213/U (95% shield - non-contaminating jacket)	$0.29/ft.
RG8X (95% shield-non contaminating jacket)	$0.18/ft.
RG11/U (75 OHM - 95% shield)	$0.35/ft.
½" Aluminum Hardline w/poly jacket	$0.69/ft.
½" Copper Hardline w/poly jacket	$1.10/ft.
½" Alum. H.L. Conn (UHF or N - Male or Female)	$15.00
½" Copper H.L. Conn (UHF or N - Male or Female)	$22.00
Amphenol Silver Plate PL259	$ 1.25
Amphenol Nickel Plate PL259	$ 0.90
Amphenol N Type Male Conn For RG213/U	$ 2.95

HYGAIN CRANKUPS

HG37SS	37 ft. Self Supporting	$669
HG52SS	52 ft. Self Supporting	$949
HG54HD	Heavy Duty 54 Ft. Self Supporting	$1499
HG70HD	Heavy Duty 70 Ft. Self Supporting	$2399
HG50MT2	50 ft. Side Supported	$779

ALL HYGAIN TOWERS FREIGHT PAID! CALL FOR PACKAGE QUOTE ON TOWER, ANTENNA & ROTOR—FREIGHT PAID

ROHN TOWERS

20G-$32.00 25G-$41.50 45G-$93.50

HBX32	32 ft. Free Standing (rated 10 sq. ft.)	$169
HDBX32	32 ft. Free Standing (rated 18 sq. ft.)	$189
HBX40	40 ft. Free Standing (rated 10 sq. ft.)	$229
HDBX40	40 ft. Free Standing (rated 18 sq. ft.)	$259
HBX48	48 ft. Free Standing (rated 10 sq. ft.)	$289
HDBX48	48 ft. Free Standing (rated 18 sq. ft.)	$319
HBX56	56 ft. Free Standing (rated 10 sq. ft.)	$349
FK2548	48 ft. 25G Foldover Tower	$789
FK2558	58 ft. 25G Foldover Tower	$879
FK2568	68 ft. 25G Foldover Tower	$959
FK4544	44 ft. 45G Foldover Tower	$1099
FK4554	54 ft. 45G Foldover Tower	$1219
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Foldover Towers Freight Paid-10% Higher West of Rockies.
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3/16" EHS Guywire (3990 lbs.)	$12/100 ft.	$111/1000 ft.
1/4" EHS Guywire (6000 lbs.)	$15/100 ft.	$139/1000 ft.
5/32" 7 x 7 Aircraft Cable (2700 lbs.)		$11/100 ft.
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)		$0.30
1/4" CCM Cable Clamp (1/4" Cable)		$0.40
1/4" TH Thimble (fits all sizes)		$0.25
3/8 EE (3/8" Eye & Eye Turnbuckle)		$5.50
3/8 EJ (3/8" Eye & Jaw Turnbuckle)		$6.50
1/2 EE (1/2" Eye & Eye Turnbuckle)		$8.50
1/2 EJ (1/2" Eye & Jaw Turnbuckle)		$9.50
3/16" Preformed Guy Grip		$1.65
1/4" Preformed Guy Grip		$1.85
6" Diam 4 ft. Long Earth Screw Anchor		$12.50
2" Diam - 10 ft. Long Heavy Duty Steel Mast		$39.00
500D Guy Insulator (5/32" or 3/16" Cable)		$0.95
502 Guy Insulator (1/4" Cable)		$1.95
5/8" Diam - 8 ft. Copper Clad Ground Rod w/clamp		$11.00

ANTENNA WIRE & ACCESSORIES

14 Ga. Solid Copperweld (Multiples of 50 ft.)	$5/50 ft.
14 Ga. Stranded Copper (Multiples of 50 ft.)	$5/50 ft.
14 Ga. Stranded Copper (70 ft. coil)	$ 7.00
14 Ga. Stranded Copper (140 ft. Coil)	$ 14.00
18 Ga. Copperweld (1/4 mile spool)	$30.00
Heavy Duty B&W End Insulator	$4/Pair
HYGAIN Model 155 Center Insulator	$ 5.95
HYGAIN Model 157 Center Insulator w/SO239	$11.95
450 OHM H.D. Low Loss Ladder Line	$.14/ft.

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THE ROBOT MODEL 800 SUPER TERMINAL

Using microprocessor technology, Robot has created the most complete specialty mode terminal ever built for amateur radio.

The Model 800 has all the features you need (Baudot, ASCII, Morse, and SSTV graphics) built-in as standard equipment. While most other units require the purchase of several accessories to make a complete operating system, all you add to the Robot 800 is a monitor. Everything else is included in the unit, and in the price!

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- Full 25 watts of RF power output from extremely compact package.
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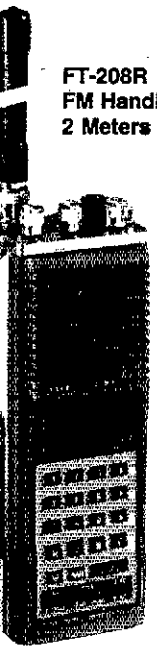
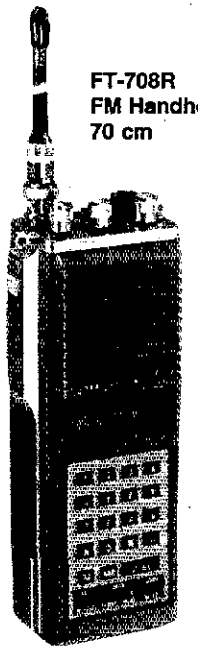
FT-208R
FM Handheld
2 Meters



FT-708R
FM Handheld
70 cm



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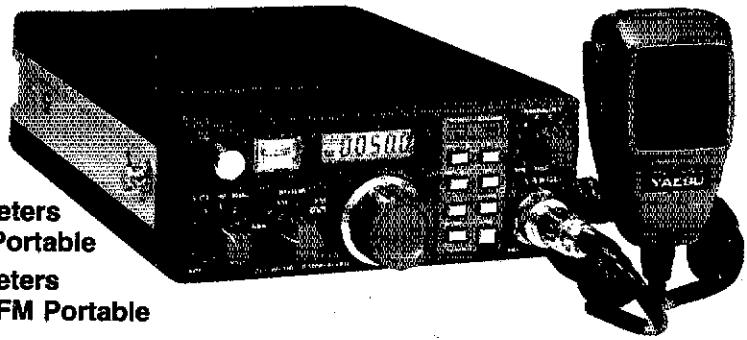

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SSB/CW/FM Portable

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NEW

Watts to see...

Big LCD, Big 45 W, Big 21 memories, compact.

TR-7950/7930

Outstanding features providing maximum ease of operation include a large, easy-to-read (direct sunlight or dark) LCD display, 21 multi-function memories, automatic offset, programmable priority channel, memory and band scans, built-in lithium battery memory back-up, built-in 16-key autopatch encoder, and a choice of a hefty 45 watts output (TR-7950), or 25 watts output (TR-7930).

TR-7950/TR-7930 FEATURES:

- **NEW, large, easy-to-read LCD digital display**
  Easy to read in direct sunlight or dark (back-lighted). Displays transmit/receive frequencies, memory channel, repeater offset, (+,S,–), sub-tone number (F-0, 1, 2, 3), tone, scan, and memory scan lock-out. Includes LED S/RF bar meter, and LED indicators for REVERSE, CENTER TUNING, PRIORITY, and ON AIR.
- **21 NEW, multi-function memory channels**
  Stores frequency, repeater offset, and optional sub-tone channels. Memories 1 through 15 for simplex or ± 600 kHz offset. Memory pairs 16/17, and 18/19 are paired for non-standard repeater offset. Memories "A" and "B" set upper and lower scan limits, or for simplex or ± 600 kHz offset. In MEMORY mode, a circle of light appears around the memory selector knob. When the memory selector knob is rotated in either direction to channel 1, an audible "beep" will sound.
- **Choice of 45 or 25 watts output**
  The TR-7950 provides a hefty 45 watts output, while the TR-7930 features a more modest 25 watts. A HI/LOW power switch allows power reduction to approx. 5 watts.
- **Long-life lithium battery memory back-up**
  Built-in lithium battery has an estimated 5 year life.
- **Automatic offset**
  The microprocessor is pre-programmed for simplex or ± 600 kHz offset, in accordance with the 2 meter band plan. "OS" key allows manual change in offset.
- **Programmable priority alert**
  The PRIORITY channel may be programmed in any of the 21 memories. With ALERT switch "ON," a dual "beep" sounds when a signal is present on the PRIORITY channel. An OPER switch allows an easy move to the PRIORITY channel.
- **Programmable memory scan lock-out**
  "LO" key for programming scan to skip selected memory channels, without erasing the memory.
- **Programmable band-scan width**
  The lower limit may be programmed into memory "A," and the upper limit into memory "B."
- **Center stop during band-scan, with indicator**
  Stops in center of channel during band-scan, with center tuning indicator.
- **Scan resume selectable**
  Scan stops on busy channel. Selectable automatic time resume-scan (approx. 5 sec., adjustable), or carrier operated resume-scan. A scan delay of approx. 1.5 seconds built-in.
- **Scan control using up/down microphone**
  Momentarily pressing UP or DOWN button on microphone tunes one step in the selected direction, on memory or on 5-kHz step tuning. Holding the button for about 2 seconds starts UP or DOWN automatic scan action. Scan start also possible using "SC" key on keyboard. Scan may be cancelled by momentarily pressing the PTT switch, or by pressing both UP/DOWN buttons simultaneously.
- **Programmable sub-tone channels**
  Optional TU-79 3 frequency sub-tone unit provides keyboard selectable sub-tone channels, which may be stored in memory.
- **Built-in 16-key autopatch, with monitor**
  The keyboard functions as a 16-key autopatch encoder during transmit. DTMF tones appear in the speaker output when a key is pressed during transmit.
- **Front panel keyboard control**
  Used for selecting frequency, offset, programming memories, controlling scan, and autopatch encode. Keyboard lighting is provided.
- **Extended frequency coverage**
  Covers 142.000-148.995 MHz, in 5-kHz steps.
- **Repeater reverse switch**
  Locking-type switch, with indicator.
- **"Beeper" amplified through speaker**
- **Compact, lightweight design**
- **Easy-to-install adjustable-angle mobile mounting bracket**

Optional accessories:

- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.

More information on the TR-7950 and TR-7930 is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

KENWOOD

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Specifications and prices are subject to change without notice or obligation