QST

May 1980 $2.50

devoted entirely to Amateur Radio

Torch relay fuels Olympic spirit

Page 43

tempo...

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

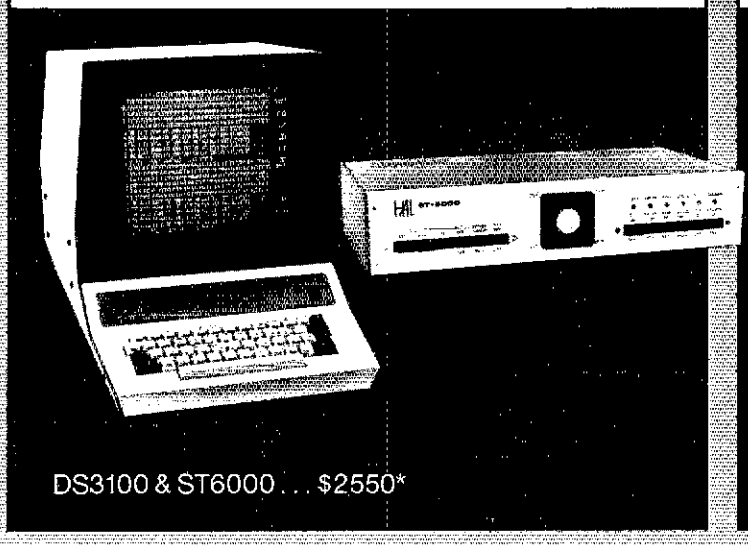
...the new S-5

* The only synthesized hand-held offering 5 watts output. (Switchable for 1 or 5 watt operation)
* The same dependability as the time proven S-1. Circuitry that has been proven in more than a million hours of operation.
* Heavy duty battery pack.

SOMETIMES THE BEST COSTS A LITTLE MORE...

BUT you get a LOT more for your money. For instance:

- Full length 72 character line and 24 line screen
- True "ASR" operation—type into 50 line on-screen buffer *while* receiving
- 150 line receive buffer and power off EAROM storage
- Ten HERE IS messages plus CW ID, WRU, and SEL-CAL
- Original split-screen plus bright/dim display of RX/TX text
- Control Functions *clearly marked* on the keytops
- On screen status indicators and time
- P31 eye-ease green screen phosphor (white also available)
- All three modes—CW, Baudot RTTY, and ASCII Computer code
- Upper/lower case ASCII with all control characters; 110-9600 baud
- ST6000 multiple active filters and detectors for super reception
- Crystal controlled TX tones matched to RX filters for true transceive
- Interface LOOP, RS232, MIL188 and CMOS with no extra options to buy
- Full RS232 Modem connector and full or half-duplex for computer use
- HAL one year warranty and ten years' experience with RTTY

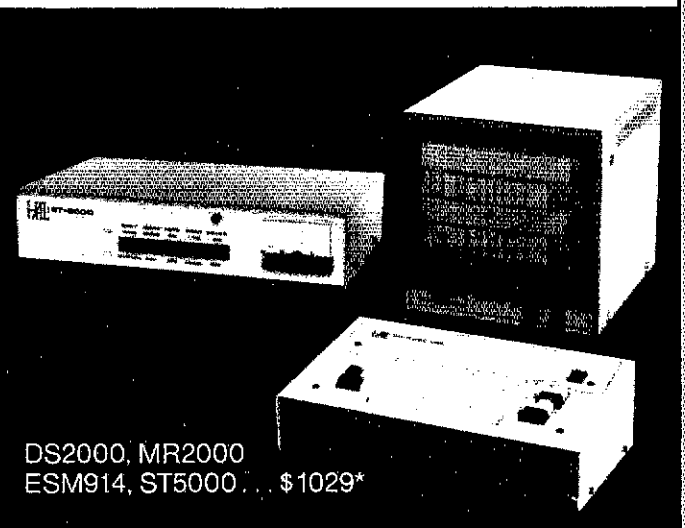


DS3100 & ST6000 . . . $2550*

...AND THEN SOMETIMES IT DOESN'T!

COMPARE with other similarly priced systems—note these extra features and better performance for fewer dollars:

- Full length 72 character lines and 24 line screen
- "Semi-ASR" operation by typing into 255 character buffer *while* receiving
- Pretype the entire 1728 character screen
- Two programmable HERE IS messages plus CW ID
- Keyboard Operated Switch (KOS) for automatic TX/RX control
- Bright/dim display of RX/TX text
- Labeled controlled keys plus on-screen status line for easy operation
- All three modes—CW, Baudot RTTY, and ASCII Computer code
- 1-175 wpm CW; 60, 66, 75, 100, 133 wpm Baudot; 110, 300 baud ASCII
- Word wrap-around, Unshift On Space, Synchronous Idle
- Edit as you type with Word Mode
- High performance external demodulator rather than built-in compromise
- Internal Loop Supply and Motor control for full TTY machine compatibility
- Solid state RTTY Loop interface; both cathode and grid-block CW outputs
- HAL one year warranty and ten years' experience in RTTY



DS2000, MR2000
ESM914, ST5000 . . . $1029*

LOOK FOR THE BEST or THE MOST ECONOMICAL . . . WE HAVE BOTH!

*Prices for U.S. customers purchasing complete systems as specified in our catalog. Write for our complete catalog for detailed specifications and other system combinations. Prices and specifications subject to change without notice.

HAL COMMUNICATIONS CORP.
Box 365
Urbana, Illinois 61801
217-367-7373

For our European customers, contact: Richter & Co. D3000 Hannover 1 • Transradio SA, 6816 Bissone/Lugano • Radio Shack Ltd., London NW6 3AY • Erik Torpdahl Telecom, DK 3660 Stenlose Denmark

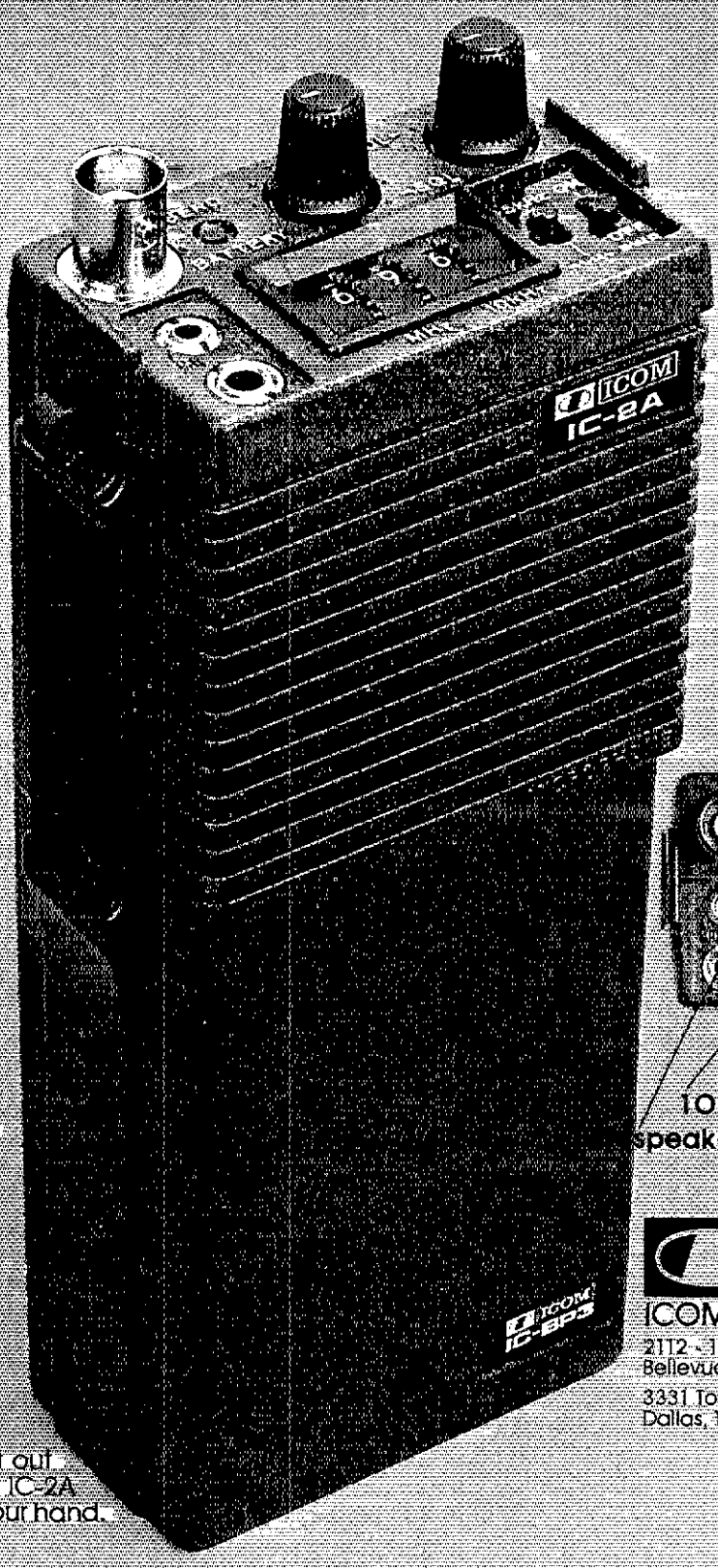
The Question we seem to get most often from our customers:

"WHEN IS ICOM COMING OUT WITH A HAND-HELD?"

ICOM IC-2A SYNTHESIZED 2 METER HAND-HELD

FEATURES YOU'VE WANTED

- ☐ 800 T/R Channels. Synthesized.
- ☐ 1.5 Watt Output High/Low Power Battery Saving Switch to .15 Watt.
- ☐ Separate built in Speaker & Mic. Excellent audio quality.
- ☐ Compact. About the size of a dollar bill.
- ☐ Variable size NiCd Power Pack, 3 sizes available to suit your needs. (250 MA standard). Makes the IC-2A the most compact synthesized HT on the market.
- ☐ ICOM level Receiver Performance-ICOM Quality Receiver in a compact package (.2uv/ 20db typical)
- ☐ Optional Tone Pad, Desk Charger, Speaker/Mic available.
- ☐ With slip on/slip off Bottom NiCd Pack, you can vary the size of the HT from about 116 mm high to 175 mm high. Easy to carry extra Snap-on packs with you for extended trips.



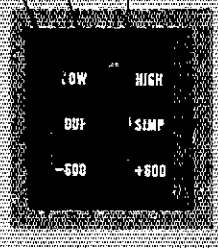
Actual size: Cut out and put the ICOM IC-2A in the palm of your hand.

BACK VIEW

±600 khz offset

simplex/dupl

Hi/lo po



TOP VIEW

BNC antenna conn

"Rubber Duckie"

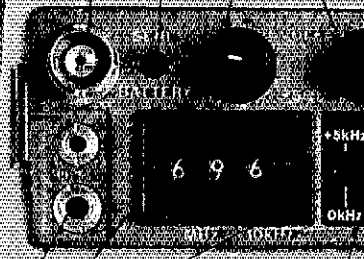
standard

transmit indica

squelch

volu

cont



or

5 khz channel selec

10 khz channel selectio

speaker/mic jack

ICOM

ICOM AMERICA, INC.

2112 - 116th Avenue NE
Bellevue, WA 98004

3331 Towerwood Dr., Suite 307
Dallas, TX 75234

THE ANSWER IS: NOW!

May 1980
Volume LXIV Number 5

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THE COVER

Armand Canestraro, WA2EQW, was among the scores of volunteer amateurs who helped smooth the way for the Olympic torch run. Their story begins on page 43. *(photo courtesy Gary J. McPherson)*

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Introducing .....

the All New DTR Component Series.

Is your operating ability superior to the equipment you're using?

If you're a serious amateur who takes pride in his talent you should own the best, the new DTR Communication Stystem.

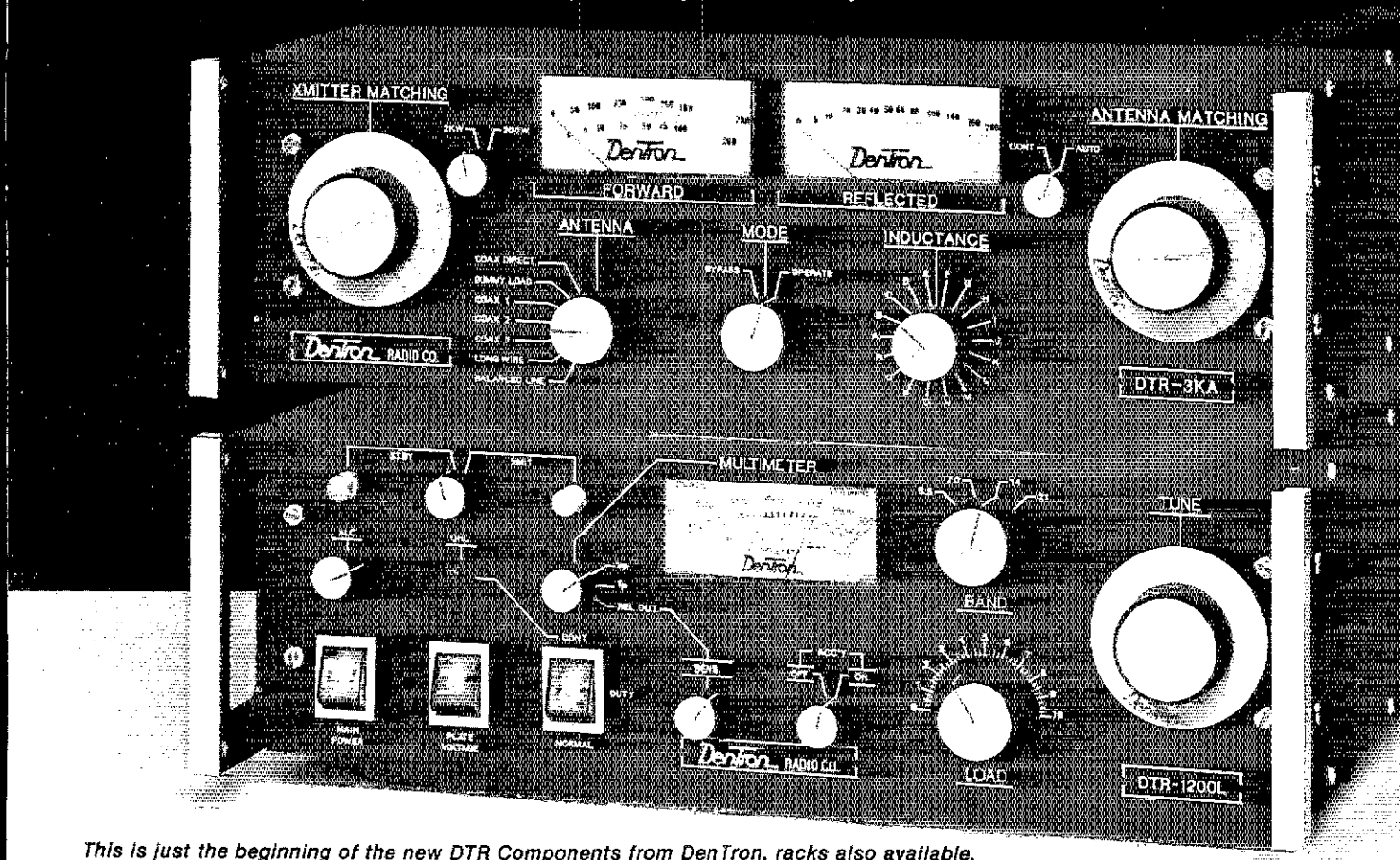
Amateur Radio has developed over the years into a sophisticated hobby. We all recognize the thrill of transmitting global signals, but to many hams it is the finesse with which those signals are transmitted that determines his pride and success as a ham.

The DTR 1200 linear amplifier provides 1200 watts SSB and 1000 watts CW input, continuous duty. We used large, 3½" shadow box, back-lit meters for easy reading, and tuned input for compatibility with solid state or tube transceivers.

The DTR 3KA antenna tuner handles a full 3KW PEP. It features a built in 2KW dummy load with thermostatically controlled forced air cooling, a remote sensor box to insure meter accuracy and 50 ohm impedance.

The DTR stackable components are designed to give you a complete communication system with mobility and versatility. Rack mount the DTR components on either a stationary rack or one on wheels. The DTR components are equipped with heavy-duty handles for easy rack mounting. If you opt for a desk-top station, the DTR components may be stacked or used separately.

Isn't it time you owned equipment to match your ability and increase your station's success?



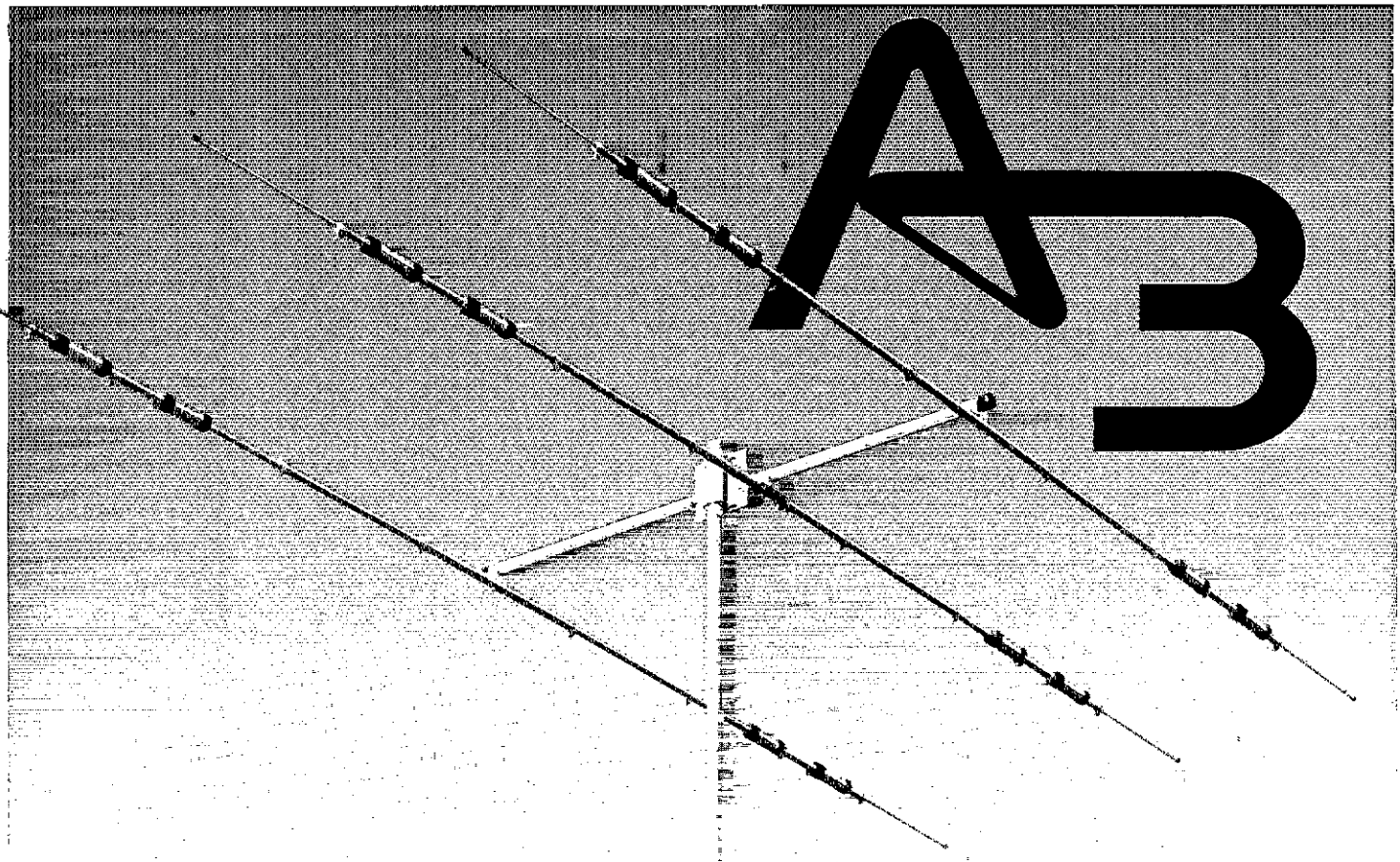
This is just the beginning of the new DTR Components from DenTron, racks also available.

FCC TYPE ACCEPTED

DR

DenTron®

1605 Commerce Drive
Stow, Ohio 44224
(216) 688-4973



$199.95

The full power, full performance 20-15-10 meter beam.

V.S.W.R.	1.2-1 Typical
Average Bandwidth	500 KHz
Power Rating	2000 w PEP
Feed Point Impedance	50 Ω
Connector	Twin terminal stainless steel takes all coax.
Boom	1⅝"-1½" x 14'
Elements/Longest	1⅛"-½" x 27'9"
Wind Sfc. area	5.6 Feet²
Weight	35 Pounds
Turn Radius	15'6"
Mast Diameter	1¼" min. 2" max.
Material	6063-T832 Seamless aluminum
Fasteners	Zinc Plated Steel
Telescope Method	Taper tubing with full circle clamps

UPS Shippable

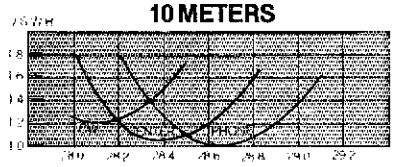
No balun required

Enjoy the thrill of working rare DX with excellent A3 forward gain. Increase the pleasure of your daily contacts with A3 interference reducing front to back ratio. Use your linear amplifier with confidence in our new A3 high power traps.

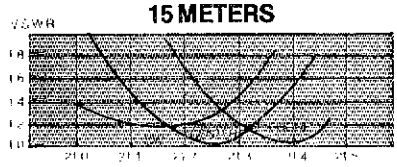
Make friends of your neighbors with A3 compact dimensions, low profile, and small turn radius. Satisfy your budget with A3 economy pricing.

The Cushcraft engineering team has again created that unique combination of quality materials, easy assembly and high performance with A3, the three band beam for the eighties.

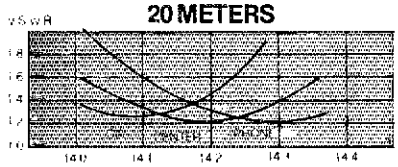
10 METERS



15 METERS



20 METERS



A LEADER FOR OVER 30 YEARS

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KENWOOD
...pacesetter in amateur radio

Hand-shack.

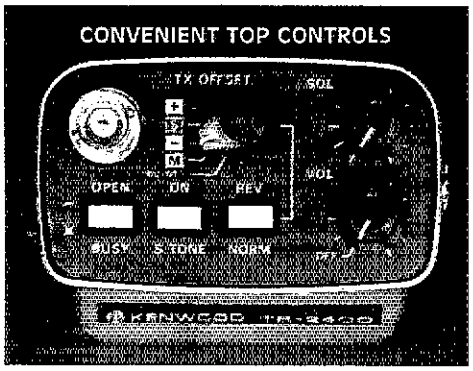
Synthesized, big LCD, 10 memories, scanning, DTMF Touch-Tone®

TR-2400

Put a ham shack in your hand. The TR-2400 is the ideal hand-held for 2 meters FM. It features a large LCD readout that can be read in direct sunlight or in the dark, 5-kHz-step PLL synthesized operation, 10-channel memory, scanning, and 16-button autopatch DTMF encoder.

TR-2400 FEATURES:

- **Large LCD digital readout**
  Readable in direct sunlight (better than LEDs). Readable in the dark (with lamp switch). Virtually no current drain (much less than LEDs) and display stays on. Rugged and dependable in hot or cold temperature ranges. Shows receive and transmit frequencies and memory channel.
- **5-kHz-step frequency selection**
  PLL synthesized keyboard channel selection system. No "5 up" switch needed. Selects from 144.000 to 147.995 MHz.
- **UP/DOWN manual scan**
  Single or fast continuous 5-kHz steps from 143.900 to 148.495 MHz for Amateur and MARS or CAP simplex or repeater operation.
- **10 memories**
  Retained with battery backup (only 0.8 mA). "MO" memory may be used to shift the transmit frequency any desired amount to operate on repeaters with nonstandard split frequencies.
- **Built-in autopatch DTMF (Touch-Tone®) encoder**
  Uses all 16 buttons of keyboard while transmitting.



- **Automatic memory scan**
  Checks all 10 memory channels. Programmable to lock automatically on either BUSY (signal present) or OPEN (no signal) channels.
- **Subtone switch**
  Activates subaudible tone encoder (not Kenwood-supplied).

- **Repeater or simplex operation**
  Convenient mode switch shifts transmit freque +600 kHz or -600 kHz or to the frequency sto in "MO" memory.
- **Reverse operation**
  Nonlocking switch shifts receiver to transmit quency and transmitter to receive frequency.
- **Extended operating time**
  With LCD and overall low-current circuit desi Only draws about 28 mA squelched receive 500 mA transmit (at 1.5 W RF output), for lon operating time between charges.
- **Two lock switches**
  Prevent accidental frequency change and ac dental transmission.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR," "MR" (memory recall), "BA (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connect**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, 1-7/8 inches deep. Weighs only 1.62 pounds cluding antenna, battery, and hand strap).

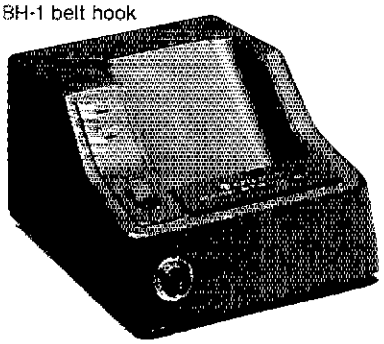
STANDARD ACCESSORIES INCLUDED:

- Flexible rubberized antenna with BNC connec
- Heavy-duty (450-mAh) NiCd battery pack
- External-standby (PTT) plug
- AC charger
- External-microphone p
- Hand strap
- Earphone

NOTE: *Price, specifications subject to change wi out notice and obligation.*

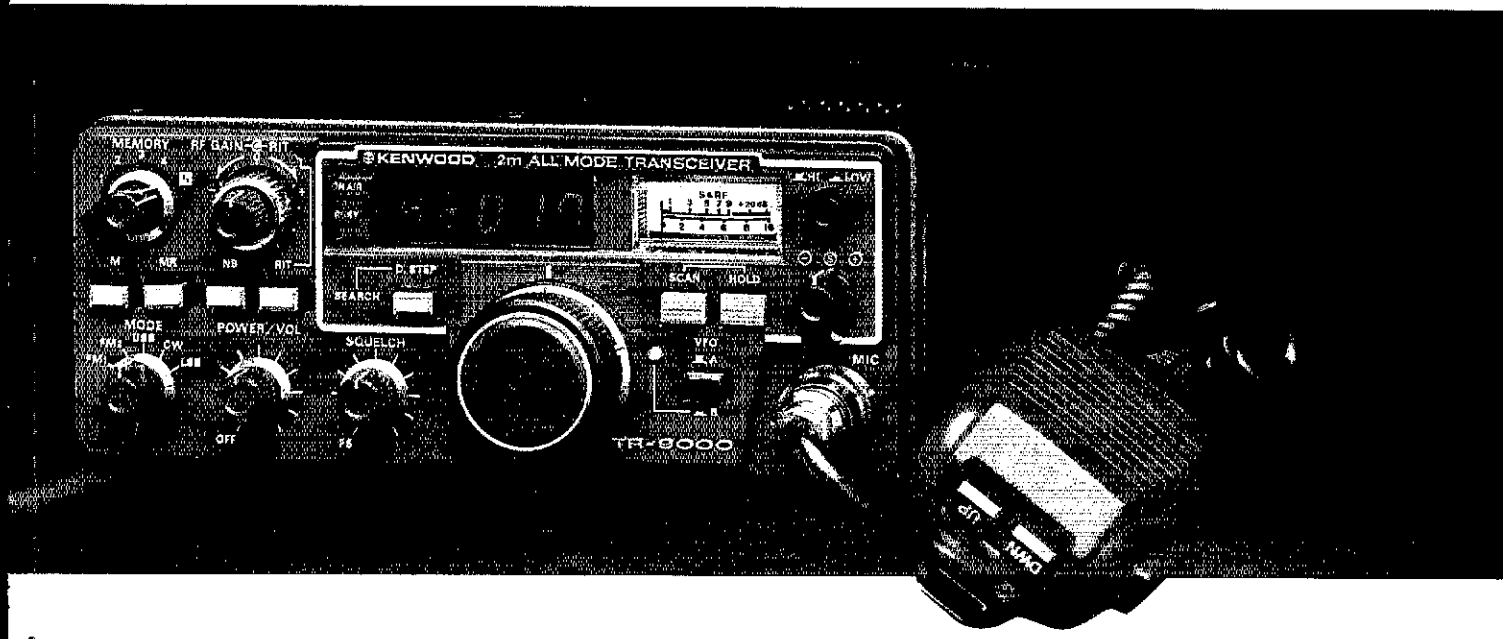
OPTIONAL ACCESSORIES:

- ST-1 base stand (shown) which provides 1.5 hour quick charge and automatic switch to trickle charge, floating charge (operate while charging), 4-pin connector for dynamic microphone, and SO-239 antenna connector
- BC-5 DC quick charger (1.5 to 2.0 hours)
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
- BH-1 belt hook



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

New 2-meter direction.



A compact transceiver with FM/SSB/CW plus...

TR-9000

Kenwood's done it again! Now, it's the exciting TR-9000 2-meter all-mode transceiver...complete with a host of new features. Combining the convenience of FM with long-distance SSB and CW in a very compact, very affordable package, the TR-9000 is the answer for any serious Amateur Operator! Versatile? You bet! Because of its compactness, the TR-9000 is ideal for mobile installation. Add on its fixed-station accessories and it becomes the obvious choice for your ham shack!

TR-9000 FEATURES:

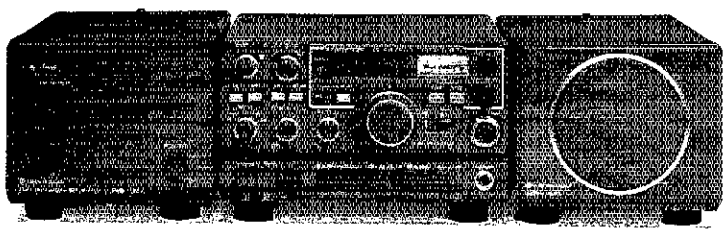
- FM, USB, LSB, and CW...all popular modes
- Compact size...only 6 11/16 inches wide X 2 21/32 inches high X 9 7/32 inches deep
- Digital dual VFOs...with selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz, convenient for each mode of operation
- Digital frequency display...five, four or three digits, depending on selected tuning step
- Extended frequency coverage...143.9000 – 148.9999 MHz
- Five memories:
  M1 – M4...for simplex or ± 600 kHz repeater offset
  M5...for nonstandard offset (memorizes transmit and receive frequency independently)
- Scan of entire band...automatic busy stop and free scan
- SSB/CW search...sweeps over selectable 9.9-kHz bandwidth segments, for easy monitoring
- UP/DOWN microphone (standard). "beep" sounds with each frequency step
- Noise blanker...eliminates pulse-type noise on SSB and CW
- Low-noise, dual-gate MOSFET and two-stage monolithic crystal filter for improved receiver front-end characteristics
- RIT (receiver incremental tuning) for SSB and CW...effective even on memory channels
- RF gain control
- CW sidetone
- Automatic selection of AGC time constant with MODE switch (slow for SSB and fast for CW)
- Improved power module for reliable and stable linear RF output
- Selectable power outputs...10 W (HI)/1 W (LOW)
- Mobile mounting bracket...easy to mount, with quick-release levers
- LED indicators...ON AIR, BUSY, and VFO
- Accessory terminals on rear panel...KEY, BACKUP DC, STBY, EXT SP, DC, TONE INPUT, and ANT

See your Authorized Kenwood Dealer now for details on the TR-9000...the new direction in 2-meter all-mode transceivers!

NOTE: *Price, specifications subject to change without notice and obligation.*

MATCHING ACCESSORIES FOR FIXED-STATION OPERATION:

- PS-20 power supply
- SP-120 external speaker
- BO-9 System Base...with power switch, SEND/RECEIVE switch for CW operation, backup power supply for memory retention (BC-1 backup power adaptor may also be used for this application), and headphone jack



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Ontario — L. P. Thivierge, VE3GT, 34 Bruce St. W., Renfrew K7V 3W1 (613-432-5967)
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Eastern Massachusetts — Richard P. Beebe, K1PAD, 82 Wyman Rd., Billerica 01821 (617-667-5609)
Maine — Edward B. Bristow, Jr., WA1MUX, Box 187, Route 4, Skowhegan 04976
New Hampshire — Robert Mitchell, W1SWX/W1NH, Box 137-A, Chester 03036 (603-895-3456)
Rhode Island — John Titterington, W1EOF, 45 Mountain Ave., Riverside 02915 (401-438-3619)
Vermont — Robert L. Scott, W1RNA, 9 Larae St., Swanton 05488 (802-868-4944)
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Idaho — Lemuel H. Allen, Jr., W7JMH, 1800 S. Atlantic St., Boise 83705 (208-343-9153)
Montana — Robert E. Leo, W7LR, 6790 South 3rd Rd., Bozeman 59715 (406-586-6147)
Oregon — Dale T. Justice, K7WWR, 1369 N.E. Sunrise Ln., Hillsboro 97123 (503-648-8232)
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Nevada — Ralph E. Covington, Sr., W7SK, P. O. Box 11874, Reno, NV 89510 (702-322-7988)
Pacific — J. P. Corrigan, KH6DD, Box 698, Kaneohe, HI 96744
Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland, CA 95695 (916-666-1465)
San Francisco — Arthur P. Samuelson, W6VV, 440 Davis Ct. #811, San Francisco, CA 94111 (415-986-3129)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Jettie B. Hill, W6RFF, 22410 Janice Ave., Cupertino, CA 95014 (408-255-6714)

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Utah — Royce Henningson, K7QEQ, P. O. Box 1267, Moab 84532 (801-259-5018)
Wyoming — Chester C. Stanwaity, W7SDA, 353 S. Ferris St., Powell 82435 (307-754-3624)

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Orange — Roy C. Zukerman, AC6H, P. O. Box 8305, Fountain Valley, CA 92708 (714-962-8318)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (714-273-1120)
Santa Barbara — D. Paul Gagnon, N6MA, 3800 So. J St., Oxnard, CA 93030 (805-484-1951)

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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

Rewrite — Write Now!

Inflation, taxes and bills to rewrite the Communications Act always seem to be with us. We can't do much, apparently, about inflation or taxes. But at last there's a chance to do something about Rewrite: The staff of the Senate Subcommittee on Communications has put final touches on its draft of a rewrite bill. It is a bipartisan effort combining Senator Hollings' S-611 and Senator Goldwater's S-622, though it may end up with a new number.

Amateurs have a stake in the bill. It incorporates at least the spirit of the legislative goals established by the ARRL Board of Directors at its meeting in July 1977 — except one. "Point-of-Sale Control" of transmitters did not survive the Subcommittee this year as being "too expensive and too controversial." A staffer invited us, however, to draw ammunition from Canada's experience with point-of-sale control, and come back next year.

The bill would provide for 10-year amateur licenses; FCC authority over the sale and manufacture of TV receivers to reduce susceptibility to rf; and, perhaps, a rewriting of the secrecy provisions of Section 605 to make it clear that signals from amateur, CB and broadcasting stations are not secret (a necessary ingredient for self-policing of the bands).

The most urgent of this year's changes would give FCC statutory ". . . authority to delegate to qualified persons, by contract or otherwise, the preparation and administration of examinations for Amateur Radio Operator licenses, and the issuance of temporary authorizations, but not licenses, to qualified applicants." This is important and urgent because, last November at a Commission meeting, the FCC General Counsel questioned the use of volunteer examiners without specific statutory authority. Absent a change in the Communications Act, one must assume that the Commission would either have to absorb the Novice workload or suspend that program, potentially cutting off an input of some 25,000 newcomers per year. (The General Counsel has not set a timetable or proposed a specific course of action to implement his view; nevertheless, the sword is dangling over the heads of prospective Novices.)

Okay, we need the proposed revisions in the Communications Act, and we want them this year. What should you do? As we said in the title of this column, "Write Now." Or better yet, if the opportunity presents itself, visit! Contact your own Senators at once, urging that the Communications Act Rewrite provisions affecting Amateur Radio be reported out of Committee favorably, and that they be enacted by the Senate. Simply address your letter to The Honorable _____, U.S. Senate, Washington, DC 20510 — and please send us a copy.

The danger is that busy legislators will bypass "technical" bills like this one to concentrate on glamorous issues more fully in the public eye — especially in this, an election year! The letter writing, the personal visits, will show Congress that a portion of the public *does* care, *does* want passage of the bill in 1980.

The first trick, of course, is to get the bill from the Subcommittee to the full committee, and thence to the floor of the Senate. The members of the Senate Committee on Commerce, Science and Transportation are Senators Howard W. Cannon, D-Nevada,* chairman; Warren G. Magnuson, D-Washington*; Russell B. Long, D-Louisiana; Ernest F. Hollings, D-South Carolina*; Daniel K. Inouye, D-Hawaii*; Adlai Stevenson, D-Illinois; Wendell H. Ford, D-Kentucky*; Donald W. Riegle, D-Michigan*; J. James Exon, D-Nebraska*; Howell Heflin, D-Alabama; Bob Packwood, R-Oregon; Barry M. Goldwater, K7UGA, R-Arizona*; Harrison H. Schmitt, R-New Mexico*; John C. Danforth, R-Missouri*; Nancy L. Kassebaum, R-Kansas; Larry Pressler, R-South Dakota*; and John W. Warner, R-Virginia.* Asterisks denote members of the Subcommittee on Communications, of which Senator Hollings is chairman and Senator Goldwater is minority leader. The Subcommittee, of course, is instrumental in determining whether, when and in what shape the bill will be presented to the full Committee.

Amateurs in the key states have made contact with Senators on the Subcommittee during the Easter recess. But it will take large numbers of individual letters from constituents to overcome legislative inertia and get this bill moving. Amateurs responded beautifully to the call on this page, last October and November, to write FCC and Congress about Article 41 of the ITU regulations. You can do it again — the task is fully as important! — *Perry F. Williams, W1UED*

League Lines...

Attention Phase III satellite users. FCC rules restrict the power allowed for operating between 420 and 450 MHz in the states of Florida and Arizona, and parts of California, Nevada, Texas and New Mexico. The limitation is now 50 watts dc plate input power. The recommended power requirement for the Phase III satellite uplink is 500 to 1000 watts effective radiated power (erp) because of the path losses of the high elliptical orbit. If you live in the affected area and desire to use more than 50 watts dc plate input power for Phase III operation, ask the FCC engineer-in-charge of your district for the proper forms to request an increase in power. ARRL is supporting AMSAT's request for a blanket exemption from the power restriction for Phase III operation; however, because the Commission may not be able to act on the request before Phase III is operational, League hq. recommends that affected amateurs file for exemptions.

Canadian Amateur Rules amended. In last month's "Happenings" we were able to mention briefly some of the important DOC changes to the Radio Regulations. This month, "Canadian News-Fronts" covers these amendments in detail. This column also examines the question of which frequencies are permitted to U.S. and other non-Canadian amateurs when operating in Canada. See page 51.

Through a most unfortunate chain of circumstance, some of the ARRL Hall of Fame correspondence was lost in transit between Newington and another office. Because of that, it is not now possible to hold the election to the Hall of Fame previously scheduled for the July meeting of the Board. In order to solve the problem in the quickest way possible, we ask that those who have submitted nominations in the past please do so again. Submit only the names, not the supporting documentation. Do this prior to October 1 of this year, so that the nominees can be reviewed by the Membership Affairs Committee and the Executive Committee before being submitted to the full Board at its meeting next January. (For details on the Hall of Fame, see page 16 of September 1979 QST.)

FCC's volunteer examination program may be in trouble unless the Communications Act is amended. See "It Seems to Us . . . " on page 9 of this issue.

An apparent threat to the 220-MHz amateur band has been averted. The FCC had earlier released a Notice of Proposed Rulemaking (Docket 80-1) concerning a proposed automated inland waterways communication system in the 216-220 MHz band. The docket contained one reference, though, to the frequency range 216-225 MHz. On March 10, the FCC issued a Third Errata to Docket 80-1 stating that the reference to 216-225 MHz was an error and should read 216-220 MHz to be consistent with the docket as a whole.

League Members! The last item in this column for April contained an error. It is possible that you could pay more for amateur equipment when making a purchase if you use a credit card rather than cash. While the Truth in Lending Act prohibits merchants from imposing a surcharge on credit card transactions, there is no restriction against your being offered a discount for paying with cash. If the selling price is established, for example, at $300, you should pay no more than this if you use a credit card. However, the merchant may offer you a discount from this amount for a purchase made in cash.

"Happenings" update. At presstime we received word that the bill to reclassify Amateur Radio call letter license plates as "prestige" plates in Nebraska has been defeated in committee. This updates the information on page 55.

Instructors and students who are a little baffled by the changes in the new FCC Study Guides (March 1980 QST, pp. 55-58) should see "In Training," p. 64 in this issue, for a summary of those changes.

Wanted: Successful, creative solutions to the omnipresent problem of putting up antennas in apartments/condos that prohibit any outside antennas. We want to hear from the most clever hams out there. Send photos (high contrast, black and whites, no "instants" please), sketches, schematics and a few words describing what you have done to Peter O'Dell, AE8Q, Basic Radio Editor, QST, ARRL hq.

Amateurs in radio broadcasting: Communication World, Volume 2 is now ready, according to the program's producer, Steve Brown, WD8QJB. The series of five-minute programs, designed for broadcast radio, deals with the many facets of Amateur Radio communications. There are 13 programs in each volume. To obtain the series, send two 1400-foot reels of tape for each set of 13 programs. Send tapes to Steve Brown, WD8QJB, Parkland College, 2400 W. Bradley, Champaign, IL 61820.

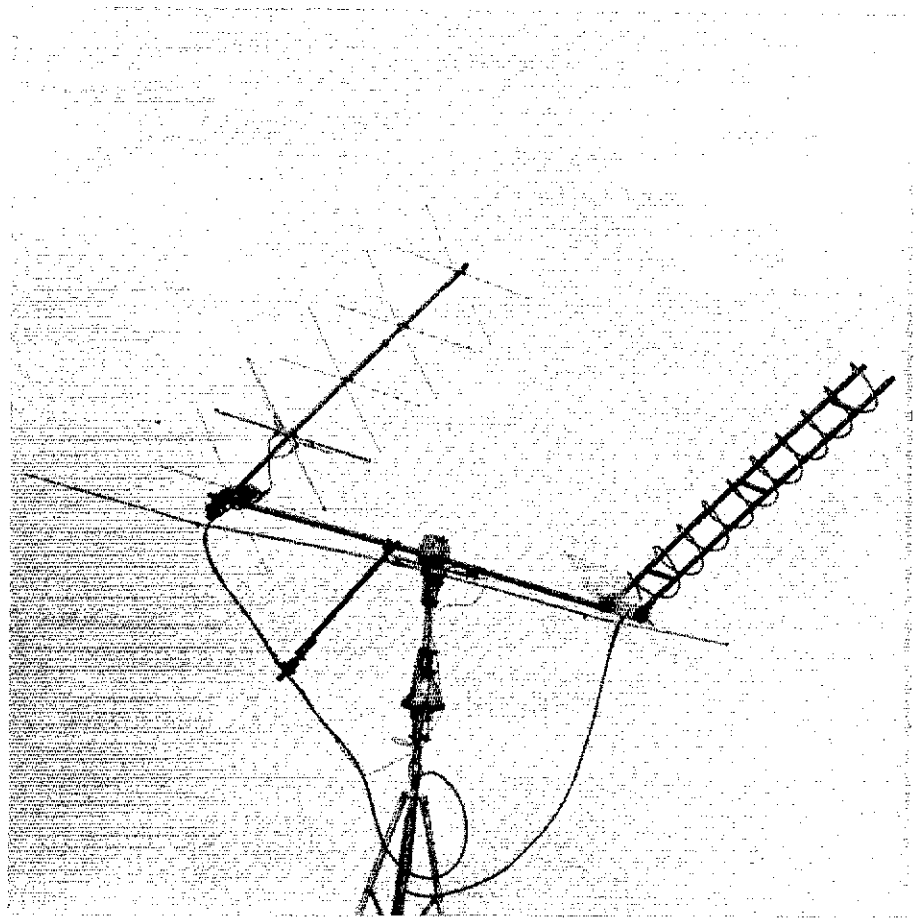
Circular Polarization and OSCAR Communications

OSCAR users are switching to circular polarization to lessen signal fading. Build this low-cost antenna system and hear what you've been missing.

By Bernie Glassmeyer,* W9KDR

Most amateurs use either horizontal or vertical polarization because no other types are needed for terrestrial communication. In space communication certain polarization changes must be accounted for. This may be simply done with a basic understanding of what to expect and how to compensate for it.

Skywave communication involves the use of the mysterious ionosphere to reflect the waves of high-frequency signals. The ionosphere consists of ionized particles that extend from about 30 to 300 miles above the earth. See Fig. 1. Because the particles are in a constant state of flux, the effect on the radio signal passing through the ionosphere is random and ever-changing. Signals to and from a satellite are affected to varying degrees depending on the frequency, time of day, and location of the receiver and transmitter. The major effect is contributed by Faraday rotation, which causes changes in the polarization of electromagnetic waves as they pass through the ionosphere. Frequencies up to approximately 1 GHz (1000 MHz) are subject to Faraday rotation when they traverse the ionosphere. Since the present OSCAR satellites operate in this frequency range, we have an opportunity to observe the phenomenon of Faraday rotation.



The author's satellite communications antenna system. On the left is a commercially made crossed-dipole Yagi antenna for 2 meters. On the right is a 9-turn 70-cm helical antenna. Note the counterweight mounted on the elevation boom.

Orbital Perspective

To track the satellite we must know its

*OSCAR Operations Manager, ARRL

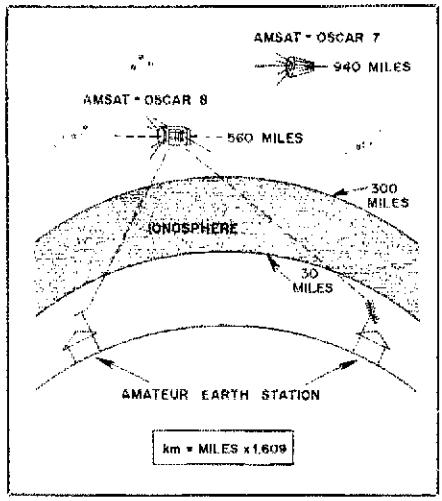


Fig. 1 — Both uplink and downlink signals must pass through the ionosphere to reach the OSCAR satellites. Approximate distances from the earth's surface are shown.

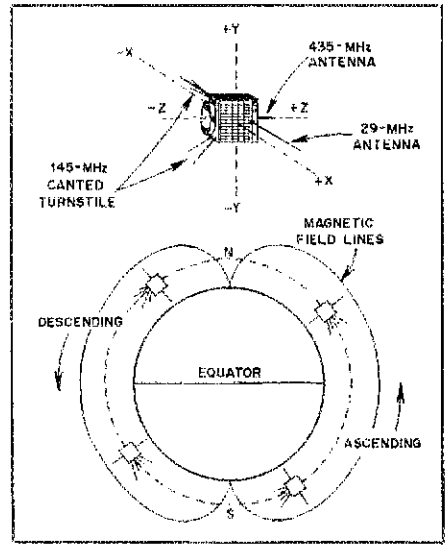


Fig. 2 — The path and orientation of OSCAR 8 as it orbits the earth.

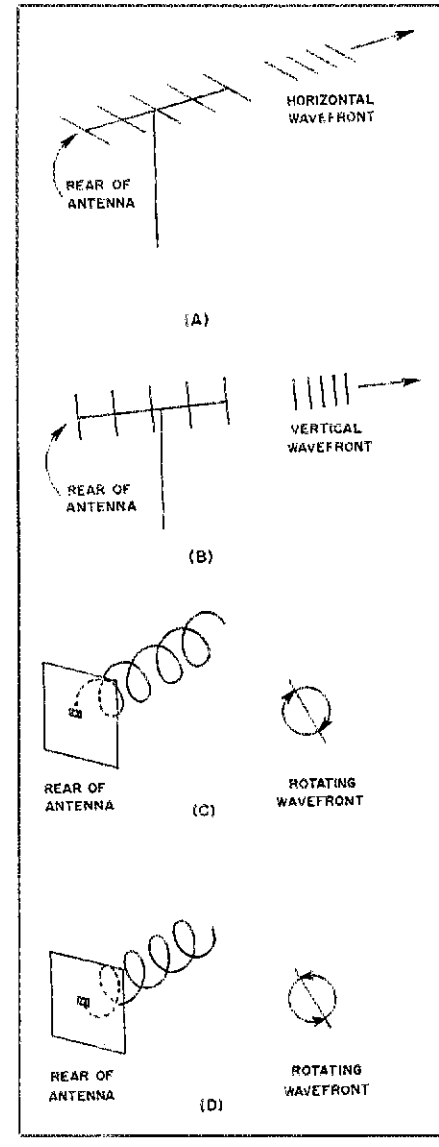


Fig. 3 — Types of polarization. (A) Horizontal polarization. (B) Vertical polarization. (C) Right-hand circular polarization. (D) Left-hand circular polarization.

location relative to our position on earth. This is easy to do using tracking devices available from ARRL hq.[1] and other sources, and the OSCAR operating schedule, published monthly in *QST*. Once the position of the satellite is established, it is time to consider another unknown: spacecraft rotation. A perspective may be gained by studying Fig. 2. The direction of orbit for OSCAR 8 on a south-to-north evening (ascending) pass is indicated by the positive *z*-axis (top of spacecraft). For a north-to-south morning (descending) pass, the direction of orbit is indicated by the negative *z*-axis. Therefore, the positive *z*-axis points in the direction of the earth's geomagnetic north pole, and the negative *z*-axis points in the direction of the south geomagnetic pole. The north and south geomagnetic poles, distinct from the more familiar geographic poles, define the earth's magnetic field. Because this axis inclines about 12 degrees from the geographic axis, the geomagnetic poles lie 798 miles from the geographic poles. The stabilization system aboard OSCAR 8 consists of four permanent magnets aligned along the *z*-axis. These magnets allow the spacecraft to remain parallel to the earth's magnetic field.

The OSCAR 8 spacecraft currently makes one 360-degree rotation about its *z*-axis every five minutes. The 2-meter antennas (four canted turnstiles) mounted on the negative *z*-axis (bottom of the spacecraft) and the 10-meter dipole mounted on the x axis both rotate on the *z*-axis. Result: additional polarization rotation and fading.

Circular Polarization

Now that we have some idea of the orbital mechanics of the spacecraft, let's take a look at the types of polarization used in space communications. The two most likely polarization candidates are right-hand circular polarization (RHCP) and left-hand circular polarization (LHCP). To understand these two forms, we must choose one of the two conventions of circular polarization theory. One theory is the 1942 classic physics definition; the other is the definition of the Institute of Electrical and Electronics Engineers (IEEE). Arguments lasting to the wee hours of the night have occurred between these two schools of thought. I chose the IEEE convention, since all recent work done in the field uses it. Let's accept it and proceed. The IEEE convention is taken from a viewpoint at the rear of the antenna looking in the direction of travel of the wavefront, as shown in Fig. 3. As we look in that direction, an RHCP wave will turn *clockwise*. An LHCP wave will turn *counter-clockwise*.

Most vhf operators know that vertical and horizontal polarization are not compatible; about 20 dB of signal strength is lost when the transmitting station uses one polarization and the receiving station uses the other. But circular polarization can be used with vertical and horizontal polarization, and any form in between.

Because of Faraday and satellite rotation, the polarization of the rf energy from space is indeterminate. Observing the intense fading of a received signal such as the 435.095-MHz beacon from the OSCAR 8 spacecraft has changed the thinking of many recent OSCAR converts who would rather switch than fight Faraday rotation. If you tune in the beacon and get QSB (fading of the received signal), that's it — polarization rotation — unpredictable and ever-changing. Regardless of the polarization at the spacecraft or earth station antenna, whether uplink or downlink, when the signal passes through the ionosphere its polarity is changed. Sometimes the rotation is as much as 180 degrees in a five-minute period, as on 10 meters. By switching to circular polarization, it is possible to change a marginal signal to "solid copy," and gain the hands-on experience you will need to become proficient in space communications.

The best possible system would be switchable RHCP and LHCP on both the uplink and downlink frequencies. Both RHCP and LHCP are useful because the effects of Faraday rotation may be so severe that the polarization sense may actually become reversed!

Assembling such an antenna system is not difficult. Fig. 4 shows four Yagi antennas, a pair for 144 MHz and a pair for 432 MHz. Note how each antenna is mounted at a right angle to its counter-

[1]A simple tracking device, the OSCARLOCATOR, is available from ARRL.

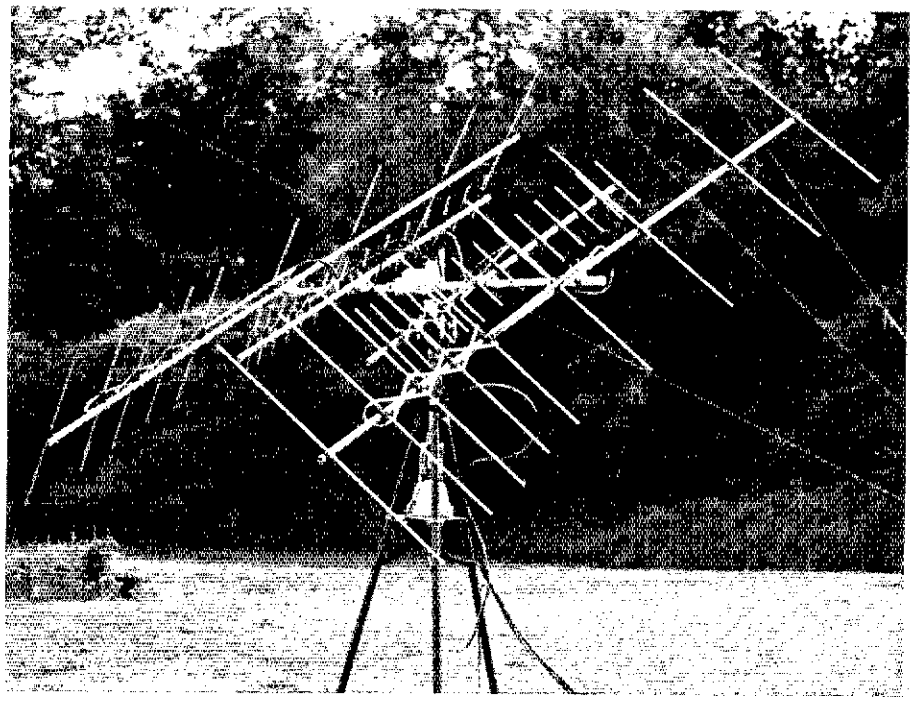


Fig. 4 — An OSCAR array, built by W1VD and assembled from KLM log-periodic Yagis (featured in the 1980 ARRL *Handbook*, page 14-8).

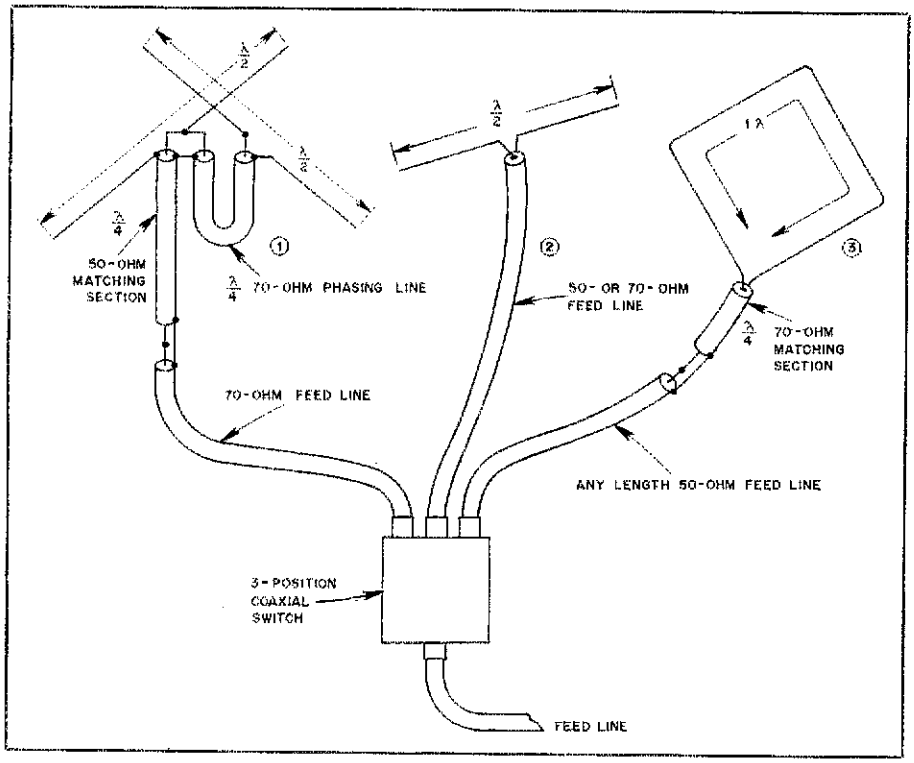


Fig. 5 — Any one of three 10-meter antennas — a turnstile (1), rotary dipole (2), or horizontal loop (3) — may be selected for OSCAR downlink reception.

part. This is an effective means to generate circular polarization. Fig. 5 illustrates a scheme that a Mode A user might employ to recover maximum signal from the 10-meter downlink.

A Switchable-Sense Helical Antenna

A helical antenna is another effective means to generate circular polarization. Constructing a set of helix antennas for the 70-cm band is very easy. One antenna wound for RHCP, the other LHCP, a uhf spdt antenna switch or relay, and some good hardline is all that is needed to complete the system. Such a setup is shown in Fig. 6. Only readily available, inexpensive

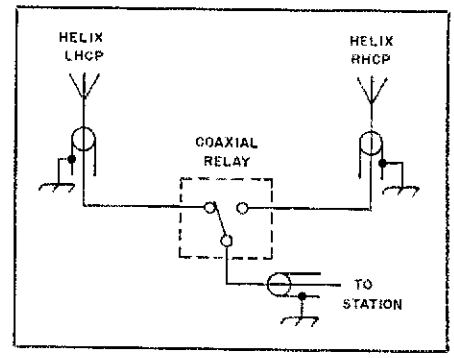


Fig. 6 — A switchable-sense antenna system for satellite communications.

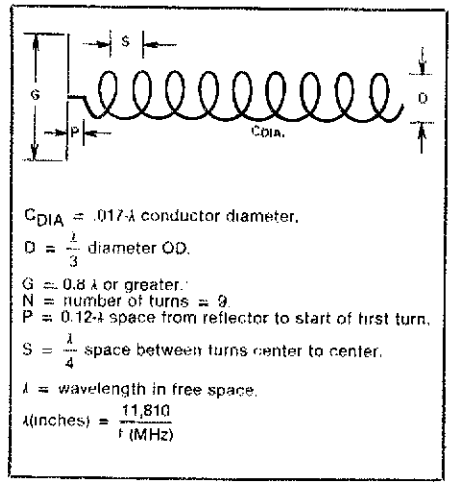


Fig. 7 — A 70-cm, 9-turn helix, with formulas for determining the critical dimensions. For a 430-MHz design frequency, C_{DIA} = 0.47 inch, D = 9.16 inches, G = 22.0 inches, P = 3.3 inches and S = 6.9 inches (mm = inches × 25.4).

materials are used for construction, and the most comforting part is that the dimensions are not critical. Fig. 7 shows the helix formulas and dimensions. This broadband beauty, with a 1.8-to-1 bandwidth ratio, is ideal for a high-gain, broad-beamwidth satellite-tracking antenna. With this switchable antenna system and 50 to 100 watts of rf output, you should have a respectable signal on the new Phase III satellite.

A close-up detail of the complicated portion of the helix is shown in Fig. 8. A good starting point for construction is the reflector, made of heavy wire mesh. This type of wire mesh is used in most uhf TV "bow tie" antennas. Hardware or wire companies can supply this material in four-foot widths. It is no. 14-gauge galvanized steel and sells at approximately $1.60 per foot. To build two antennas you will need a piece of mesh two by four feet. Trim the mesh so that no sharp ends stick out, or you may end up with a four-sided porcupine.

The next step is to make the reflector mounting plates and boom brackets.

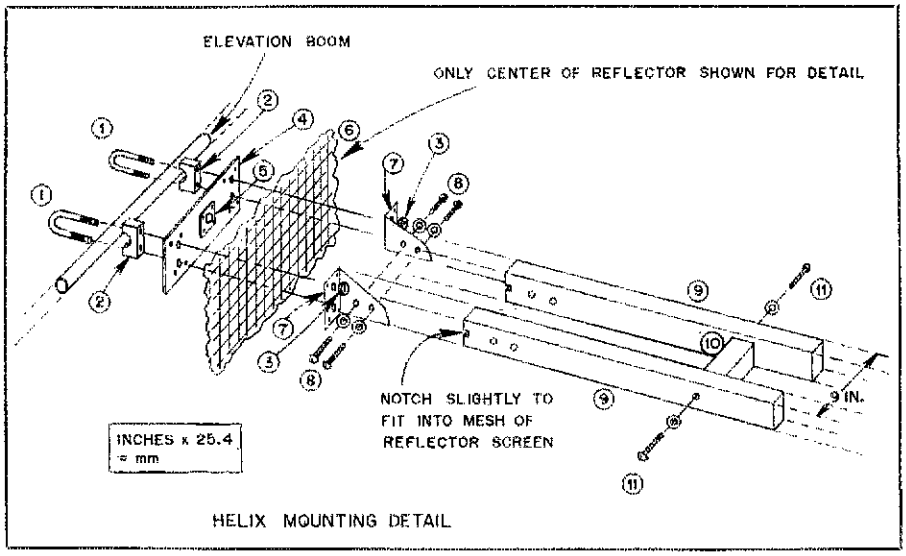


Fig. 8 — The details of the helix-mounting arrangement. See Table 1 for a number-keyed parts list.

Table 1

Parts list for the helix mounting detail shown in Fig. 8.

Piece No.	*Description*	*Comments*
1	U bolt, TV type	Use to bolt antenna to elevation boom
2	U bolt spacer	As above
3	U bolt nut with lock washer	As above
4	Reflector mounting plate (see Fig. 9)	Rivet through reflector to boom brackets
5	Coaxial receptacle, N type	Rivet to mounting plate
6	1- × 2-in. heavy gauge wire mesh	Reflector, cut approx. 22 in. square
7	Helix boom-to-reflector brackets	Rivet through reflector to mounting plate
8	No. 8-32 bolts with nuts and washers	Bolt boom brackets to boom
9	Boom, approx. 1- × 1-in. tomato stake, 6 feet long	
10	Boom spacer, 1- × 1-in. tomato stake	Bolt to boom; cut to give 9-in. spacing
11	No. 8 wood screws with washers	Attach spacers to boom (three places)

Notes: 1) Mount reflector mounting plate to boom brackets observing 9-inch clearance for boom.
2) Wire mesh may be bent to provide clearance for U bolts.
3) When positioning the reflector mounting plate, try to center the coaxial receptacle in the wire-mesh screen.

Follow the dimensions shown in Fig. 9. Heavy aluminum material is recommended; 0.060 inches (1.5 mm) is the minimum recommended thickness. Thicker material will be more difficult to bend, but two bends of 45 degrees spaced about 1/4 inch (6.4 mm) apart will work fine for the brackets in this case. The measurements shown are for TV-type 1-3/4 inch (44.5-mm) U-bolt clamps. If you use another size, change the dimensions to suit. Drill the four holes in the reflector mounting plate and mount the coax receptacle, using pop rivets or nuts and bolts. It is advisable to check clearance between the coax receptacle and the elevation boom before final assembly. The thickness of the U-bolt spacers will affect this clearance. Mount a short piece of pipe, the same size as the elevation boom you will be using, to the U bolts, wire mesh reflector, reflector mounting plate and boom brackets, as shown in Fig. 8. Position the plate in the center of the wire mesh reflector. It will be necessary to bend some of the mesh to clear the U bolts. Loosely tighten the U bolts so the plate can be adjusted to fit the mesh.

The wood boom assembly shown in Fig. 8 is two six-foot lengths of tomato stake joined together in three places. Mount one spacer in the center and the other spacers one foot in from each end. Position the notched ends of the boom to fit into the mesh. When the correct alignment is obtained, clamp the assembly together and drill holes for rivets or bolts through the reflector mounting plate, brackets and wood boom assembly. When drilling the boom holes, place the reflector flat on the floor and use a square so the boom is perpendicular to the reflector. Mark the boom through the holes in the boom bracket. When the assembly is complete, give the wood boom a coat of marine varnish.

The most unusual aspect of this antenna is its use of coaxial cable for the helix conductor. It is readily available, inexpensive, light in weight, and easy to shape into the coil required for the helix. Nine turns will require about 22 feet (6.71 m), but allow 25 feet (7.62 mm) and trim off the excess. The author used an RM-8 type of coaxial cable, but any type may be used that is near the 1/2-inch (12.7-mm) diameter required, and has a center conductor and shield that can be soldered together. Strip about four inches (102 mm) at one end of the cable down to the center conductor, but leave enough braid to solder to the center conductor. This will become an electrical short. The exposed center conductor should be measured 3.3 inches (84 mm) from the short and the excess cut off. This is the dimension P in Fig. 7. Wind the 25-foot length of coax in a coil about 10 inches (254 mm) in

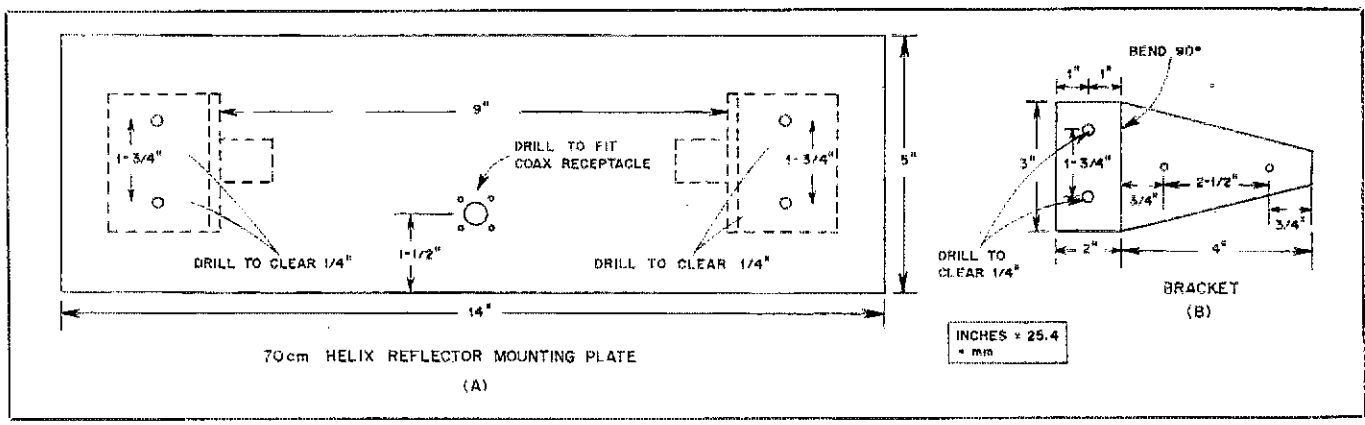


Fig. 9 — (A) The helix reflector mounting plate (part no. 4 in Table 1). (B) The boom brackets (part no. 7 in Table 1).

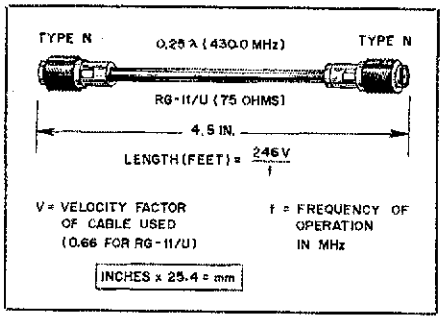
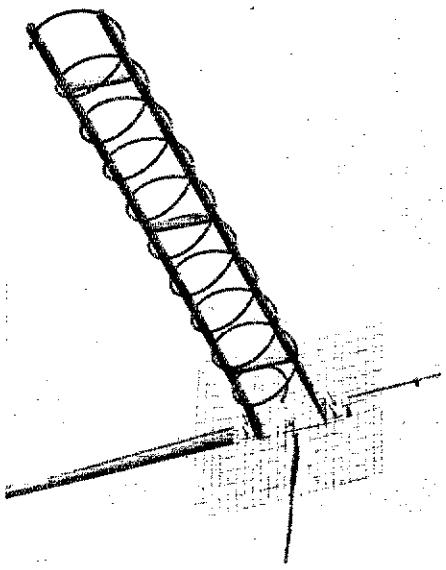


Fig. 10 — A coaxial matching section of 75-ohm cable matches the 140-ohm impedance of the helix to the 52-ohm feed line.



A close-up view of the author's 70-cm helical antenna.

diameter. Check Fig. 3 to determine which way to wind the coil for RHCP or LHCP. Slip the coil over the boom and move the stripped end of the cable toward the coax receptacle, which will become the starting point of the nine turns. Solder the center conductor to the coax receptacle, and start the first turn 3.3 inches (83.8 mm) from the point of connection at the coax receptacle. Tie-wraps are used to fasten the coax to the wood boom. Mark the boom using dimension S in Fig. 7. The first tie-wrap will be only half this distance when it first comes in contact with the boom, then each successive turn on that side of the boom will be spaced by dimension S. Use two tie-wraps so they form an X around the boom and coax. Once the first wrap is secure, wind each turn and fasten the cable one point at a time. Before each turn is tightened, make sure the dimensions are correct. When you reach nine turns, check all dimensions again. Cut the coax at the ninth turn, strip enough of the end to solder a short. The exposed solder connections at each end of the coax conductor may be taped and sprayed or covered with a RTV-type covering to weatherproof them.

The coaxial 75-ohm quarter-wavelength matching section shown in Fig. 10 is connected in series with the feed line at the antenna feed point. The formula for determining the correct impedance value for a coaxial quarter-wave matching transformer is

$$Z_o = \sqrt{Z_s Z_r}$$

where

Z_o = desired transformer impedance
Z_s = transmission-line impedance
Z_r = antenna impedance

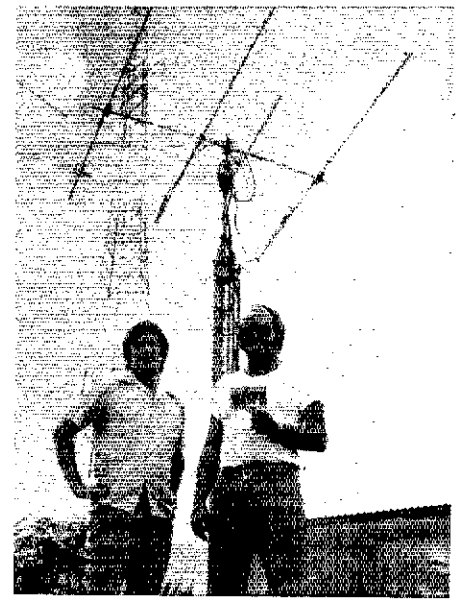
The impedance of the helix is approximately 140 ohms. To match the 52-ohm transmission line, a transformer of 85.3 ohms is required. The 75-ohm cable used here is close enough to this value for a good match. The transformer should be connected directly to the female connector mounted on the reflector mounting plate. Use a double-female adapter to connect the feed line to the matching transformer. Wrap the connectors with plastic electrical tape, then spray with an acrylic resin for waterproofing.

To mount these antennas on an elevation boom, a counterbalance is required. The best way to do this is to mount an arm about two feet (610 mm) long to the elevation boom, at some point that is clear of the rotator, mast and other antennas. Point the arm away from the direction the helices are pointing in, and add weight to the end of the arm until balance is found.

Do not run long lengths of coax to this antenna, unless you use hardline. Even short runs of good RG-8/U coax are quite lossy: 50 feet of foam RG-8/U at 430 MHz has a loss of 2 dB. There are other options if you must make long runs and can't use hardline. Some amateurs mount the converters, transverters, amplifiers and filters at the antenna. This could be done with the helix antenna very easily; the units could be mounted behind the reflector, which will also add counterbalance. If this approach is used, check local electrical codes before running any power lines to the antenna.

Many theoretically minded amateurs will argue that polarization sense does not change as the signal passes through the ionosphere. So far, only a few active OSCAR 8 Mode J users have discovered that it pays to switch polarization sense. With one RHCP, one LHCP helix and a remote uhf spdt switch, you will be able to determine for yourself if this phenomenon exists. With active satellites equipped for 70-cm transmission and reception orbiting the earth every day, we only need point our antennas skyward to enjoy and learn from the exciting world of satellite communications. QST

Strays



These two OSCAR DXpeditioners, Herb Schoenbohm, KV4FZ, of Christiansted, Virgin Islands, and Bud Ansley, W6VPH, of Pasedena, California, have put many new spots in the Caribbean on the air for OSCAR DXers. This photograph was taken at the KV4FZ antenna farm.

"HAMFEST CALENDAR" RULES AND REGS

☐ *QST* will list your hamfest in its monthly "Hamfest Calendar," free of charge. There are certain guidelines, however.

Hamfests will be listed only once. Sponsors may specify the issue in which the announcement should appear. Normally, if the event will occur before the 10th of the month, we recommend listing it in the previous month's issue. The deadline for *receipt* of hamfest information is the 15th of the second month preceding publication. In other words, if an event is August 5, the announcement should be in the July issue, and will need to arrive in Newington by the 15th of May at the very latest. For an August 19 event, the sponsor could choose either the July issue, with the May 15 deadline, or the August issue, with a June 15 deadline.

We will acknowledge all information received at Hq. for "Hamfest Calendar" with a postcard stating the date of publication. If you do not receive an acknowledgement within two weeks, your letter may not have arrived at Hq., so please send us a duplicate copy.

Oh, yes, "Hamfest Calendar" is separate from the hamfest section of the Ham Ads. See the first page of the Ham Ads section in this issue for more information. — *Marge Tenney, WB1FSN*

Increasing Receiver Dynamic Range†

Noisy local oscillators and poor noise blankers can ruin the dynamic range of an otherwise good receiver. The techniques shown here are in the vanguard of the battle for high receiver dynamic range.

By Ulrich L. Rohde, Ph.D., Sc.D.,* DJ2LR

The demands we place on our hf receivers are ever-increasing. The hf spectrum is becoming more and more crowded, and the current sunspot maximum is making that crowding even more evident. This has pushed the performance of hf receivers to new highs, especially in the area of dynamic range.

While the dynamic range has been increased by redesigning rf amplifiers and mixers for better intermodulation-distortion performance,[1-4] two common faults have received less attention. The local-oscillator signal in a modern receiver is often generated by frequency synthesis and the noise sideband performance of such a signal source can be poor. In addition, a noise blanker that does not introduce in-band intermodulation distortion or degrade the receiver performance in other ways is a rarity.

Low-Noise Synthesizers for Receivers

Currently there are three different approaches used to generate the LO signal for synthesized receivers. Direct synthesis is extremely fast in switching speed, very bulky because of the enormous filtering requirements and fairly large in power consumption. A second method is a combination of various phase-locked loops, sometimes used with the mix-and-divide principle. The third method is the digiphase system, which allows infinite resolution. Only the last two methods are in common use.[5] The Hewlett-Packard HP-3335A synthesizer/level generator[6] and the Racal RA6790 communications receiver[7] are good examples of these design approaches.

One of the most complicated problems in frequency-synthesizer design is the trade-off between loop bandwidth, settling time and sideband noise. In a single-loop synthesizer, the phased-locked loop will improve the noise performance of the synthesizer. This reduction in noise output will occur around the synthesizer output frequency for a bandwidth equal to the loop bandwidth. For division ratios greater than 1000, the loop filter would probably need to be extremely narrow. Therefore, noise reduction would only occur for a few hertz on either side of the carrier. Such a loop would not compensate for microphonic effects and other turbulences. Since these effects *must* be compensated for, it is essential that the loop bandwidth be reasonably wide. If the output frequency is divided by 100 or 1000, the modulation index, and therefore the unwanted microphonics, will be reduced. Unless this is done, a loop bandwidth of less than 1 kHz should be avoided.

The noise contribution of the voltage-controlled oscillator (VCO) is usually greater than the noise contribution of the reference signal. If we assume that the ideal loop bandwidth is 1 kHz, it is apparent that we must design a VCO that has sufficient low-noise performance in the range from 1 kHz from the carrier frequency out to several megahertz from the carrier frequency. How far out from the carrier frequency the output must be clean depends on the requirements of the receiver.

The noise-sideband performance of any oscillator depends upon the Q of the tuned circuit and the noise contribution from other parts of the circuit, such as the transistor and other lossy devices. It is, therefore, apparent that the best noise performance will be obtained from a crystal oscillator, where the Q of the crystal is extremely high.[8-10] Such a circuit minimizes any pulling effects and makes the crystal itself the main reference element. A crystal oscillator cannot be used as a VCO, however. In a phase-locked loop, a steering input is needed: The frequency of the oscillator should be a function of the dc control voltage applied to the oscillator.

It is not uncommon that the amount of frequency shift required is as much as 10 or 15% of the center frequency. Therefore, the tuning diode will have a major influence on the noise-sideband performance. In most cases, tuning diodes used in synthesizers are the same as those

†This article has also been submitted in a slightly different form to IEEE for presentation at IEEE EUROCON/80, Boston, Massachusetts, May 1980.

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References appear on pages 20 and 21.

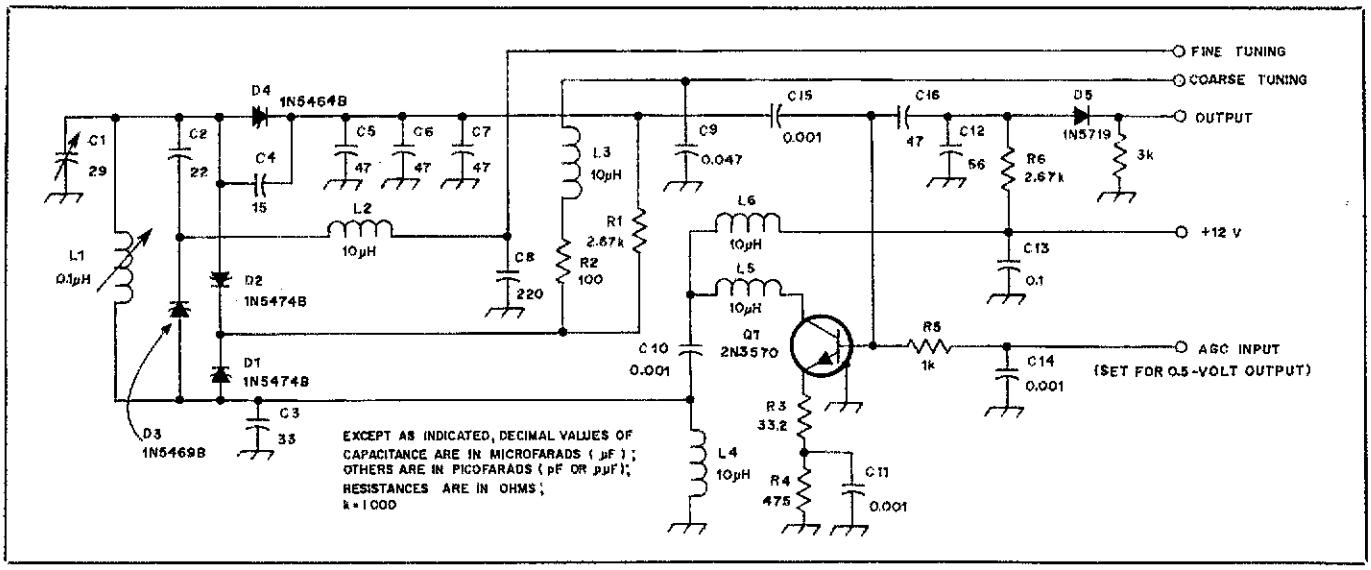

Fig. 1 — A 70- to 80-MHz VCO with coarse and fine tuning.

found in entertainment circuits. The noise contribution of those diodes, and therefore the degradation of VCO spectral purity, is excessive. There are special tuning diodes available, such as the Motorola 1N5464B/5474B series, that will fulfill the stringent requirements of low-noise VCOs.

Let us assume, for example, that the first i-f of a receiver is 72 MHz and that the entire shortwave spectrum should be tuned. This necessitates a VCO frequency of 72 to 102 MHz. While it might be possible to build a VCO that covers the entire frequency range, this would be an extremely poor design choice. Let us examine the reason for this statement.

Thermal Noise

The voltage gain K_v = 30 MHz/12 V or 2.5 MHz/V. The resultant noise voltage is generated according to Nyquist's formula

$$V_n = \sqrt{4kT_oR\Delta F}$$

where T_o is the temperature in kelvins, and k is Boltzmann's constant (1.38×10^{-23}). R is the equivalent leakage resistance of the diode and ΔF is the bandwidth over which we want to examine the noise performance. The resistance, R, will typically range from 1000 to 10,000 ohms depending upon the diode and the reverse voltage supplied. A typical example will be a noise bandwidth of 10 kHz, an equivalent noise resistance of 3 kΩ and a temperature of 23°C or 296 kelvins. The calculation tells us that the value of the noise voltage is 0.7 μV. When we multiply this voltage by the voltage gain of the VCO, we determine the residual fm to be 1.75 Hz. This is caused by the effect of thermal noise modulating the VCO. In general, inexpensive varactor diodes are much worse in this respect: Their equivalent noise resistances are substantially greater. When using this type of diode, residual fm up to 1 kHz has been observed.

To improve the noise performance, the amount of influence the tuning diode has in the circuit should be kept as small as possible. Fig. 1 shows the VCO of the hf synthesizer used in a transceiver built by Rohde & Schwarz, and used in military communications. This VCO is tuned from 70 to 80 MHz and exhibits a signal-to-noise ratio of 90dB/Hz at 1 kHz off the carrier and 135 dB/Hz at 25 kHz off the carrier. The loop bandwidth of the synthesizer is kept in the vicinity of 1 kHz or less. The microphonic effects are well suppressed and the noise-sideband performance is determined only by the oscillator.

This oscillator has a number of unusual features. The influence of the transistor parameters is fairly small, as the collector circuit is kept at a low impedance by means of C3. The base is held at an even lower impedance by C5 through C7. The Motorola high-performance tuning diodes mentioned earlier are used. Fine tuning is accomplished via the 1N5469B diode, while the other tuning diodes are responsible for coarse tuning and linearization of the VCO gain. Since the receiver tunes the entire 30-MHz hf band, three of these 10-MHz VCOs are employed. Fast band switching is not important — more emphasis has been placed on the requirements for low noise.

To obtain low phase noise within the natural frequency of the loop, phase detectors rather than phase-frequency detectors were used. Since those have a limited capture range (not more than 1.5 MHz), coarse steering was required. Another reason to use coarse steering is to shorten acquisition time. The coarse steering is done with tuning diodes, which still have some noise contribution even when they are held at a constant terminal voltage. Outside the control loop frequency this noise voltage degrades the noise performance. Additional means had to be investigated to reduce this noise. The development of multistandard television tuners in Europe has spurred research activities in the field of switching diodes and the application in VCOs.

Rather than use tuning diodes for coarse steering, it is now much more elegant to use binary-coded inductors to coarsely preset the frequency in 1-MHz steps. When these diodes are conducting, their loss resistance is typically 0.4 Ω at 10-mA dc. This resistance degrades the Q of the coils very little. Intermettal, an ITT subsidiary located in Germany, has probably one of the best low-cost switching diode series. Type BA244 diodes require only 10-mA of switching current and should be used as shown in Fig. 2. Their differential forward resistance is a function of forward current, as shown in Fig. 3. The BA243 is recommended for lower frequency applications, while the BA244 should be used for our application. Fig. 4 shows a VCO that covers 40 to 70 MHz using such switching diodes for coarse steering. This VCO has the same noise-sideband performance as the oscillator shown in Fig. 1, but over a frequency range of 30 MHz.

An Exotic Example

A semi-fast frequency synthesizer using this type of VCO was developed for a commercial receeiver. Fig. 5 shows the block diagram of this novel approach. A single-loop synthesizer covering the range of 50 to 150 MHz with an internal reference of 1 kHz is divided by 100. This results in an output frequency of 500 kHz to 1.5 MHz. This division has increased the resolution from 1 kHz to 10 Hz, which is suitable for all practical applications. (Most receivers having 1-Hz resolution do not have adequate frequency standards to justify this resolution. The absolute

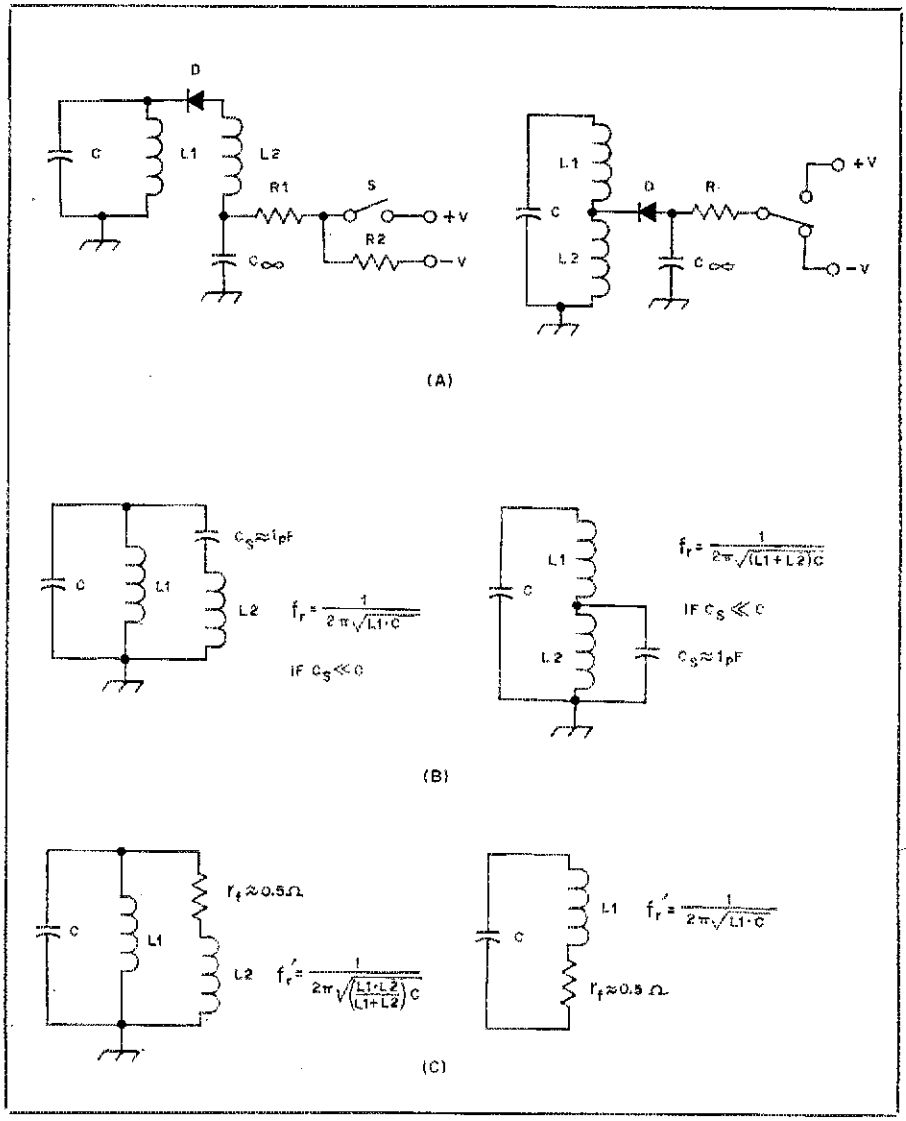

Fig. 2 — Shown at A are two methods of using a switching diode to change the resonant frequency of a tuned circuit (coarse steering). C_∞ is a very large value of capacitance. At B is the equivalent circuit when the diode is biased off (open). C_s is stray capacitance which can be neglected when calculating the resonant frequency, F_r. At C is the equivalent circuit when the diode is biased into conduction; r_f is the forward resistance of the diode, which can also be neglected when calculating the new resonant frequency, F_r'.

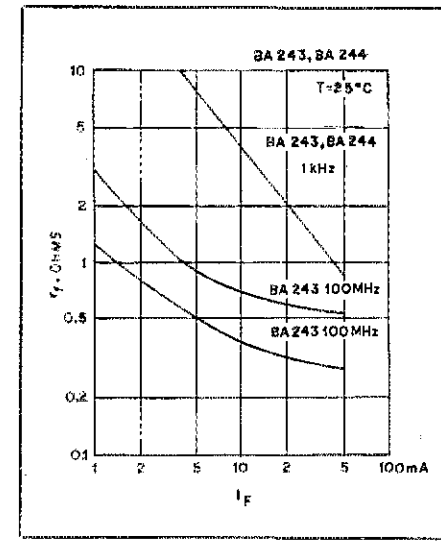

Fig. 3 — Forward resistance of BA243 and BA244 diodes as a function of forward current and frequency.

accuracy is typically between 10 and 100 Hz.)

Dividing the fine resolution loop by 100 also produces a noise improvement at its output of 40 dB. This noise reduction removes the stringent requirements on the loop oscillator, as the signal-to-noise ratio initially needs to be only 100 dB/Hz or slightly better. A third-order filter in the PLL permits very fast acquisition time. Because of the fairly wide loop bandwidth, a switching time of about 10 ms is possible. (The digiphase system may allow quasi-infinite resolution, but the receiver is almost never phase-coherent with the internal standard. The resulting noise sidebands are often barely 60-dB suppressed.)

The output loop of the synthesizer covers the frequency range of 40.455 MHz to 70.455 MHz. It is mixed with an identical set of oscillators used in a step loop. The step loop is locked in 1-MHz steps to the internal frequency standard and is very fast because of the small division ratio. This loop is called the high-gain loop and exhibits extremely low-noise performance. The coarse dc control voltage of this step loop is used to preset the output loop VCOs within a few hundred kilohertz. One VCO is fed the coarse control voltage only, while the other VCO has both coarse and fine inputs. The outputs of the two VCOs will differ in frequency by 200 kHz minimum to several megahertz maximum. The outputs are mixed and fed to a phase/frequency comparator and compared with the output of the fine resolution loop described above. The two auxiliary loops are not multiplied inside the phase-locked loop and therefore don't degrade the noise performance, but their noise contribution is added. The output loop has no divider chain and transfers the noise of both loops directly to the output. Because of this clever method the resulting noise is equal to the noise of the high-gain 1-MHz loop (highest multiplication, 70) while the internal reference is operating at 10 MHz. Therefore, the additional multiplication factor is only seven as far as the noise degradation is concerned. The dividers have a noise floor of about 160 dB/Hz, and therefore the sidebands of the 1-MHz loop ultimately remain at 140 dB/Hz. More than 100 kHz away from the carrier frequency, the close-in signal-to-noise ratio is never worse than 120 dB. For more information on local oscillators, references 11, 12 and 13 are recommended.

A High-Dynamic-Range Noise Blanker

As discussed previously, interference which is generated inside the receiver has been reduced by improving the performance of amplifiers and mixers. Undesired noise sidebands of the LO depend upon the spectral purity of the synthesizer. In the real world, however, there is another type of annoying interference. These are pulses, either manmade or made by nature.

The two most violent sources of pulse interference are discharges during a lightning storm and noise generated by jamming stations and pulse radar stations. A nuisance called the "woodpecker" is a several-megawatt over-the-horizon pulse radar system that apparently has its origin in the U.S.S.R. This system produces pulses up to several hundred microvolts at the receiver input and interferes with communications. LORAN is the bane of amateurs using the 160-meter band. Naturally occurring noise discharges such

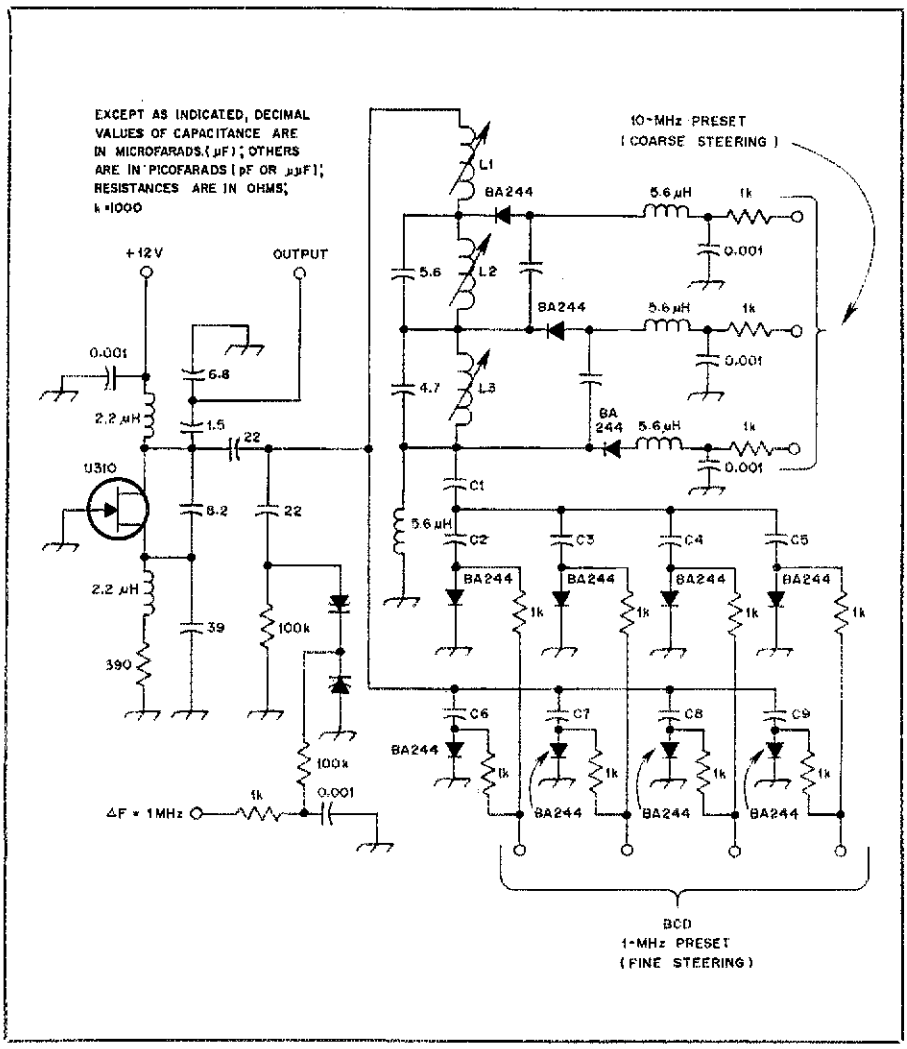

Fig. 4 — An ultra-low-noise VCO with coarse steering. The values of L1 through L3 and C1 through C9 depend on the frequency of operation chosen.

as lightning add to the man-made noise sources to make a noise blanker a necessity in modern communications receivers.

In general, the rise and decay times of man-made and naturally occurring noise pulses are substantially faster than the rise and decay times of desired signals. This phenomenon can be used to differentiate between the two types of interference. It is therefore desirable to build a pulse receiver that can become part of the existing receiver system without degrading the overall receiver performance.[14]

The noise blanker example of Fig. 6 is based on a publication by M. Martin, Hahn-Meitner Institute, Berlin, West Germany.[15,16] Martin's circuit is very involved and expensive. The simpler version published here can be added to any hf receiver with a first i-f between 9 and 70 MHz. It is assumed that the receiver has no rf preamplifiers and that the amplifier following the mixer has a low enough noise figure to make such a preamplifier unnecessary.

The noise blanker uses a Siemens TCA440 IC that incorporates all the elements of a single-conversion receiver. The i-f chosen is about 2 MHz and the values of the input coils are selected for an input frequency of 9 MHz. [Editor's Note: This circuit is provided for tutorial purposes. Further design information on the TCA440 is contained in "Designed Examples of Semiconductor Circuits," Siemens Corp., Issue 1975/76. Copies of the material relevant to the TCA440 are available from Siemens Corp., IC Component Group, 186 Wood Ave. South, Iselin, NJ 08830.]

The 9-MHz signal is taken from the

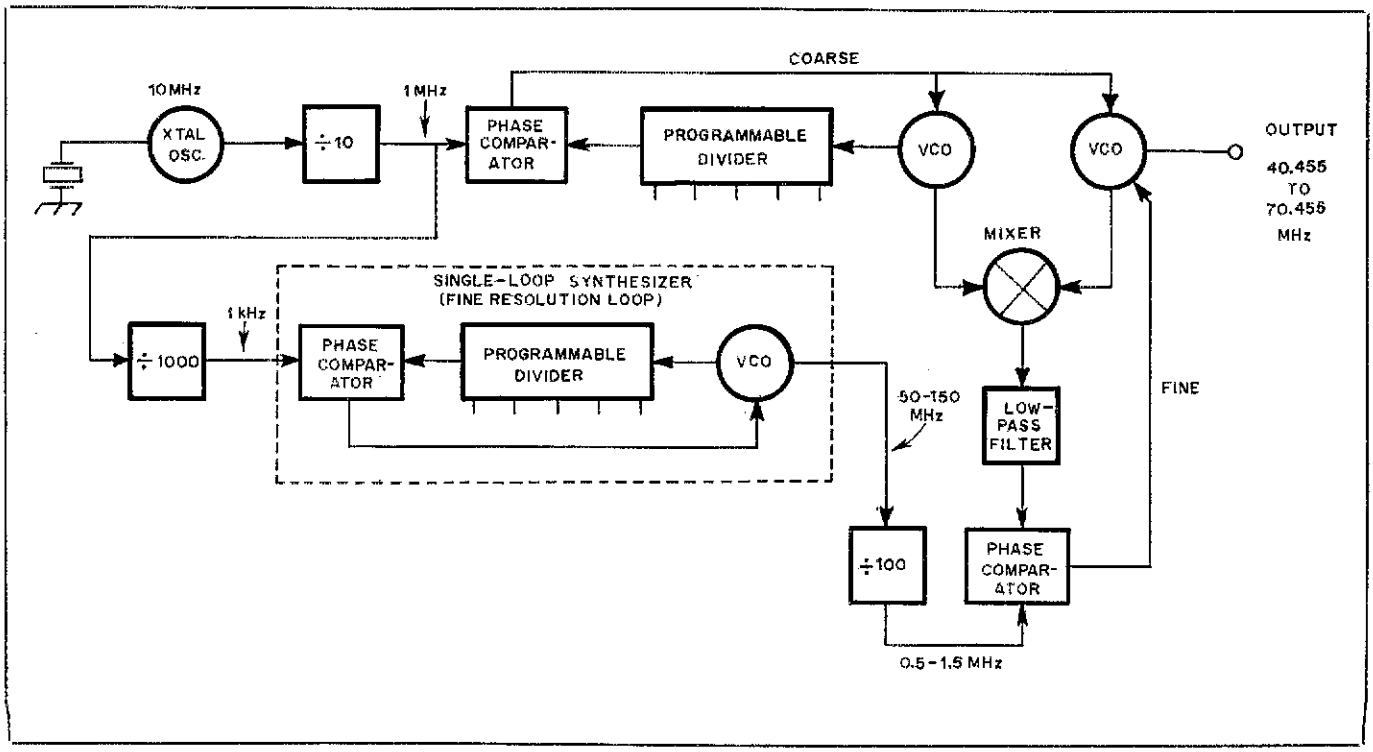

Fig. 5 — The block diagram of a novel frequency synthesizer using the type of VCO shown in Fig. 4.

mixer of the receiver and fed to a CP643 amplifier and a BF246C source follower. The source follower drives a series tuned circuit. The signal is then applied to the TCA440 single-conversion receiver and converted to the 2-MHz i-f. An external germanium diode provides fixed age voltage to pin 9 of the TCA440. An audio test output is available to monitor the age action of this receiver section. The 2-MHz i-f output is taken from a BF246 source follower and drives a BC177 with an adjustable-trigger threshold. The 74LS173 IC has the proper rise and decay times to drive the four-diode switching gate via a 2N2219 driver.

It was determined that the intercept point of this arrangement is about 26 dBm and the switching gate has a depth of about 80 dB. This is sufficient to suppress interference since the rf signal-to-noise ratio very rarely exceeds 60 dB. Practical experiments have shown this noise blanker to be superior to other configurations. The famous "woodpecker" completely disappears when it is switched in. The circuit layout should not be too critical. However, some care is required to build the switching gate without leakage. Good balance is required. Slightly better performance can be expected using HP 3081 PIN diodes, but this is achieved at considerably higher expense.

The vulnerability of hf receivers to internally and externally generated noise can be greatly reduced by improving the spectral purity of the LO and adding a noise blanker that introduces a small interference product. This, together with the use of high-level doubly balanced mixers and other low-distortion circuits, will make even tube receivers obsolete with respect to dynamic range.

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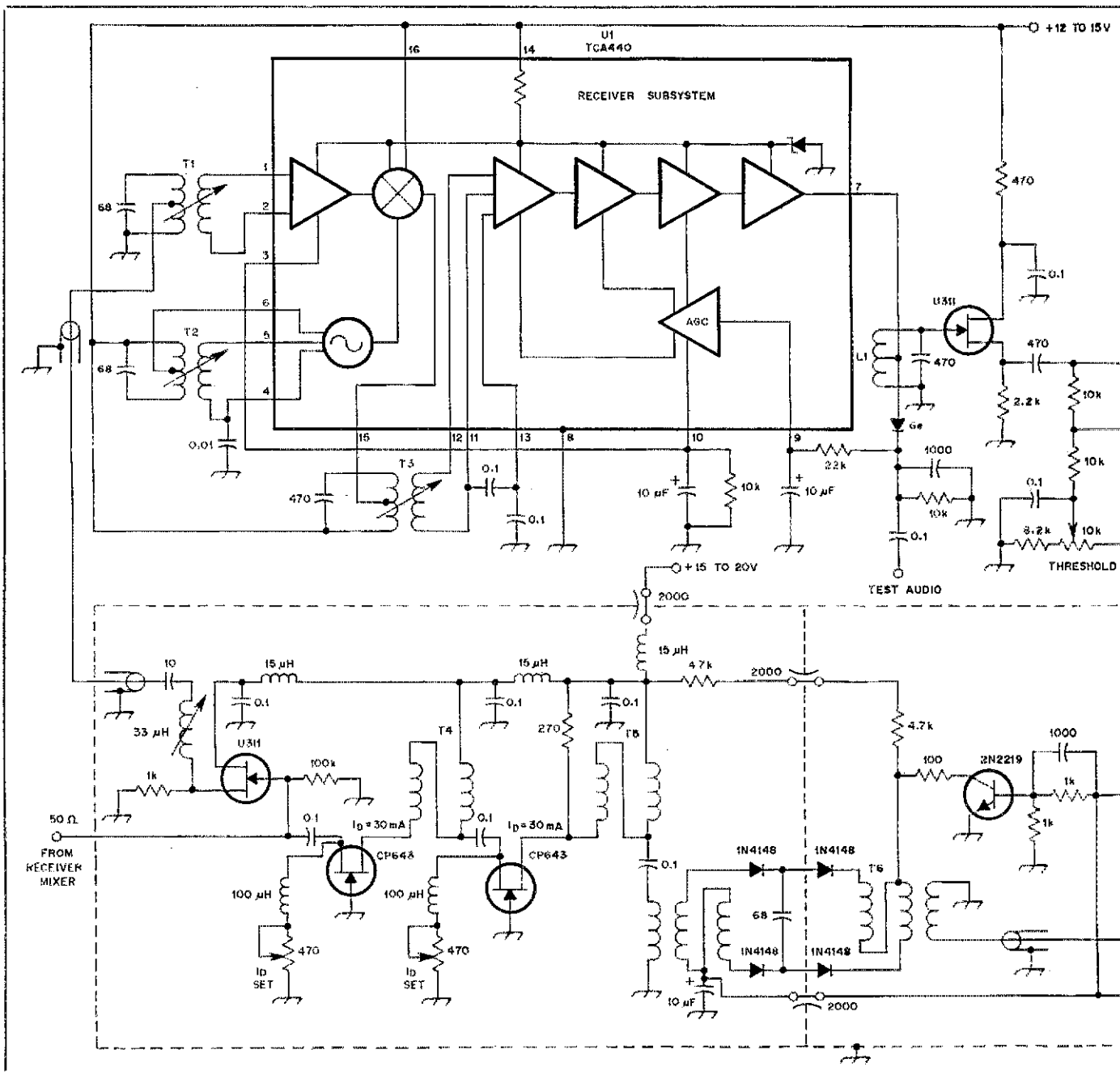

Fig. 6 — A high-performance noise blanker.

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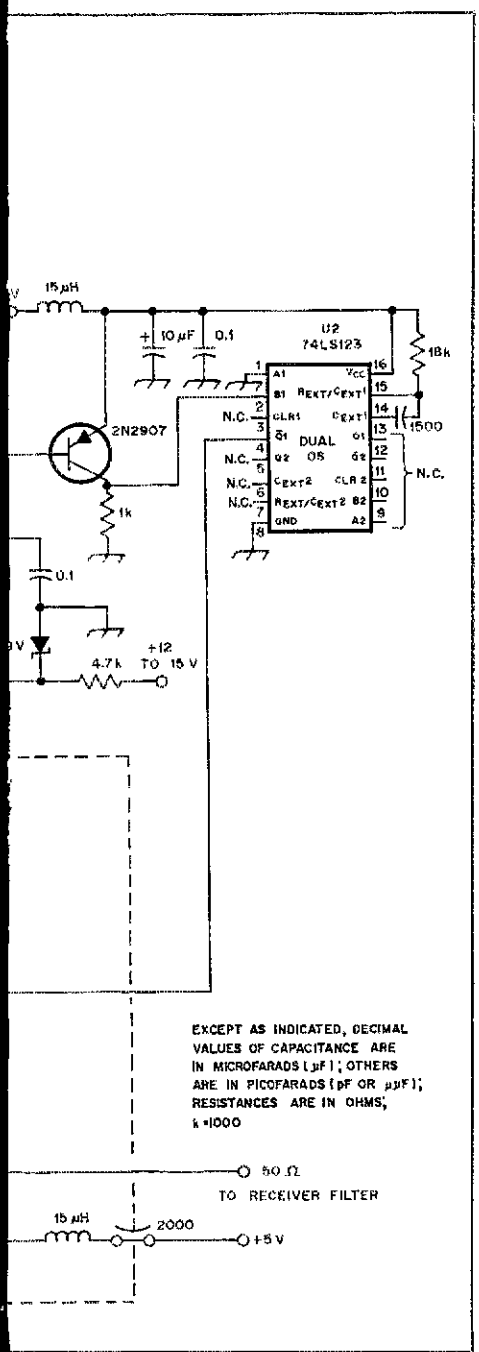


New Books

☐ *Technology — Fire in a Dark World*, by Perry Pascarella. Published by Van Nostrand Reinhold Co., New York, 1979. Hard cover, 6-1/4 × 9-1/2 inches, 172 pages, $12.95.

Hardly a day goes by that we aren't exposed to antitechnology sentiments. Bookburnings, oil spills, and antinuclear rallies capture media attention, but we also hear local grumblings about erroneous bills generated by computers. In his review of *The Zapping of America* (see May 1978 *QST*), Jim Kearman suggested that the antitechnology movement needs study. Perry Pascarella, executive editor of *Industry Week*, has done this job in his new book.

Our thoroughly technical society debates whether technology is good or evil. Pascarella points out the futility of such debate, taking the position that technology is integral to human evolution, and is in fact essential to our continued existence. He systematically refutes the arguments of the zero-growth advocates, drawing support from such eminent futurists and social critics as Toffler, de Chardin, Glasser, Sagan and McLuhan.

The actual problem we face is not how much technology should grow, but in what directions. To analyze this and related questions, Pascarella divides *Technology* into four parts: Toward a Better Life, Misconceptions and Apprehensions, The Worsening Climate for Innovation, and the Democratization of Technology.

"Toward a Better Life" examines the interdependence — the inseparability — of technology and freedom. The author defines what technology is and what it is not. He explores the meanings of innovation, ingenuity and productivity. The "international goodwill" and "advancement of the art" definitions of Amateur Radio fit neatly into this perspective of technology.

In "Misconceptions and Apprehensions," Pascarella looks into society's disillusionment with technology. Misuse of technology and some unexpected side effects have given it a bad name, but much of the criticism of technology should really be directed against our social structure. "If we can put a man on the moon, why can't we eliminate poverty, ignorance and disease?" This is a commonly asked question, and the author's answer is that the lunar problem was well defined and purely technical. Poverty, ignorance and disease are *social* problems, and any solutions must remain social. Nonetheless, technology, when properly applied, can assist in the solutions. "Haven't we had enough technology?" is another frequently heard question. We can have anything we want, but not everything at once, Pascarella counters. We must select "appropriate" technology to solve our problems.

Jim Fisk answers the often-heard lament that "modern technology is ruining Amateur Radio" in his editorial in the November 1979 issue of *Ham Radio*. He points to exciting new developments and chides those who would return to the "good old days." Fisk is right, of course, but I started out with a 6L6 crystal oscillator on a wooden chassis, and to *me*, radio hasn't been as much fun since. Punching buttons on a microprocessor-controlled 2-meter transceiver doesn't do a thing for me. All the elegant reasoning in the world can't uproot a gut feeling. Apprehensions about change are difficult to overcome. Think about that when you try to justify your new antenna to your neighbor.

Pascarella warns of impending technological stagnation in "The Worsening Climate for Innovation." Today's electronic watches and calculators are the fruition of 15 years of research and development. If we expect anything equally innovative 15 years from now, we will be disappointed, for the labs are empty. Industry has reduced its commitment to basic R&D in the face of stockholders' demands for faster payoffs. Economic and political considerations are forcing an industrial retreat at a time when the solutions to our most pressing problems require long-term effort.

The final section of the book, "The Democratization of Technology," deals with technology's *outward* relationship to society. The author investigates possible options for technological direction from the lay public. The goal is to educate the public so it can make informed decisions. Pascarella believes the technical community is equal to this task. I disagree. After enduring much frustration attempting to teach basic electrical theory to radio amateurs (who are supposedly scientifically oriented), I shudder at the thought of educating the lay public in complex subjects without dangerous oversimplification.

Technology — Fire in a Dark World is a thought-provoking book, and all thoughtful people should read it. Despite exposing some disturbing trends, Pascarella concludes the volume on a hopeful note: "Man will not settle for a future without hope, and hope lies only in change. He must, therefore, make technology his and give it direction. He may tremble as he carries the torch evolution gave him, but he knows the answer to the question 'is it wrong to turn back?' " A comprehensive bibliography documents the work and allows the reader to draw his own conclusions. — *George Woodward, WIRN*

• *Basic Amateur Radio*

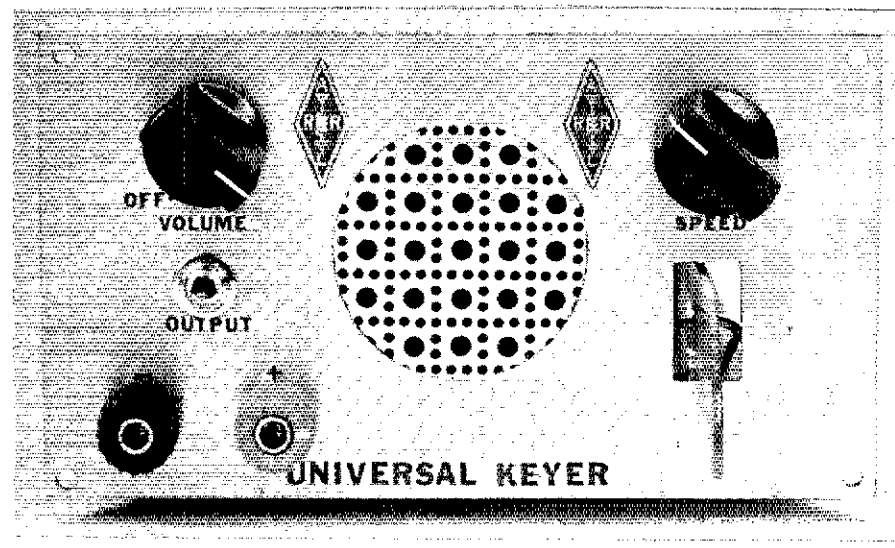
The NOR-Gate Break-In

Break into the world of the mysterious black boxes known as digital ICs. Investigate how these intriguing devices go together. You will come away with a simple, inexpensive keyer and know the basic secrets of the "black box."

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

Have you been sitting on the sidelines listening to conversations in which words like "gate," "inverter" and "flip-flop" were bantered about? Have you dreamed about owning an electronic keyer but shied away because of the high price? If there were a quick, inexpensive and easy way that you could learn the basics of digital ICs and at the same time build a practical keyer, you would want to know about it, wouldn't you? Well, this keyer uses digital ICs and is simple, inexpensive and suitable for use with most rigs. It even has a built-in paddle that *can* be used if you want to avoid the expense of a commercial paddle.

As usual in this series, we're relying on the use of inexpensive materials in our workshop project. Printed circuit-board material is used for the front panel, side brackets, paddle arm and ballast compartment. The Universal Breadboard is employed as the main chassis of the keyer, and we are introducing a Universal IC Breadboard.[1] It will be used in subsequent Basic Radio projects as well as in this one.



Front view of keyer, which features digital ICs and a built-in paddle.

I See an IC

For the newcomer and any veterans who have managed to avoid the last 15 years of technology, an IC is best regarded as a "black box." There is no need (now, at least) to be concerned about what is going on inside the black box; you merely have to be aware of what happens to the output when a change is made to the input.

Basically, we have two general types of ICs — linear and digital. Although it is somewhat of an oversimplification, the beginner can think of the output waveform of the linear IC as being a scale model of the input form. This scale model can be larger, smaller or the same size as the input. Examples are audio amplifiers, rf amplifiers and oscillators.

For the most part, digital ICs are used in logic circuits. They are designed to function as binary (two-state) devices. Any given input or output is either on or off — just as the light switch in your kitchen is either on or off (assuming that you do not have a dimmer connected to it). These two states are usually called "low" and "high," depending on whether the voltage is near zero (or ground potential) or near the supply voltage. Through the use of binary arithmetic, digital ICs can be made to add, subtract, multiply and divide. Digital ICs are used in such things as calculators, clocks, computers, frequency counters and keyers.

ICs are frequently referred to as chips, but don't get the idea that you can eat them while drinking beer or play poker with them! They taste terrible and it is dog-gone near impossible to stack them without ruining the leads. The term "chip" comes from the fact that the ICs are made from numerous transistors

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[1]Notes appear on page 27.

"integrated" onto a tiny "chip" of silicon.

What Good is it If You Can't Eat It?

This month's project is a keyer that automatically produces properly spaced dits and dahs when the appropriate contact is closed. It is designed to mate with the Universal Transmitter that appeared in December 1979 *QST*, and to be powered by the Universal Power supply featured in November 1979 *QST*. It can be used, however, with most other transmitters and the supply voltage is not critical. Although the specifications for the chips that we are using call for a supply voltage between 5 and 15 volts, the unit that we constructed in the lab exhibited some quirks below 7.5 volts.

The "guts" of this month's project is made of eight NOR gates which are found in two CD4001 ICs. Fig. 1 depicts the top view of the CD4001. For each individual NOR gate each input and each output comes to a separate pin. The two remaining pins on the IC package provide power supply connections. Since the CD4001 is a CMOS device, these last two pins are labeled Vss (source voltage) and Vdd (drain voltage).

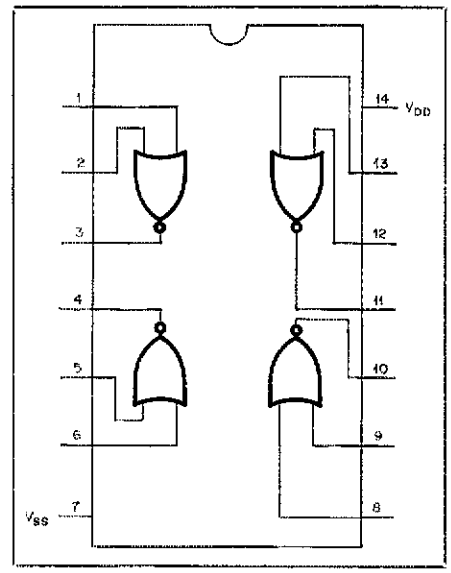


Fig. 1 — The top view of the CD-4001 IC. The indent at the top of the package is used for pin location identification.

The schematic diagram of the keyer is given in Fig. 2. Although upon first glance the uninitiated may tend to view it as the scribbling of a demented chimpanzee, it really is a very simple design. There are road maps that will guide those who wish to *wade* through the circuit — the truth tables for the NOR gate and the R-S flip-flops.

The keyer is equipped with a sidetone oscillator. Q1 acts as a switch by turning on Q2, which is wired as a twin-T oscillator. This keyer by itself will work with the Universal Transmitter. If the keyer is to be used with a different transmitter, it is recommended that the circuit in Fig. 3 be added. Chet Opal, K3CU, used this circuit with his Micro-

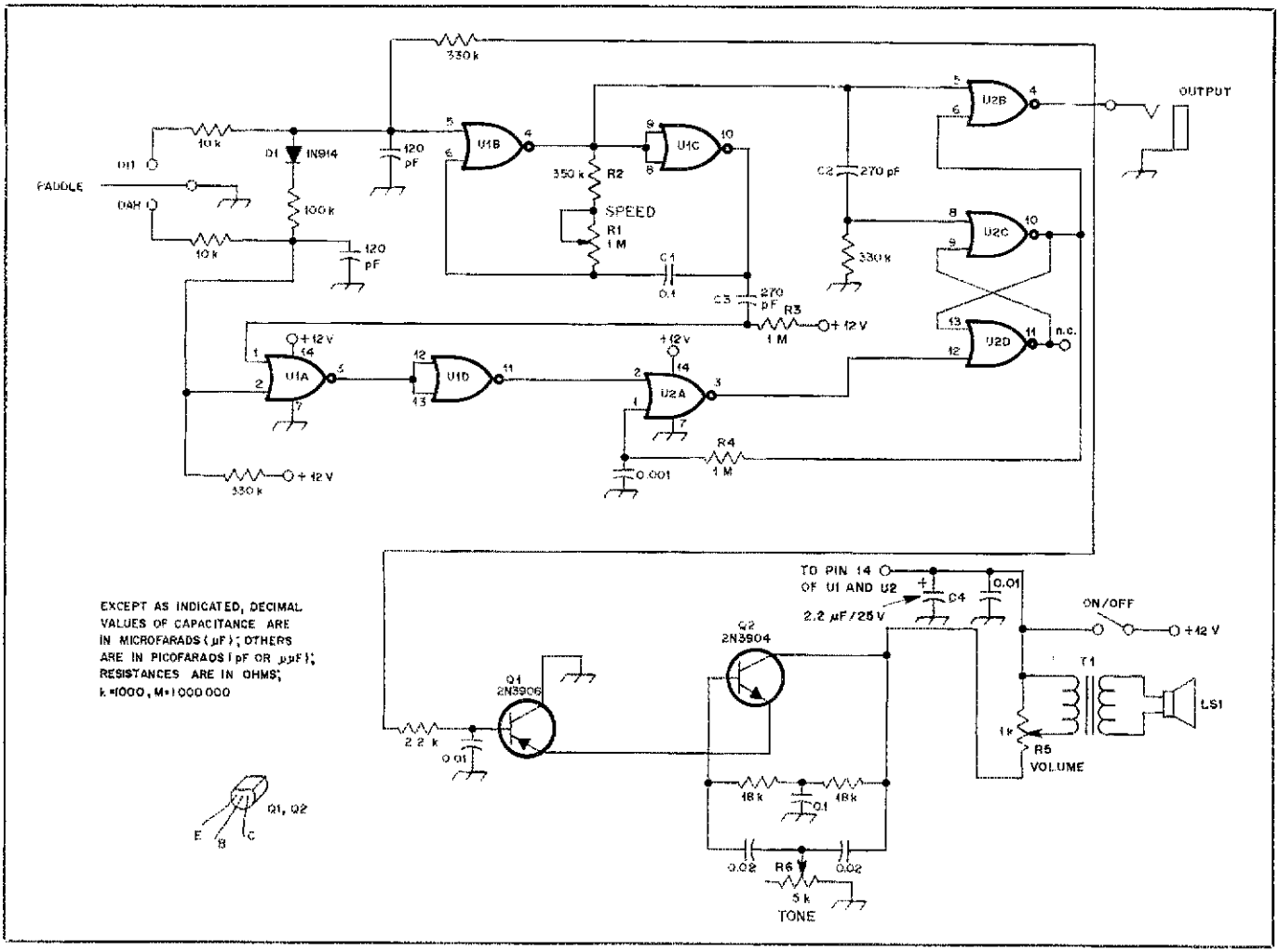


Fig. 2 — Schematic of keyer. All capacitors are disc ceramic, except for those with marked polarity. Fixed-value resistors are carbon-composition, 1/2 watt or less. For ease of understanding the circuit operation prepare the overlay described in the appendix to go over U2C and U2D.

C1, C2, C3, R2, R3, R4 — Numbered for text discussion and parts-placement purposes.
C4 — 22µF, 25 V electrolytic.
D1 — High-frequency switching diode, 1N914 or equiv.
J1 — Miniature phone jack (non-shorting).
J2, J3 — Insulated binding posts, one red (+), one black (−).
LS1 — Small 4- to 8-ohm speaker
Q1 — 2N3906 or equiv. pnp.
Q2 — 2N3904 or equiv. npn.
R1 — 1-MΩ reverse-log-taper.
R5 — 1-kΩ linear-taper, composition control (with spst switch).
R6 — 5-kΩ linear-taper, composition control.
S1 — (Part of R5)
T1 — Audio output transformer, 1-kΩ primary, 8-Ω secondary (Radio Shack 273-1380 or equiv.).

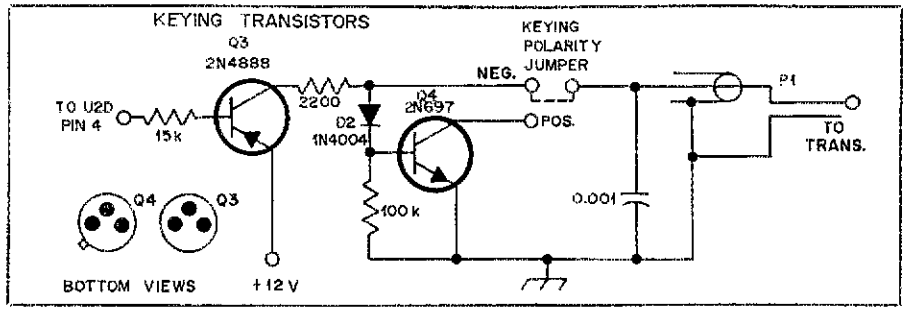


Fig. 3 — Suggested keying circuit to be used when keyer is mated to transmitters other than the one described in this series.
D2 — 1N4004 or equiv.
Q3 — 2N4888 or equiv.
Q4 — 2N697, 2N1711 or equiv.
P1 — (Appropriate plug to mate with transmitter)

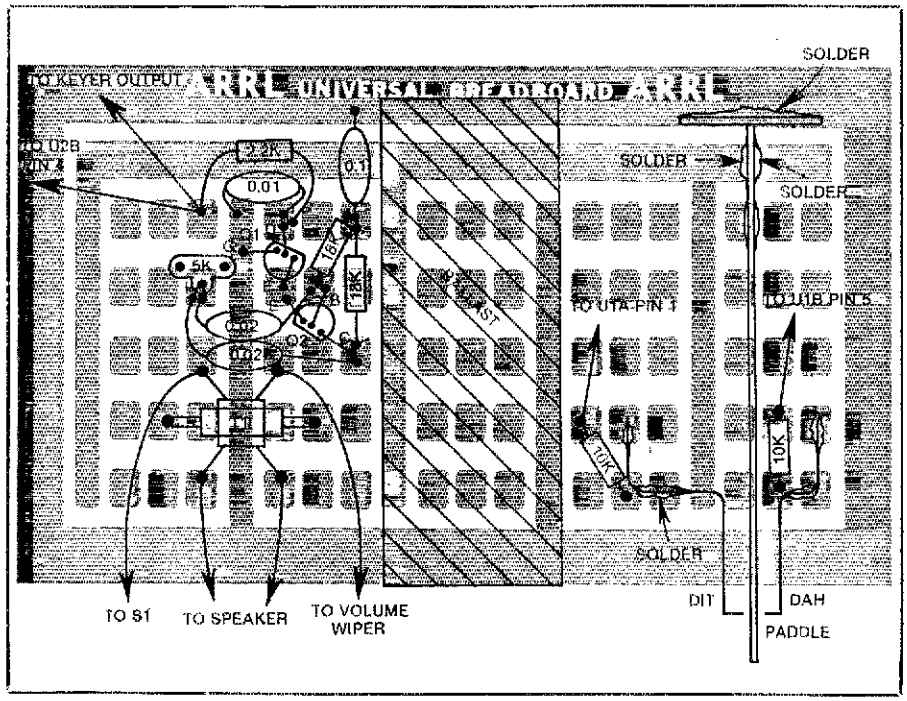


Fig. 4 — Parts-placement guide for part of the keyer. Parts are mounted on the foil side of the board. Resistances are in ohms; k = 1000 and M = 1,000,000. Capacitors are in microfarads. The etching pattern for this board appears on page 47 of September 1979 *QST*.

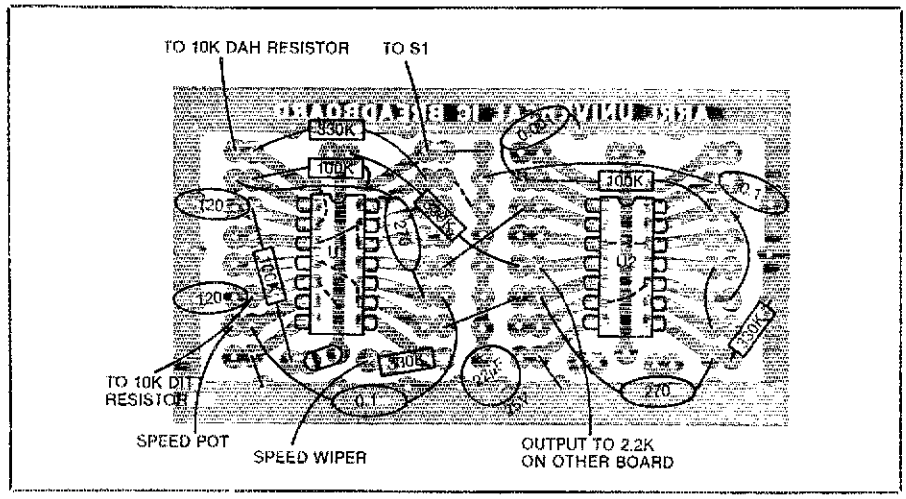


Fig. 5 — Parts-placement guide for IC breadboard of keyer. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. (The etching pattern appears in the "Hints and Kinks" section of this issue.) Resistances are in ohms; k = 1000 and M = 1,000,000. Capacitors with whole-number values are in picofarads except those with polarity shown, which are electrolytic with values in microfarads. Capacitors with decimal-value numbers are in microfarads. Unmarked lines indicate insulated wire jumpers. Broken lines indicate jumpers on foil side of board.

TO Message Keyer, described in February 1978 *QST*.[2] This circuit can be adapted to either positive or negative keying by moving a jumper. Should the builder have more than one transmitter requiring different keying modes, he could substitute a switch for the jumper to facilitate moving the keyer from one rig to the other.

If you like to know what is going on in a circuit, this is covered in the appendix at the end of this article. There you'll find a brief outline of digital devices and a short and very understandable explanation of how the circuit works. For those appliance operators who think that a keyer is the neatest thing since sliced bread, plunge right on into the construction section and ignore the appendix. And you can also forget all the details that we've presented so far, because the quiz scheduled for tomorrow morning has been canceled.

Careful Does It

Construction should be straightforward; with little chance of problems if the builder keeps in mind the quirks of CMOS. Since CMOS can be destroyed by static electricity, it would be advisable to install the two ICs while in an area of low static electricity, e.g., a damp basement. We also recommend that the builder use IC sockets for the two ICs. If not, the builder should use a three-wire, grounded-type soldering iron, or at the very least clip a grounded wire to the tip of the soldering iron.

There is nothing critical about using either of the Universal Breadboards. Other techniques could easily be employed. If the Universal Breadboards are to be used, suitable parts layout is given in Figs. 4 and 5.[3] The keyer should be assembled on the two circuit boards. All leads should be double checked against the schematic. Once the builder is sure that everything is in order, the two ICs can be installed into the sockets. The builder should then apply power and make sure that the keyer is functioning properly. If the keyer is to be housed in a pc board case, as pictured in the photo, the ICs should be pulled after removing power and set aside to avoid damage during the final stages of assembly. Just make sure that you don't confuse these chips with the Pringles.

The Universal IC breadboard serves as one side panel. The dimensions for the front panel and the other side panel were given in an earlier article.[4] The paddle (if desired) is constructed of double-sided pc board material and may be any suitable shape. It is soldered to the Universal Breadboard and to another piece of pc board that is mounted perpendicular to the breadboard and to the key. (See rear-view photo and Fig. 4 for details.) The keyer contacts are made of short lengths of brass welding rod.

The large rectangular object near the center of the breadboard is ballast

material. This provides the keyer with enough weight to keep it from "walking" around the operating table while in use. The ballast is made by casting molten lead into a chamber that is constructed of double-sided pc board. If the builder is not steady of hand, it may be wise to cast the ballast before the electronic parts are mounted — *or substitute some less dangerous ballast for the molten lead.* With the ballast mounted first, parts placement will be more difficult.

Now that you have participated in the NOR-Gate Break-In and found the multilegged creatures living there not so bad after all, what are you going to do? Are you going to "stonewall it" and pretend that digital circuits are over your head, or are you going to get involved in this growing facet of ham radio? P.S. Please pass the chips; I'm hungry.

Appendix

The most basic type of digital IC is the *gate*. It is the electronic equivalent of the gate on your back yard fence (it controls the flow of traffic). In the case of the yard, the gate controls the kids and dogs; in a logic circuit, the signal levels. Even a small dog wouldn't fit through one of these gates.

One type of logic gate is the AND gate. Its output is *high* if and only if both input channels are in their high state. Fig. 6A shows the schematic symbol for an AND gate. A *truth table* for this IC is given at B of Fig. 6. A truth table describes a logic function by listing all possible combinations of input values and indicating for each of the combinations, the true output value.

Next, we have the OR gate. Its output is high when any one or more of the inputs is high. Fig. 6C shows the electrical symbol for the OR gate. Its truth table is shown at D of Fig. 6.

English would become an incredibly difficult language (some of us have enough trouble as it is) without words such as "not," which indicates a *negative* state. Digital logic is facilitated with the use of negative gates called *inverters* or NOT gates. Inverters have one input and one output. When the input is low, the output is high; conversely, when the input is high, the output is low. The symbol for an inverter is given in Fig. 6E; its truth table, Fig. 6F.

The inverter can be combined with the AND gate and the OR gate to produce two additional, highly useful gates. When an inverter is placed on the output of the AND gate, a NAND gate is produced. The output of the NAND gate is the complement of the AND gate output. That is, with equivalent levels at the inputs, the output of the NAND gate will be just the opposite of that of the AND gate. The symbol for the NAND gate is depicted at Fig. 7A. Notice that the only difference between the NAND gate symbol and the AND gate symbol is the small loop on the output of the NAND. An analysis of the truth table of the NAND gate (Fig. 7B) will further establish the relationship between the AND gate and the NAND gate.

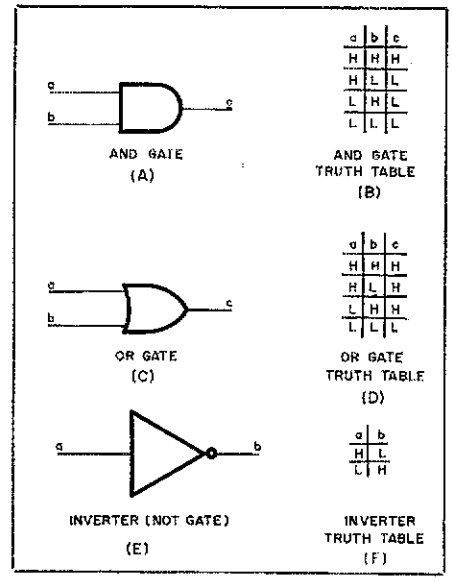


Fig. 6 — These are the logic symbols and corresponding truth tables for the AND, OR and Inverter gates.

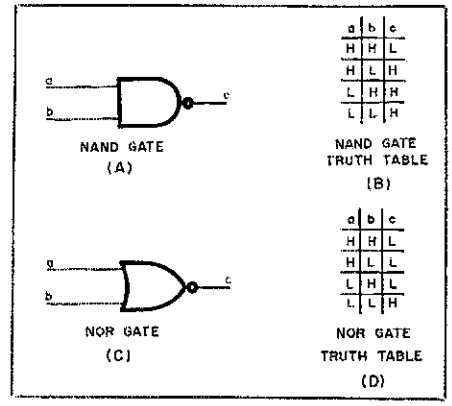


Fig. 7 — The symbols and truth tables of the NAND and NOR gates indicate the effect of combining a gate with an inverter.

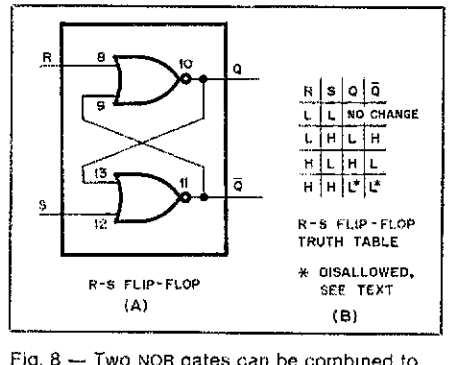


Fig. 8 — Two NOR gates can be combined to produce an R-S flip-flop. Once wired together in this fashion, the flip-flop can be considered a "black box" itself.

Just as the AND gate can be inverted, so can the OR gate. An OR gate with an inverter on the output becomes a NOR gate. Again, to indicate that the basic function has been inverted, a small loop is placed on the output of the OR gate to indicate that it is a NOR gate (Fig. 7C). The truth table of the NOR gate (Fig. 7D) compared with that of the OR gate indicates the complementary nature of these two gates.

These five basic gates are referred to, in general, as combinational logic. That is, any changes that are introduced are carried out immediately. However, these gates can be combined in such a fashion as to produce circuits that are known as sequential logic. Sequential logic has the ability to store information and hold it for processing during the next (or later) cycle. The simplest form of sequential logic is the R-S flip-flop.

The R-S flip-flop can be constructed from two NAND gates or from two NOR gates. Fig. 8A shows a simple R-S flip-flop using two NOR gates; its truth table is at Fig. 8B. Although this R-S flip-flop is made of two independent NOR gates, it can be thought of as a separate "black box." The S and R are the "set" and "reset" inputs, respectively. The outputs are Q and $\bar{Q}$ ($\bar{Q}$ is pronounced "Q-bar" or simply "not-Q"). The outputs are complementary — that is, when Q is high, $\bar{Q}$ will be low, and vice versa. Typically, only one of the outputs will be used in any given circuit.

If both S and R become low, then there will be no change in the outputs. That is, if Q was low before, it will remain low; if high, it will remain high. The remaining possibility is that both S and R are high — this is said to be disallowed. If both inputs are held high, there is no problem, both outputs are low. But if both inputs are only pulsed high and then go low, the outputs may assume any state. Thus there is no predictability; therefore, it is useless as a storage device. This is a problem only where the inputs are being pulsed simultaneously.

How Did We Get Here?

Digital circuitry came into its own as solid-state technology proliferated. Early in the game it became obvious that speed, power dissipation and noise immunity are the criteria that most affect the usefulness of logic devices. Speed simply refers to how long it takes an output to switch from low to high and back again. One frequently finds reference to the *upper limit* of some family of devices as being some specified number of Megahertz. This gives the user the upper limit of how many cycles from high to low to high again can be expected to occur without errors being introduced.

Power dissipation refers to the heat generated within the IC as it switches states back and forth. Excessive power dissipation can cause problems within a given circuit, e.g., the *clock* (in digital terminology an oscillator is usually referred to as a "clock") may change frequency with a change in temperature, or the device itself may self-destruct. Power con-

sumption is primarily dependent on the number of devices that are connected to the output of a given IC and the speed at which the IC is used.

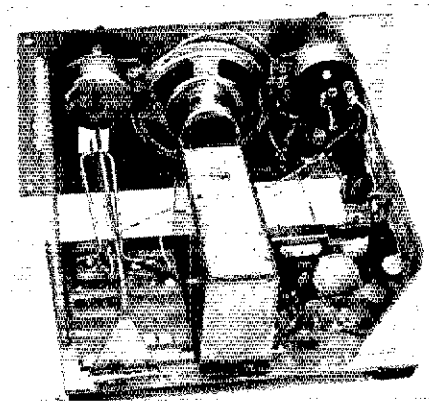
The world that we live in is filled with electrical noise. It would be difficult to design a digital circuit that could be completely isolated from the noise of the outside world. Additionally noise is generated within the digital circuit itself. Much of the noise is in the form of voltage spikes. Even though the duration of these spikes may be very short, they can play havoc with digital circuits. Noise immunity refers to the ability of a device to "ignore" the spikes and respond only to legitimate circuit signals. When a gate responds to a noise spike, it is said to have "falsed."

The first commercially available family of digital ICs was the RTL (*resistor-transistor-logic*). Although its performance was adequate for low level applications, it was soon superseded by DTL (*diode-transistor-logic*). DTL is far less susceptable to noise than is RTL. Some DTL devices are still available, but its use is not now widespread.

DTL was followed by TTL (*transistor-transistor-logic*), which has become one of two main families of logic available to today's hobbyist. The main advantage of TTL over DTL is its superior speed. Each RTL, DTL and TTL chip contains numerous bipolar transistors. Since bipolar transistors operate on the principle of control by current flowing through the base, these ICs require regulated sources of power capable of comparatively large amounts of current. The nominal operating voltage for TTL is 5 volts dc.

Another family of digital ICs is the CMOS (complimentary-metal-oxide-semiconductor). CMOS chips are made up of numerous MOSFETs that have been integrated into one small chip of silicon. Just as TTL has many of the attributes of the bipolar transistor, CMOS has many of the advantages and the disadvantages of FETs. Unlike bipolar transistors, FETs are sensitive to voltage levels. The input impedance to an FET is quite high, resulting in a low level of current flow. The net result is that FETs and CMOS operate at a very low power level. When the signal lines are quiet, the operating current of a typical CMOS chip is measured in *pico-amperes*.

CMOS tolerates a wide range of supply voltages. Where TTL is limited to 5 volts, CMOS will operate on any voltage between 5 and 15. The breakdown voltage for a CMOS gate is on the order of 50 to 90. Once the critical voltage has been exceeded, the gate is destroyed. It does not take much current, either. A person walking across a carpet may develop a static charge in excess of 1000 volts. If this static electricity is discharged through the IC, it will destroy the gate. Care should be exercised when handling a CMOS IC while it is



Rear view of keyer. Note the ballast material near the center of the main board.

out of circuit to avoid damage from static electricity.

CMOS chips may also be damaged if inserted or removed from circuits that have power and signals applied. Power should be turned off and any input should be disconnected before removing CMOS ICs from a circuit. Additionally, if a CMOS chip is to be soldered into a circuit, the soldering iron should be of the three-wire, grounded type. If only a two-wire iron is available, it can be used if it is *made* into a grounded iron. Simply run an alligator clip and a piece of wire from the tip and to a good electrical ground.

Truth in Wading

The heart of the keyer is the oscillator or clock, which is made up of U1B and U1C. The designator "U" comes from "unrepairable assembly." The "1" refers to the first IC, and the "B" and "C" indicate the second and third gate, respectively. Since we are dealing with CMOS, we are concerned with voltage levels and not with current flow. Initially, pin 5 of U1B is high, and as a result pin 4 is low. U1C is wired as a straight inverter. Since pins 8 and 9 are low, pin 10 must be high. This results in C1 being charged high, initially. However, C1 is returned to the output of U1B by the R1 in series with R2. Thus, after the time period determined by the R-C constant of C1 and the resistors, the lower side of the variable resistor, and therefore pin 6 of U1B, will become low. The oscillator will *hold* in this state until it is forced by external means to change.

The external means of change comes in the form of the dit paddle that is connected to pin 5 of U1B. Use the truth table to verify the following. When the dit paddle is grounded (low), the clock begins to oscillate and will continue so long as the paddle is low. Since pin 6 is already low, pin 4 goes high as soon as pin 5 goes low. Pin 10 of U1C goes low. C1 is now charged to the level of U1B pin 4 (high) through the same resistors as before (resulting in the same RC constant). When C1 becomes high, U1B pin 6 also becomes high, which forces pin 4 low, thus starting the cycle over again. The clock will continue oscillating until the dit paddle is released and pin 5 of U1B goes high. At that time, oscillation stops, but the circuit remains poised.

The output of the keyer is pin 4 of U2B. When the clock begins to oscillate, pin 4 of U1B goes high; this forces pin 5 of U2B high, so pin 4 goes low. This provides the keying action. Notice that the output of the keyer (pin 4) is tied back to pin 5 of U1B. If this were not done, the keyer would stop as soon as the dit paddle was released, leading to irregular dits. By depressing the dit paddle, we have made one complete dit.

How does the keyer go about making a dah that is exactly three times as long as the dit that was described? To best understand this process, those interested in wading through the schematic would do well to make an overlay to go over U2C and U2D. Fig. 8A gives the diagram of an R-S flip-flop that is made of two NOR gates. Notice that this is identical to U2C and U2D. Position the overlay over U2C and U2D such that the two NOR gates are replaced with a *box* having R (U2C, pin 8), S (U2D, pin 12) and Q (U2C, pin 10). $\bar{Q}$ is not used. This is another situation where the black box approach simplifies things a bit.

Truth tables for the NOR gate and for the R-S flip-flop will be useful in understanding the circuit operation. Pin 5 of U1B goes low through D1 when the dah paddle is depressed. This starts the oscillator, which causes pin 5 of U2B to go high, resulting in pin 4 going low. Thus far this is the same as depressing the dit paddle. When U1B pin 4 goes high, U1C pin 10 goes low, which forces U1A pin 2 low. Notice that these two gates are connected through C3. Pin 2 of U1A is also connected to +12 V through R3. Thus pin 2 of U1A is only "pulsed" low. The duration of this pulse is determined by the R-C constant of C3 and R3.

Pin 1 of U1A is also low by virtue of being connected to the dah paddle. U1A pin 3 is pulsed high; U1D is wired as an inverter resulting in U1D pin 11 being pulsed low. This places a low pulse on U2A pin 2. Pin 1 of U2A is also low because it is connected to Q of the flip-flop. Pin 3 of U2A goes high placing a high pulse on S.

Pin 4 of U1B is also connected to R through C2. When the clock started and pin 4 of U1B went high this placed a high pulse on R. The duration of this pulse is determined by C2 and the 330K resistor that allows the charge to bleed low. Because this time constant is smaller than that of C3 and R3, the duration of this pulse will be shorter than that of the pulse going through U1A and U1D.

There is a slight delay between the time that a signal appears at the input and when it shows up at the output of each gate. This time period is known as the propagation delay and is on the order of 35 nanoseconds for CMOS gates. Since the signal that comes

to S travels through four gates that the signal to R does not, the signal at R reaches the flip-flop about 140 nanoseconds (0.14 μs) before the signal at S.

The sequence of the pulses reaching the flip-flop and their duration are significant. The pulse at R arrives first, which momentarily gives a high on R and a low on S. According to the truth table, this will result in no change since these are the conditions that call for Q being low, which it already is. When the pulse arrives at S, both outputs of the flip-flop become low. The high on R decays before that on S, leaving the situation of S high and R low, which according to the truth table causes Q to go high. Q is also connected to pin 1 of U2A through a delay network consisting of R4 and the 0.001-μF capacitor. After a delay approximately three times as long as the duration of the pulse on S, pin 1 of U2A goes high. At the end of the high pulse on S, S again went low, leaving a condition of both S and R low, which left Q unchanged (high).

As the clock continues, pin 4 of U1B suddenly goes low. This causes pin 5 of U2B to go low, but since Q is high, pin 6 is also high. Therefore, pin 4 of U2B stays low. Since R is already low and since pin 2 of U1A is already high, nothing changes at the flip-flop.

When pin 4 of U1B next goes high, another string of pulses is generated. If the dah paddle is still depressed the pulse proceeds through U1A; if not, it stops at this point. R is pulsed high just as the first time that U1B pin 4 went high. R is high and S is low, which causes Q to go low. Because the delay on U2A pin 1 is about three times longer than the duration of the low pulse reaching pin 2 of U2A, these two pins do not go low at the same time. Therefore, pin 3 of U2A, and consequently S, remain low.

With R, S, Q and pin 6 of U2B low, pin 4 of U2B goes high when pin 5 goes low. This places a high on pin 5 of U1B if neither of the paddles is depressed, which stops the oscillator. If one or the other of the paddles is depressed, the output of the keyer remains high for the duration of one dit, and then the cycle starts again.

If this did not "sink in" the first time, try switching back and forth from this description to the schematic to the truth tables. There is nothing magical or "deep" about this. Once you get used to using truth tables with schematics, you will find it easy to *wade through* just about any digital circuit.

Notes

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

[2]Opal, "The Micro-TO Message Keyer," *QST*, February 1978, p. 13.

[3]Etching pattern for the Universal Breadboard appeared on page 47 of September 1979 *QST*. The etching pattern for the Universal IC Breadboard appears in "Hints and Kinks," elsewhere in this issue. See note 1 for information on ready-made boards, negatives, etc.

[4]Shuttee and DeMaw, "A Simple RF Sniffer," *QST*, October 1979, p. 16.

New Books

☐ *Audio IC Op-Amp Applications*, by Walter G. Jung, second edition. Published by Howard W. Sams & Co., 4300 West 62nd St., Indianapolis, IN 46268. Soft cover, 8-1/2 × 5-1/4 inches, 208 pages, $7.95.

Walt Jung, who's authored a number of "cookbooks" (electronic, that is), has a new offering. This one is aimed at those searching for information on how to apply op amps in audio-signal processing.

The introductory chapter discusses those IC types that are dealt with throughout the rest of the book. It points out certain types that are optimum for use in audio applications, methods of compensation, protection and layout considerations necessary for stable operation. After examining various op-amp parameters, the book explores the multitude of configurations in which the ICs may be used. Then, it's a step into practical audio circuits, equalized amplifiers and active filters. The latter should be especially of interest to those involved in designing and building their own audio filters for cw and/or ssb reception.

A variety of special-purpose audio circuits is analyzed in the last chapter. The appendix is a handy reference for names and addresses of manufacturers of the different ICs discussed as well as a data sheet on a single op amp, the 5534. The book is replete with diagrams and required formulas and each chapter contains a list of references that may be used to obtain further detailed information. — *Paul K. Pagel, N1FB*

From Spark to Satellite: A History of Radio Communication, by Stanley Leinwoll. Published by Charles Scribner's Sons. Hardcover, 9-1/4 × 6-1/4 inches, 241 pages, $14.95.

Not another dry treatise of radio, that modern wonder of wonders, you say? No. Mr. Leinwoll has presented here a comprehensive *and interesting* story. History, as the title suggests, is boring. This is the *story* of radio communications from the beginning to present, laced with anecdotes involving notable contributors to the radio art, amusing sidelights, and intimate pieces of understanding. The book begins with a chapter devoted to the Father of Wireless, Guglielmo Marconi. One is immediately taken with the spirit of adventure that must have existed, and with the spirit of competition once others realized the commercial possibilities. The book proceeds chronologically with chapters on the early days; technological developments, Continuous Waves, The Audion; "Early Regulation," "Progress and Problems;" "Broadcasting and ensuing regulation. "The Amateurs Break Through" describes amateur activity following World War I. When vacuum tubes became available, amateurs were among the first to experiment, spelling doom for spark-gap. The amateurs, of course, were relegated to the frequencies under 200 meters where they would remain "out of the way." Everyone knew that radio propagation at these frequencies was ridiculous. (Tell that to a Spratly Island DXpedition today!) Further chapters cover the advent of television, fm, radar, semiconductors and, finally, space and laser communications, with an excellent chapter, "Hams in Space," which outlines the OSCAR program. The book should be of great interest to hams wondering just where Amateur Radio has fit in to the scheme of things in the past 90 years. — *Richard K. Palm, K1CE*

☐ *Handbook of Electronic Formulas, Symbols and Definitions*, by John R. Brand. Published by Van Nostrand Reinhold, 135 W. 50th St., New York, NY 10020. Hardcover, 4-1/4 × 7 inches, 368 pages, $15.95.

This outstanding little book should be invaluable to persons who are engaged in electronics work. Radio amateurs should also be delighted with the contents, as every formula one might encounter in studying for a higher class license or during a workshop design project is contained in the book. Professional persons will no doubt want it as a constant companion which can be carried in the attache case, to and from the office. Electronics students may find this volume their most useful tool for classroom and home-study applications.

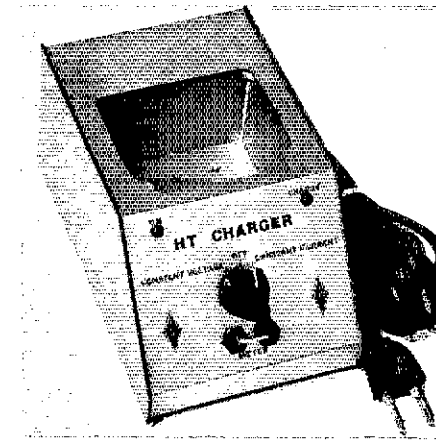
This book contains thousands of "instant access" formulas, negating the need for a vast collection of references through which to sift for needed information. An important feature of this publication is the logical order in which the data are presented. That is, each page heading contains a letter of the alphabet under which the appropriate information is found. The alphabet is presented in its normal progression from A to Z. Therefore, if the reader wanted to look up the formulas for decibels, he or she would look under page heading "D." In each example, all of the pertinent variations of the basic equation are given.

The volume also contains such data as the Greek alphabet, phase-angle definitions, transistor math (extensive), op-amp symbols, math and circuits, plus a multitude of other modern data found in no other single reference. In the reviewer's opinion this is a book that will be hard to put down after perusing its contents. The owner may discover that this neat compendium will occupy a place alongside the *Radio Amateur's Handbook*; it will be carried with the *Handbook* almost every place the owner goes! — *Doug DeMaw, W1FB*

A Deluxe NiCad Charger for Hand-Held Transceivers

Keep your NiCad batteries up to charge with this voltage-regulated unit. It's worry free and designed to maintain your transceiver ready for action.

By Robert D. Shriner,* WAØUZO



A useful accessory for the amateur who has a hand-held 2-meter transceiver is this NiCad charger designed by WAØUZO. The enclosure is made from printed circuit-board material. To charge the batteries, the transceiver is placed in the opening. The two pins visible at the bottom of the opening are the charging-voltage contact pins. See text for details.

When it became my good fortune to afford the purchase of a new 2-meter hand-held radio, I found that finances would not stretch far enough to acquire a good desk-type charger as well. Previously, I had experienced poor luck when charging NiCad batteries. Now, with a new transceiver, having a reliable means of keeping the NiCads "up to snuff" seemed more pressing. After all, I wanted to keep these expensive little rascals in good shape for as long as possible.

*1740 E. 15th St., Pueblo, CO 81001

Traditionally, if an amateur can't afford to buy ready-made gear, the alternative is to build what is needed. Rather than do without a suitable charger, I chose the construction route, opting to design a deluxe unit that would take advantage of components on hand and

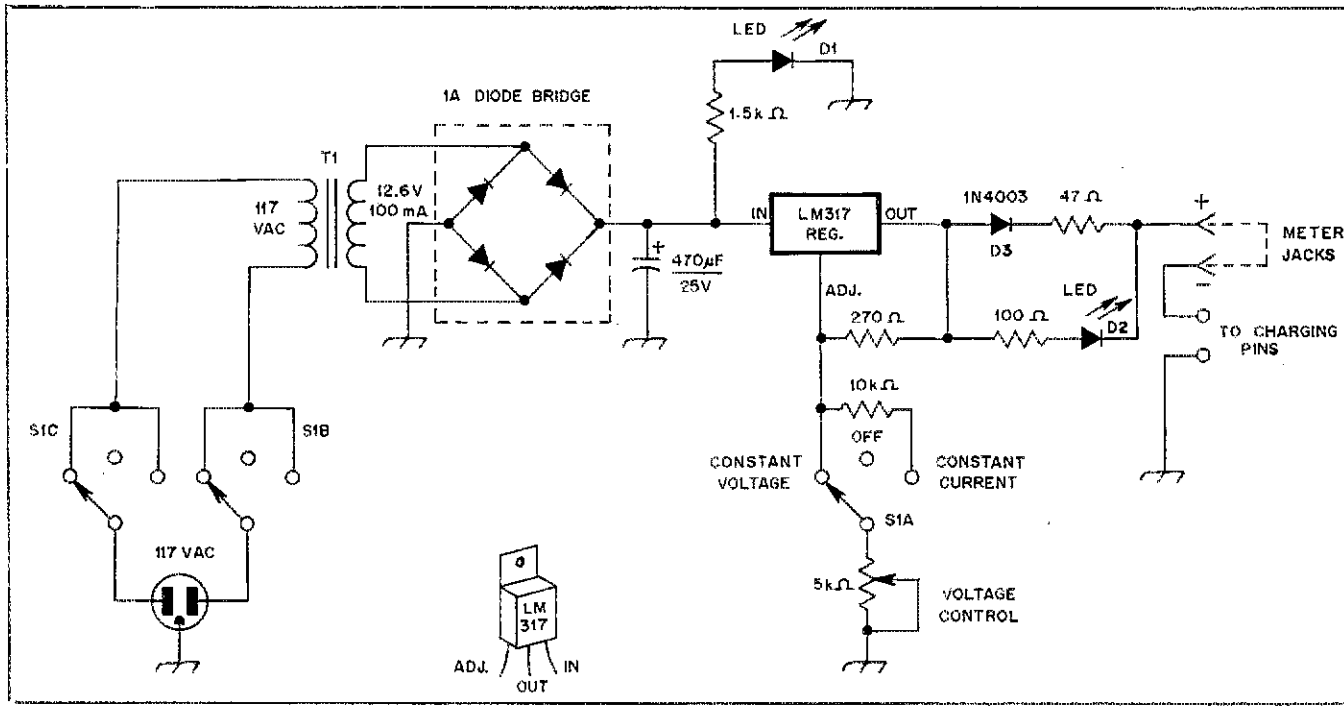


Fig. 1 — The WAØUZO charging circuit for hand-held transceivers. Proper charging of NiCad batteries is provided by this arrangement.

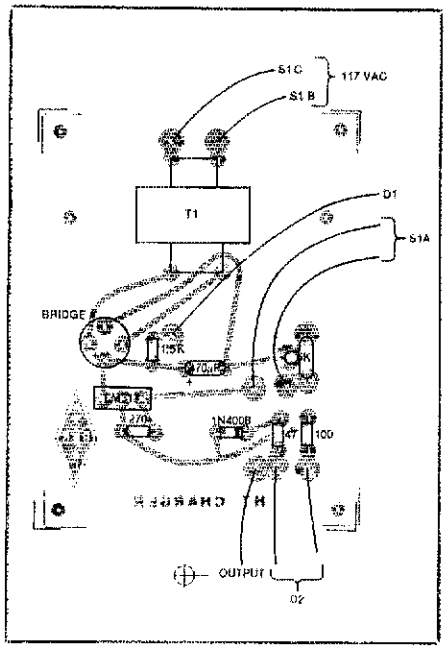


Fig. 2 — The WAØUZO hand-held radio NiCad battery charger may be constructed on perforated board or on an etched circuit board, as indicated here. This view shows the construction from the component side of the board. The shaded area represents an X-ray view of the copper pattern. (The etching pattern appears in the "Hints and Kinks" section of this issue.) Resistances are in ohms; k = 1000.

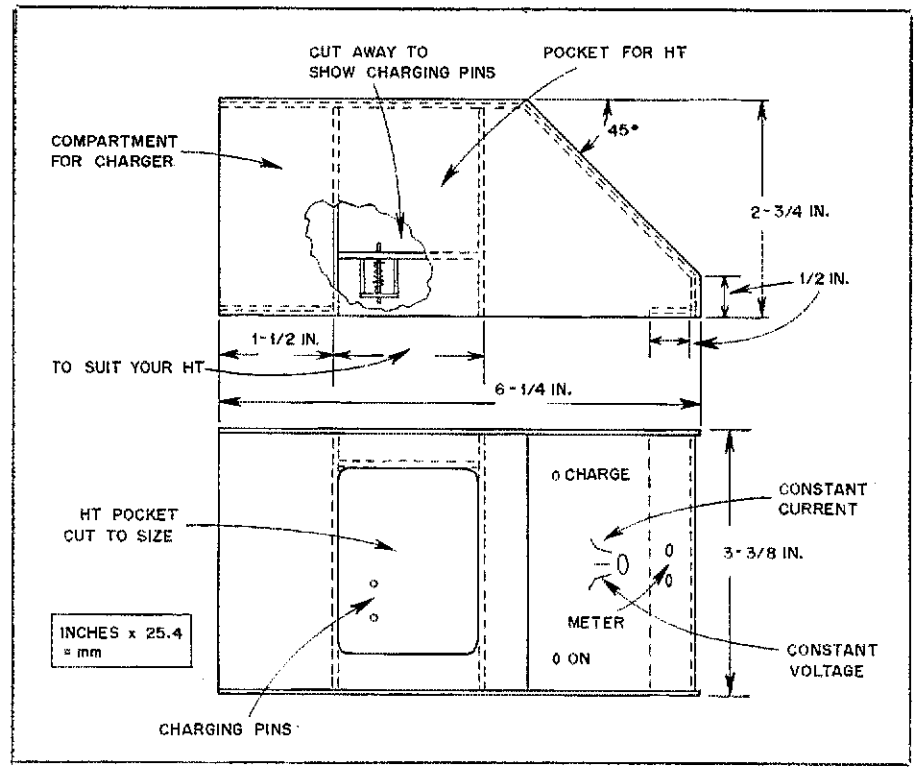


Fig. 3 — An attractive enclosure for the charging circuit can be fabricated with printed circuit-board material. Patterns for making the cabinet are shown above. The cut-away portion shows a spring-loaded pin used for connecting power to the transceiver battery circuit.

minimize the number of parts requiring purchase.

After determining my objective, I next performed some research. An analysis of information related to NiCads and charging methods disclosed that there are three popular methods of charging nickel-cadmium batteries. There is a choice of the *pulse* method, the *constant-current* method or the *constant-voltage* system. Before I go into detail about my design, let us briefly examine all three of the options.

Pulse charging is generally done with a square wave, a very good but expensive method that requires additional circuitry to control the charge. Constant-current charging, a popular way, does involve the danger of ruining a set of batteries if one forgets to shut the charger off or intentionally leaves it on longer than the recommended 16 hours. With that in mind, we arrive at the third choice, the constant-voltage system. This method will never harm your batteries. The disadvantage is that a full charge takes nearly 36 hours.

A design that combined the best features of all three methods seemed feasible. From the drawing board came the circuit shown in Fig. 1. Once the prototype was developed and tested, I found that the charger performed beyond all expectations.

The Circuit

A charging-circuit power transformer must have ample current- and voltage-handling capability for the task. T1 in Fig. 1 is a 12.6-volt unit rated at 100 mA. It has proved adequate for the purpose. Under small loads it produces 15 volts. Add a full-wave bridge to T1 and you can take full advantage of available current.

The 470-μF electrolytic capacitor at the output of the bridge rectifier smoothes out the ripples besides charging up to peak voltage. The formula for peak voltage is rms $\times$ 1.4 or 15 $\times$ 1.4 = 21 volts. That amount is available for constant-current charging. To ensure the presence of a constant voltage, the circuit contains a voltage regulator.

Pulse charging is obtained by means of the 470-μF capacitor. Under a heavy current charge, which will occur when the batteries are low, this value of capacitance will allow some ripple voltage through the system giving a 120-Hz pulse.

To prevent a reverse charge from getting into the batteries (but without sacrificing the constant current), a 1N4003 diode is in series with the output of the voltage regulator. The 47-ohm resistor serves as a limiter.

At the heart of the charging circuit is the LM-317 regulator IC. This unit of the charger deserves some explanation, particularly concerning the control capability. An LM-317 voltage regulator, rated at 1 A, will run "cool as a cucumber" under the load required for charging the NiCads. The output can be varied from 2 volts to full voltage by means of a 5-kΩ variable resistor. A 10-kΩ resistor is switched in series with the variable resistor, enabling the adjustable leg of the LM-317 to be raised far enough above ground to allow full voltage to pass through for constant current. The LED, D1, is a *power on* indicator. D2 performs as a *charge* indicator.

Construction

The circuit may be assembled on perforated board, or an etched circuit board may be used. (See Fig. 2.) After installing all parts, set S1 for constant current. A 100-mA meter should then be connected in the line to your battery. A reading of 50 mA is normal, but this will vary according to the charge held by the battery.

Next, charge the battery fully and switch to constant voltage. Adjust the

5-kΩ resistor so that a charging current of 3 mA is observed.

Now, just for the fun of it, turn your hand-held radio on. By doing so the charge rate will go up to nearly 5 mA. When a station comes on the air, you will be able to see the voice peaks on the meter as the charger automatically jumps in to replace the small amount of current used on modulation. With these adjustments completed, the charger should perform properly.

Making the Cabinet

Furnishing a suitable enclosure for the charger is next on the agenda. I resorted to the old "home-brew" method after a visit to the local supply house failed to produce a suitable cabinet. Being quite familiar with printed circuit-board material, I decided to use some for my enclosure. The accompanying photographs show the cabinet parts before assembly and the finished product.

Dimensions shown in Fig. 3 will accommodate most hand-held transceivers. The width of the enclosures may have to be increased for some of the larger sets. You can cut the printed circuit-board material to the dimensions shown in the illustration or they may be purchased in precut form.[1] To prepare the cabinet parts, get your hands on a good, sharp single-cut file. In order to clean up the edges of the board material, lay a sheet of wet or dry sandpaper on a flat surface. Stand the board on edge. Rub the edge around in a circular motion on the sandpaper. Keep at it until the edges are smooth. Check for squareness as you proceed. The file is used to round the upper edges for a neat finish.

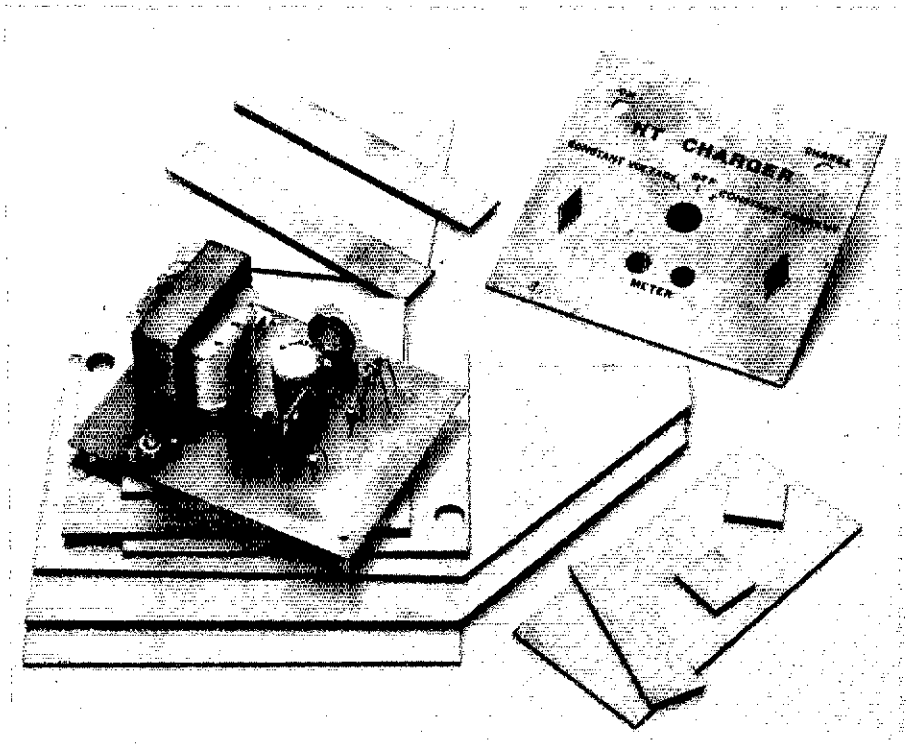
Take your time, working carefully in order to provide a professional appearance. That appearance will depend only upon the quality of your work. Lay out the hole in the top of the case for your transceiver. Allow 1/16 inch (1.5 mm) clearance for easy "drop in" of the hand-held set. The cutout can be made with a "nibbling" tool or small metal cutting saw.

File the angle on the control panel, top and front pieces. Go slowly at this point for the sake of good workmanship. After you have completed trimming the parts to fit, polish them with fine steel wool.

When preparing to solder the cabinet panels in place, a helping hand will be of much assistance. Having someone hold the panels in position will free your hands to work with the soldering iron.

Lay the front panel down on the top piece of circuit-board material, which will serve as a spacer. Position one side panel in place and have your helper hold it so that you can solder the panel in place. Be careful not to solder your helper. That could result in some knots on your head and the loss of some good help!

[1]Circuit board, material and parts kits are available from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002.



Components for the WAØUZO NiCad charging unit are shown mounted on a printed circuit board. The precut panels used for making the cabinet are also displayed.

Place the other side of the cabinet in position and tack it in place. Next comes the top piece. Again, use the piece of circuit-board material for a spacer with the top piece laid on it. Position the assembly. Check the fit. Tack solder the work as needed and proceed to tack on the short front piece. Continue to work slowly. Use a bit of common sense while assembling these parts. Avoid working yourself into a blind alley!

If all has gone well, then fit in place the two spacers that will form the pocket for the hand-held radio. Tack them with solder. Now position the two sides of the pocket, using the general procedure mentioned above.

At this point, stop to look over your work. If any parts fail to fit properly, a little solder wick will aid in the removal of solder so that the offending piece can be removed and dressed down. Once refitting is accomplished, run a bead of solder along the full length of all seams.

The Final Touches

Most hand-held transceivers are equipped with a pair of contact buttons on the bottom of the cabinet. These are for charging the NiCad batteries with a desk charger. If your set lacks this feature, I suggest that you install a pair. Providing the charging contacts is the most difficult part of the project. A study of your "HT" will show the best place for them. Just make sure that they are recessed a little so that a short will not occur if the transceiver is placed on a metal surface.

Select the piece of circuit-board material that will form the bottom of the pocket. Mark the location of the charging pins. Fig. 3 illustrates the method I used to make these pins. Cut the copper foil around the positive pin to provide insulation.

Apply your own ingenuity to make these contacts, if you wish. The contacts should be spring loaded and the positive pin must be insulated from ground. After these are made and installed on the board material, position the piece so that the contacts will fit in the transceiver without the possibility of developing a short.

Polish the case with fine steel wool and apply a coat of polyurethane varnish. Most hardware stores have this in easy-to-use spray cans.

Once you assemble the charging unit in your enclosure, your work is done. Note that a set of jacks is provided on the front panel for metering the charging rate. Normally, a shorting bar is placed across these jacks when a meter is not connected to the unit. The LEDs are held in place by a drop of epoxy cement.

If you need a charger or are not satisfied with the one you have, construct this circuit. Several of them have already been made in my local area. Each one performs nicely. I believe it is the best. No doubt you will agree. QST

The Half Sloper — Successful Deployment is an Enigma

That new leaning-wire DX chaser you've installed may be the "in" thing, but VE2CV puts a new slant on the sloper that may change your thinking about it!

By John S. Belrose,* VE2CV

The so-called half-sloper antenna seems to have reached its heyday. Bill Orr, W6SAI, for years has lauded the performance of slopers. George Smith, W4AEO, writing in *73 Magazine,* has discussed both full- and half-sloper antennas. Dana Atchley, W1CF, and Doug DeMaw, W1FB, have recently published their comments in *QST*.[1-6]

An antenna of this configuration consists of approximately 1/4 wavelength of wire that slopes from the top of a tower. An angle of 45 degrees between the wire and ground level is considered appropriate. Termination of the far end of the antenna may be placed from 5 to 15 feet (1.5 to 4.6 meters) above ground. The general practice is to feed the antenna with 50-ohm coaxial cable, the center conductor of which is connected to the antenna and the sheath connected to the tower at a position adjacent to the feed point. Some amateurs tape the cable to the outside of the tower, but others prefer to pass the cable through the center of the tower in an effort to minimize any effect of the radiated field on the transmission line.

Among the many radio amateurs who have slopers, there are those who claim that a perfect match has been attained by employing a sloping wire cut to the traditional length for a 1/4-wave radiator but shortened 5%. Others have found that the wire had to be 8% longer than 1/4 wavelength. Still others have found that with a tower shorter than 1/4 wavelength, the radiator had to be considerably shorter than a 1/4-wave antenna. Bob Lunsford, formerly WB4DPG/5, found that the best match is obtained when the end of the antenna is parallel to the ground and close to the earth for some distance.[2] From all this, one must infer that there does seem to be a problem in regard to resonating and matching the impedance of the antenna.

Concerning performance, some amateurs have reported good results with this type of antenna. Others have been unable to make it work or became discouraged when they failed to make it resonant. The azimuthal and elevation patterns for the antenna are unknown. In some descriptions of the half sloper, the tower is thought to be like a reflector, providing some directionality to the azimuthal pattern. Most amateurs who have used the antenna agree that it should be a good radiator because the current maximum is generally in the clear, being at the top of the radiator rather than appearing near the bottom, as would be the case with a 1/4-wave vertical antenna.

Although the author of this article has not used the half sloper for 80 or 40 meters, he has modeled the antenna at 200 MHz, measured its impedance and graphed polar diagrams on a professional antenna-pattern range which is over a perfectly conducting ground plane. This article discusses these results.

Resemblance to a Delta Loop

A half-sloper antenna and the image on the ground plane are shown diagramatically in Fig. 1. It is clear that if the antenna were fed at the far end, with the sloping wire connected to the top of the tower, the radiator would indeed be a half delta loop (the other half for full-wave resonance is the image of the antenna in the ground plane). The antenna, however, is fed at the top of the tower with the far or lower end open-circuited. It must radiate, therefore, like some form of bent grounded 1/2-wave radiator or perhaps like a top-fed, top-loaded vertical radiator. Previous users of this antenna have considered it to be of the former type.

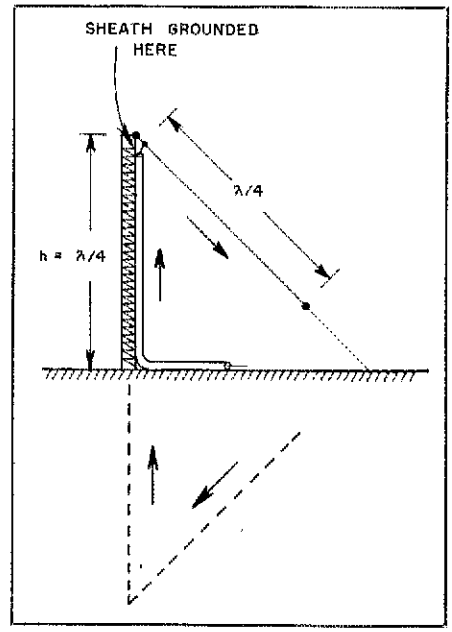


Fig. 1 — A half-sloper antenna showing method of feed and the ground image. The arrows show the instantaneous direction (phase) of current flow on the antenna and its image.

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[1]References appear on page 33.

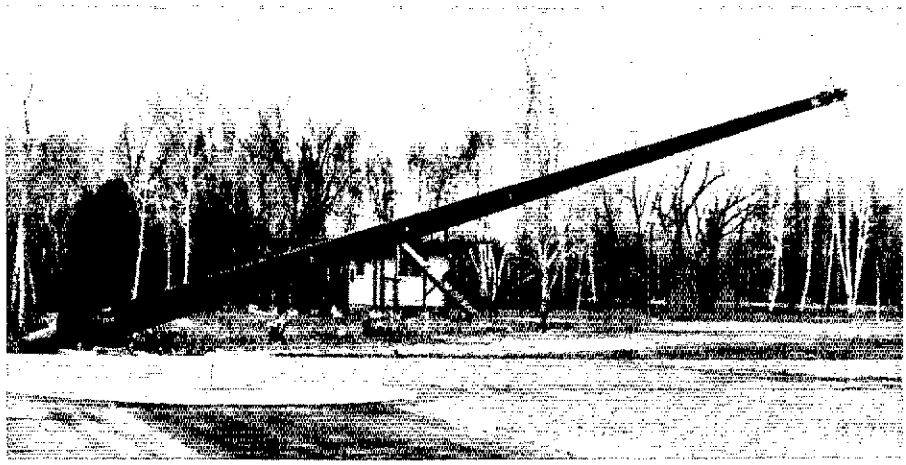

Fig. 2 — Photograph of antenna-pattern range showing boom for measuring vertical pattern, and flush-mounted turntable for measuring the azimuthal pattern.

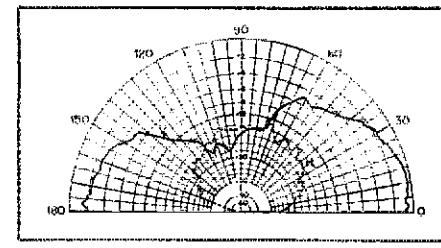

Fig. 3 — The solid line (V) represents the vertical pattern for vertical polarization measured in the plane containing the sloper and the tower. A graphical representation of the vertical pattern for horizontal polarization measured in the plane perpendicular to that containing the sloper and the tower is shown by the dashed line (H).

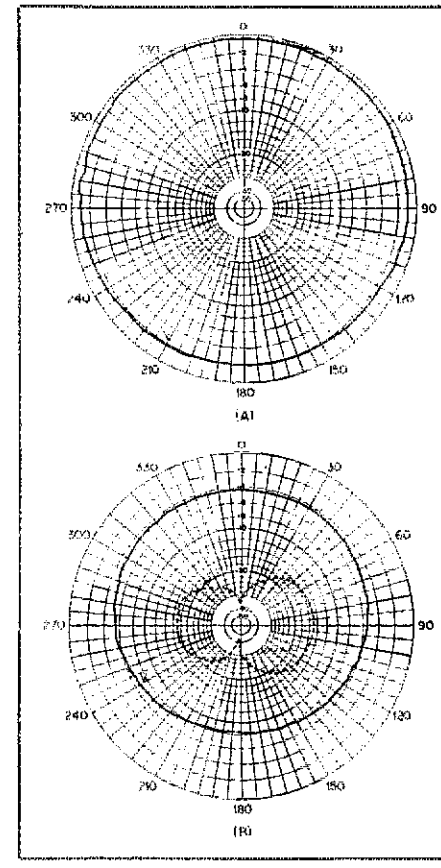

Fig. 4 — Azimuthal patterns for vertical polarization measured at elevation angles of 10° and 45° above the horizon are shown by solid lines in A and B, respectively. A figure-eight azimuthal pattern for horizontal polarization measured at 45° elevation is represented by the dashed line in B.

The sloper the author built was 1/4 wavelength long, calculated by the usual formula for wire antennas in which there was an allowance of 5% for shortening from a free-space quarter wavelength. The tower is physically 1/4 wavelength high. In order to obtain a repetition of the antenna feed-point impedance at the transmitter end of the transmission line, the transmission line was 3/2 waves long.

Tests disclosed that the antenna did not resonate at the design frequency (200 MHz). Measurements indicated the impedance to be 150 + j190 ohms. None of the adjustments of the antenna parameters (height of the tower or length of the sloping wire) resulted in obtaining resonance. Next, the configuration was changed so that the coaxial cable passed upward through the center of the tower. Little difference was found. Obviously, since the antenna would not resonate when driven from a transmission line of random length, the apparent impedance could be anything, depending on the electrical length of the line. This seems to agree with the results of other amateurs.

The Polar Diagrams

Data for the polar diagrams shown in this article were obtained from measurements made on a professional antenna range. This ground-level pattern range is 70 feet wide by 200 feet long (21.4 × 61 m). It is laid out in the form of a wire grid at one end of which is a copper-clad, flush-mounted turntable that is 20 feet (6.1 m) in diameter.

The model antenna was placed at the center of this rotatable part of the test range. A counter-balanced boom at one edge of the range can be swung overhead to measure the vertical pattern for either vertical or horizontal polarization (see Fig. 2). We did not attempt to match the impedance of the sloper. Therefore, the relative gain with reference to a monopole, for example, was not measured.

Our sloper radiated essentially like a grounded-monopole vertical radiator. The radiated field was dominantly vertically polarized and the azimuthal pattern was essentially omnidirectional. The horizontally polarized component, which is maximum in the plane broadside to that containing the sloper, was 10 dB down from the vertically polarized field.

Various measurement patterns are illustrated in Figs. 3 and 4. In Fig. 3, we show the vertical pattern for vertical polarization measured in the plane containing the sloper and the tower; and the vertical pattern for horizontal polarization measured in the plane perpendicular to that containing the radiator and the tower. In Fig. 4, we show the azimuthal pattern for vertical polarization at elevation angles of 10 degrees and 45 degrees above the horizon. The azimuthal pattern for horizontal polarization at 45 degrees elevation (Fig. 4) shows that for horizontal polarization, the field is maximum in this direction. In Fig. 4 the sloper and tower are aligned along the 0- to 180-degree axis.

Discussion

In view of the foregoing, the questions I ask myself are: (1) What does the antenna have going for it? Personally, if I had a single, grounded 1/4-wave tower, I'd employ a full-wave delta loop, apex up, lower corner feed — the best DX-type antenna I've modeled. But that is another story. An alternative is to excite the tower as a folded unipole or as a half delta loop. (2) How were the users of the antenna able to get a good match when the impedance differs so markedly from that of the 50-ohm feed line? Undoubtedly, therein lies the explanation of the difficulty many amateurs experienced when attempting to resonate the antenna. Doug DeMaw's note reveals that indeed the input impedance is probably high. He found that when the feed point became covered with ice the antenna was rendered useless. The SWR reading was full scale under those conditions.

George Smith, W4AEO, suggested grounding the sloping wire to the tower and end feeding the lower end of the sloping wire. He points out that by doing so one could avoid installing cable from the bottom to the top of the tower, an expense- and labor-saving advantage. Indeed, if we visualize this method of feed (refer to Fig. 1), we can see that the anten-

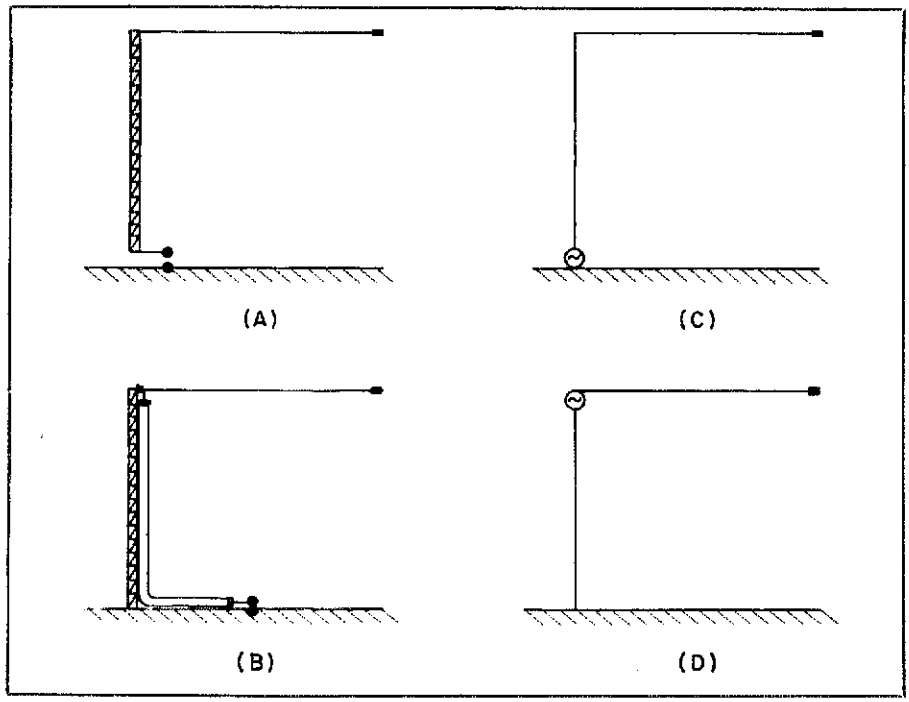

Fig. 5 — Actual and equivalent circuits for base-fed (A and C) and elevated feed (B and D) L-type antennas.

na type is clearly a grounded vertical half-delta loop (the loop is full-wave resonant since the other half of the loop is formed by the image in the ground plane).

What do we conclude about performance? Doug DeMaw has made glowing claims about the performance of his 40-meter sloper; for him, in fact, the antenna does work mighty well. Doug previously used a half-wave (a full-sloper) antenna. I have not used the half-wave sloper but had thought it to be a good one. If it is an effective radiator, then I believe the 1/4-wave sloper cannot be 10 to 20 dB better. So we haven't entirely resolved the enigma of the sloper.

Further experiments with the antenna, after we completed the antenna-pattern measurements, included measurement of the SWR over a very wide frequency range For this purpose, we used a sweep-frequency signal generator, an SWR bridge and an oscilloscope display. Curiously enough, the antenna was found to be resonant at a frequency very much lower than any for which we had previously made impedance measurements. The antenna resonated at 134 MHz and near 283 MHz rather than at 200 MHz. This suggests that the antenna is, in fact, a type of top-loaded vertical monopole. It further indicates that users of this antenna should be aware that the operating frequency is above the self-resonant frequency of the antenna by a factor of about 1.5.

This interpretation is made clear in Fig. 5, where we show actual and equivalent circuits for (A) a conventional insulated-base, base-fed antenna and (B) an antenna, like the half sloper, with elevated feed (fed with coaxial cable at the top of the mast). The equivalent circuits are shown in (C) and (D) respectively; i.e., the feed arrangement shown in (B) is equivalent to inserting the generator between the mast and the top loading. The half sloper is an L-type antenna in which the upper arm is sloping instead of being horizontal. More exactly, it is an umbrella-type radiator in which the "active guys" have been reduced to one.

In conclusion, I do not recommend the use of this antenna. The radiator is nonresonant for frequencies near those expected. The pattern is essentially omnidirectional. This same pattern can be obtained by using a more sensible arrangement of feeding a grounded quarter-wave tower, such as converting it into a folded monopole or a half-delta loop.

Acknowledgements

The author wishes to express his thanks to L. R. Bode of the Communications Research Center, Department of Communications, Ottawa, who built the model antenna and measured the impedance. Appreciation is also extended to J. G. Dunn who measured the antenna pattern on the National Research Council's antenna-pattern range. QST

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[1]Orr, "Antennas" *CQ Magazine*, September 1975, pp. 41-44. The author describes an 80-meter sloper antenna built by W6MZ.
[2]Orr, *CQ Magazine*, February 1976, pp. 46-48.
[3]Orr, *CQ Magazine*, February 1976, pp. 44-46.
[4]Smith, "Shortened Antennas for 75 and 80 Meters Which Fit Your QTH — Slopers Exposed," *73 Magazine*, July 1979, pp. 58-64.
[5]Atchley, "Putting the Quarter-Wave Sloper to Work on 160," *QST*, July 1979, pp. 19-20.
[6]DeMaw, "Additional Notes on the Half-Wave Sloper," *QST*, July 1979, pp. 20-21.

Strays

MOVING? UPGRADING?

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

ED REDINGTON MEMORIAL SCHOLARSHIP

☐ An Ed Redington Memorial Scholarship has been established in honor of W4ZM. Contributions from his many friends have been coming in to the Washington, DC, Foundation for Amateur Radio. Funds are already available to provide scholarships for at least the next two years.

Ed, one of the best known and best loved of the old-timers, was known coast to coast for his talks about the old days and his demonstrations of an operating spark-gap transmitter. His passion was helping young people get on the air.

To establish a sustaining fund, a substantial amount of money will be needed. Won't you help us reach that goal? Donations in any amount will be most gratefully accepted and acknowledged. Send contributions to: Foundation for Amateur Radio, Ed Redington Scholarship Fund, c/o Mr. Kenneth L. Joseph, W4SIG, 9416 Hermosa Dr., Fairfax, VA 22030. — *J. William Miller, K4MM, Fairfax Station, Virginia*

OPERATORS NEEDED FOR THE ASTEROID-INTERCEPT NET

☐ Precision phone operators, to become part of the new Asteroid Intercept Net, are wanted in the following cities: San Angelo, San Antonio, Austin and Dallas, Texas; Oklahoma City, Oklahoma; Shreveport, Louisiana; Little Rock, Arkansas; Kansas City and St. Louis, Missouri; Huntsville, Alabama; Jacksonville and Tampa, Florida; Atlanta, Georgia; and Washington, DC. Hams in other cities along the path of the upcoming asteroid occulation (eclipse) may also be needed. Contact William R. Shoots, K5BY, 709 Ballentine St., Seabrook, TX 77586. Only queries accompanied by an s.a.s.e. can be answered. — *William R. Shoots, K5BY*

Technical Correspondence

Conducted By
John C. Pelham,* W1JA

CONVERSION OF SURPLUS RELAYS TO OTHER OPERATING VOLTAGES

☐ Do you happen to have some old 28-volt relays in your junk box, and at the same time have a need for relays for 12-volt mobile operation? I did, and decided to rewind one of the relays to operate on 12 volts. Here is how a replacement winding can be designed.

The pull of the armature is determined by the magnetic flux produced by the coil current, and this flux is proportional to the number of turns times the current, or NI. To operate the relay at another voltage, we must rewind the coil so that the new voltage will supply the original magnetic flux.

If we use wire of twice the original diameter for the new winding, we would get half the number of turns per layer and half the number of layers — 1/4 the original number of turns and 1/4 the original length of wire. In general, $L \propto 1/d^2$ and $N \propto 1/d^2$, where d is the wire diameter, N is the number of turns and L is the total length of wire. (The symbol $\propto$ means "is proportional to.")

The resistance of the winding is proportional to its length and inversely proportional to the square of the diameter: $R \propto L/(d^2)$. Since $L \propto 1/d^2$, it follows that $R \propto 1/d^4$.

From Ohm's Law, the relay current is equal to E/R where E is the applied voltage. Therefore $I \propto Ed^4$. Since $N \propto 1/d^2$, the ampere-turns (NI) of the relay is $NI \propto (1/d^2)\,(Ed^4)$, or $NI \propto Ed^2$. This means that the quantity Ed^2 must be the same for the new winding as for the original winding. Mathematically, $E_1 d_1^2 = E_2 d_2^2$, where the subscript 1 refers to the old winding and the subscript 2 refers to the new winding. This may be rewritten as

$$\frac{d_2}{d_1} = \sqrt{\frac{E_1}{E_2}}$$

This is the equation we need for choosing the wire size for the new winding. There is no need to know the dimensions of the winding space, the number of turns on the original winding, or the length of the wire. Just measure the diameter of the old wire, calculate d_2, look up the nearest corresponding wire size, and fill the winding space with wire of that size!

Since $I \propto Ed^4$ and since the power dissipated in the coil is $P = EI$, we have $P \propto E^2 d^4 = (Ed^2)^2$. Since we have kept Ed^2 constant, the power dissipated in the new coil will be the same as the power dissipated in the original coil, so our conversion will not cause overheating.

As a practical example, let's consider the conversion of a 28-volt relay for nominal 12-volt operation. From Eq. 2 we find that d_2/d_1 should be 1.53 for 12-volt operation and 1.42 for 13.8-volt operation. The diameter of the original wire on my relay measured 4.5 mils (0.114 mm). Allowing a little for the enamel, it must have been no. 38 wire (copper diameter of 4.0 mils or 0.102 mm). Thus, I needed to choose

$d_2 = 4.0 \times 1.53 = 6.12$ mils (0.155 mm) for 12 volts or

$d_2 = 4.0 \times 1.42 = 5.68$ mils (0.144 mm) for 13.8 volts.

From the Copper Wire table in the *Handbook*, no. 34 wire has a diameter of 6.3 mils (0.160 mm) and no. 35 wire has a diameter of 5.6 mils (0.142 mm). I happened to have a spool of no. 35 in the junk box. I wound and installed the new coil, and the relay worked perfectly. In fact, it would pull in for voltages less than 12, showing that a good margin of safety had been designed into the original relay and had remained in the converted model. As a check on the design equation and my winding techniques, I modified two other relays with equal success. — *Harvey W. Lance, K7IT, Route 8, Box 314-A, Tucson, AZ 85710*

DON'T BREAK THE SEAL

☐ This is a comment on the construction procedure employed in "Tune Up Swiftly, Silently and Safely," in December 1979 *QST*. I gulped when I read that the builder "ground down"

```
8 PRINT"'FROM' LOWEST RELECTION COFFICIENT";
10 INPUT U
12 PRINT"'TO' HIGHEST REFLECTION COEFFICIENT";
14 INPUT L
16 PRINT"INCREMENTED BY 'STEP' VALUES OF";
18 INPUT I
20 PRINT
30 PRINT" G3/G1  R.C.  VSWR F3DB/FAP G1,7  G3,5  G2,6  G 4"
40 PRINT" RATIO  (%)   ----  -----    (F)   (F)   (H)   (H)"
50 FOR R = U TO L STEP I
60 V=(1+R/100) / (1-R/100)
70 A=-4.3429 * LOG(1-(R/100)↑2)
80 K=(4.17↑.14286) / (A↑.07143)
90 D=.5*(K+1/K)
100 B=A/17.37
110 X=LOG((EXP(B)+EXP(-B)) / (EXP(B) - EXP(-B)))
120 Y=.5*(EXP(.071429*X)-EXP(-.071429*X))
130 G1=.44504/Y
140 G2=.554956/((Y↑2+.188255)*(.44504/Y))
150 G3=2.24698/((Y↑2+.611261)*G2)
160 G4=3.603876/((Y↑2+.95048)*G3)
180 A$=" #.###  ##.## #.### #.###  .#### #.### #.### #.###"
185 PRINT USING A$;G3/G1,R,V,D,G1,G3,G2,G4
190 NEXT R
```

```
10 CLS : PRINT : PRINT : INPUT"FROM";U
20 INPUT"TO";L : INPUT"STEP";I : CLS : PRINT
30 PRINT" G3/G1  R.C.  VSWR F3DB/FAP G1,7  G3,5  G2,6  G 4"
40 PRINT" RATIO  (%)   ----  -----    (F)   (F)   (H)   (H)"
50 FOR R = U TO L STEP I
60 V=(1+R/100) / (1-R/100)
70 A=-4.3429 * LOG(1-(R/100)[2)
80 K=(4.17[.14286) / (A[.07143)
100 D=.5*(K+1/K) : B=A/17.37
110 X=LOG((EXP(B)+EXP(-B)) / (EXP(B) - EXP(-B)))
120 Y=.5*(EXP(.071429*X) -EXP(-.071429*X))
130 G1=.44504/Y
140 G2=.554956/((Y[2+.188255)*(.44504/Y))
150 G3=2.24698/((Y[2+.611261)*G2)
160 G4=3.603876/((Y[2+.95048)*G3)
180 A$=" #.###  ##.## #.### #.###  .#### #.### #.### #.###"
185 PRINT USING A$;G3/G1,R,V,D,G1,G3,G2,G4 : NEXT R
```

Fig. 1 — The upper list is a modified BASIC computer program for calculating design parameters of 7-element Chebyshev low-pass filters. The lower program is tailored for TRS-80 Microsoft BASIC.

*Asst. Technical Editor, *QST*

47-ohm resistors with a grinding wheel or hand file to obtain the needed 50-ohm value.

The only protection that carbon resistive material has against the disastrous effects of moisture is the specially formulated and specially applied hermetic-type covering. With this seal broken, all the production care of the manufacturer has gone down the drain. When accurate or matched-resistance values are needed, this technique may serve as a temporary aid — measured in hours. Beyond that, it would be safer to use run-of-the-mill 20% tolerance resistors. Sealing the body with a dense epoxy may lessen the absorption rate, but one must remember that moisture is devilishly persistent. — *C. Dale Peterson, N8AJV, Lock Box 7, Kearsarge, MI 49942*

AN IMPROVED BASIC PROGRAM FOR LOW-PASS FILTER DESIGN

☐ It is pleasing to see *QST* increasingly cognizant of the applications of computers to Amateur Radio. The article by Wetherhold in December 1979 *QST* appeared to be an excellent one. The inclusion of a BASIC-language computer program was in theory very helpful, but in reality almost useless because the BASIC dialect used is extremely rare and specialized. I'd guess that very few readers of *QST* will be able to make the program run because of its highly specialized coding.

I've modified the program so it will run on most computers that support BASIC at the LOG, EXP and PRINT USING level. It is given in Fig. 1A. In Fig. 1B is a "quick and dirty" version specifically tailored to Microsoft BASIC as implemented on the Radio Shack TRS-80.

Keep up these fine articles with more use of the computer as an aid. We've barely scratched the surface. — *Dr. David A. Lien, W6OVP, 8662 Dent Dr., San Diego, CA 92119*

☐ I am grateful to Dr. Lien for taking the time to write, and I will defer to his expertise regarding the BASIC dialect I used — it no doubt is rare. His guess that very few readers of *QST* will be able to make the program run may be true, but he makes the assumption that a reader is not capable of making the minor changes that are necessary to make a program that will run. My intent in providing the program was to document the equations (lines 60 to 160) so the reader could take these equations and apply them to whatever program language he is most familiar with. This is what Dr. Lien did, and I expect that others will do the same. — *Ed Wetherhold, W3NQN, Honeywell, Inc., P. O. Box 391, Annapolis, MD 21404*

MICROCOMPUTER RFI ADDENDUM

☐ In my article, "Microcomputers and Radio Interference," March 1980 *QST*, an erroneous statement occurred on page 18, the second paragraph in column two. Concerning radiation from internal leads, the Radio Shack TRS-80 does only *reasonably* well in this respect. Radio Shack has made several versions of the CPU board, and lead radiation depends on which board one has.

Radio Shack has recently been using a different keyboard assembly on a metal plate, which opens the possibility of much better shielding of the unit. I just recently obtained one of these units, lined the plastic enclosure with heavy-duty refrigerator foil (cutting out the vents), and grounded the keyboard mounting plate to the foil at several points. This makes a good scheme to reduce RFI, but not too many of these units are in the field. Such modification also voids the guarantee!

Macrotronics has introduced the M-800 terminal software, which is much improved over the M-80 mentioned in my article. I worked with this version in its formative stages, and the same ideas apply as far as RFI reduction is concerned. There are at least two new systems about to be introduced by other manufacturers. The newly introduced Atari microcomputers are the first in a new generation of machines which the FCC has forced to be designed for minimum electromagnetic interference. They are at least an order of magnitude better in this respect. — *Paul E. Cooper, N6EY, P. O. Box 324, Carmel Valley, CA 03924*

Q&A CORRECTION

☐ The newly released *Advanced/Extra Q&A Book* should be a helpful study aid for those hoping to upgrade their licenses. However, two questions in the advanced section have an unfortunate combination of typographical and conceptual errors that may confuse some readers. In Question 107, the notion of ac power is misused. Power has meaning only when averaged over at least one complete cycle. For a sinusoidal signal, the power is the product of the rms voltages and currents. Peak power has no real meaning in this context. The word "peak" should be deleted from Q. 107. The power dissipated by the resistor is, of course, 1 watt.

When the amplitude of the wave varies from cycle to cycle, as in a-m, *peak* power is the product of the rms voltage and current in the cycle having the greatest amplitude. While it can be shown that a signal having nonuniform amplitude from cycle to cycle is not a sine wave, the variation is gradual in a-m radio emissions, and the peak power can be computed as if each cycle were sinusoidal.

When analyzing amplitude-modulated waves it is convenient to speak of the *envelope* of the signal as seen when an oscilloscope is adjusted to display *many* cycles of rf. Peak envelope power (PEP) is defined just like peak power in the preceding paragraph. PEP *input* is difficult to measure — a transmitter's meters won't register it, although a scope connected across a sense resistor in the B-minus lead might do the trick. It's easy to measure PEP rf *output* across a known load resistance, though. An oscilloscope will display the peak envelope voltage. Since the modulating frequency is low compared to the carrier frequency, the amplitude difference between one rf cycle and the next is small, so the sine-wave formula, rms = $pk/\sqrt{2}$, can be used. To compute PEP, take the highest visible rms voltage, square it, and divide by the load resistance.

When an ssb envelope is composed of several equal-amplitude tones (the two-tone test is used to establish linearity and power capability), the individual tones can be viewed on a spectrum analyzer. The vertical scale of the analyzer is calibrated in *power*, so the level of each tone can be read out in watts.

Here's how to compute the PEP of a signal composed of several equal-amplitude tones: $PEP = (E_{max(rms)})^2/R$. E_{max} is the sum of the individual tone voltages. The rf envelope voltage reaches this value whenever the peaks of the individual sine waves coincide. For n equal tones, $E_{max} = nE_{(rms)}$, where $E_{(rms)}$ is the voltage of a single tone. The PEP, then, is $(nE_{rms})^2/R$, which is $n^2(E_{rms})^2/R$. Since $(E_{(rms)})^2/R$ is the power in a single tone, we can say $PEP = n^2P$, where P is the power in one tone.

A simple example will illustrate the use of this formula. Suppose we have three tones, each developing 4 volts rms across a 2-ohm load. The power in each tone is $4^2/2 = 8$ watts. The PEP is $3^2(8) = 72$ watts. The average (heating) power of the composite signal is simply the sum of the individual tone powers, which in this case is 24 watts. Mathematically, $P_{average} = nP$. Since $PEP = n^2P = (n)nP$, the peak-to-average ratio is n. From this we see that for a single-tone emission (such as cw) the PEP and rms powers are equal.

In Question 113, the answer should read: The PEP of a multiple-tone (equal amplitude) signal equals the rms power of any single tone times the *square* of the number of tones. Also, +30 dBm is *1 watt*, not 100 watts as printed. Why I committed these errors only Murphy knows, but it wasn't because I didn't know any better.

Some readers may be interested in the more general case, where the tones are *not* equal. Maximum envelope voltage occurs when the peaks of the sine waves coincide. For two tones having rms voltages E1 and E2, $PEP = (E1 + E2)^2/R = (E1^2 + 2E1E2 + E2^2)/R$. $E1^2/R = P1$, so $E1^2 = P1R$, and $E1 = \sqrt{P1R}$. Similarly, $E2 = \sqrt{P2R}$. Substituting these expressions in our power equation, we have $PEP = P1 + P2 + 2\sqrt{P1R}\ \sqrt{P2R}/R$. The third term can be written as $2\sqrt{P1P2R^2}/R$ or $2R\sqrt{P1P2}/R$, which becomes $2\sqrt{P1P2}$. Expressing all data in power (as does a spectrum analyzer), $PEP = P1 + P2 + 2\sqrt{P1P2}$. For three tones, the formula is $P1 + P2 + P3 + 2\sqrt{P1P2} + 2\sqrt{P1P3} + 2\sqrt{P2P3}$, and this method can be extended to any number of tones.

I hope this discussion will motivate those studying for the higher licenses to try to learn theory by understanding, and not merely rote memorization. — *George Woodward, W1RN*

Feedback

☐ The overload-protection circuit for Field Day generators described in the March "Hints and Kinks" should have shown the coil of K2 connected across the generator side of the 117-V line but still controlled by K1. DS1 consequently should be wired across the K1 contact controlling K2. These corrections will permit K2 to be properly energized and DS1 to indicate when an open circuit exists. By connecting R10 to pin 3 of U1, Q1 can be turned on as intended. Thanks to Ronald Young, W8RJL and Greg McIntire for these recommended changes. Additional protection is offered by a modification that "Ivy" Iverson, WD0BXK offers in the forthcoming July "Hints and Kinks."

☐ An omission occurred in "The WARC Warriors" (March *QST*, page 60). Mr. Gordon R. Elliott, W6CIT, is a contributor of $100 or more to the ARRL Foundation WARC Fund.

Product Review

Conducted By Paul K. Pagel*, N1FB

Kenwood TS-180S Transceiver

"Bells, whistles and features galore." That's the slogan this writer would assign to the TS-180S hf-band transceiver if a catch phrase were necessary. But the rig shouldn't need promotional gimmickry in order for the manufacturer to sell it: The Kenwood name has long been of high repute among buyers of hf-band equipment. The TS-180S appears to reflect the quality that Kenwood owners appreciate.

But what about these bells and whistles? Well, let's examine the features that are offered. First, the unit covers from 1.8 to 29.7 MHz in six bands. WWV is available (receive only), plus auxiliary band positions for operation from 2.0 to 15 MHz (any 500-kHz segment thereof), 18.0 to 18.5 MHz and 25.0 to 25.5 MHz.

This new transceiver is completely solid state in circuit design. It contains 145 bipolar transistors, 21 FETs, 33 ICs and 213 diodes. A substantially greater number of semiconductor devices are contained in the rig if the digital frequency control (DFC) module is included as an accessory. The dc input power to the transmitter section is 200 watts PEP on ssb, 160 watts peak on cw and 100 watts on fsk. The ssb and cw modes are derated to 160 and 140 watts, respectively, for 10-meter operation.

The i-f selectivity is 2.4 kHz at the −6 dB points of the response curve and is 4.2 kHz at the −60 dB points. A cw filter (YK-88C) is available as an option. It has a bandwidth of 500 Hz and 1.5 kHz at the −6 and −60 dB points of the curve. A second ssb-bandwidth i-f filter (YK-88S) can be added as an option at the output end of the i-f amplifier strip. This will greatly reduce the wide-band noise in the receiver while improving the skirt selectivity of the i-f system. The i-f strip is common to the transmitting and receiving modes. Therefore, the use of the second ssb filter enhances the characteristics of the ssb signal when speech compression is used. In other words, the additional filter helps to keep the transmitted signal narrow by virtue of improved skirt selectivity.

There are no tuning controls for the solid-state PA stage. To move from one band to another it is necessary only to adjust the band switch and peak the drive (the drive control serves also for peaking the receiver front end). The PA transistors are each rated at 250 watts. They are SRF1714s, and are made for Kenwood by Motorola. An SWR shut-down circuit is included in the design. It begins to shut off the drive to the final amplifier when a SWR of 3:1 occurs. Additionally, if the case temperature of the PA transistors rises to an unsafe level the drive is reduced automatically.

Notable is the fact that this transceiver is capable of covering the new WARC-79 allocated bands. The TS-180S internal VFO covers more than 50 kHz above and below each band, for MARS and other applications.

The transceiver is a single-conversion type. A PLL type of local oscillator is employed. Only one crystal is used in that system. The net result is a reduction in possible spurious responses,

The Kenwood TS-180S is shown here with its companion power supply. This transceiver is capable of covering the new WARC bands.

plus an improvement in frequency stability over that which is attainable with other types of local oscillators.

The manufacturer rates the frequency stability at ±1 kHz during the first hour of operation, after 1 minute of initial warm-up. Thereafter, the drift is not supposed to exceed 100 Hz during any 30-minute period after warm-up. These claims appear to have been made for the purpose of allowing a wide latitude of possible drift; the review unit was much better than the published specifications

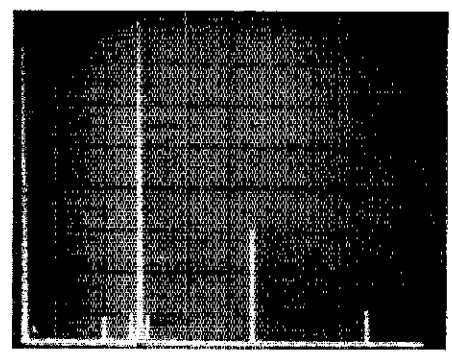


Fig. 1 — Worst-case spectral display of the transceiver at rated dc input power as observed at 28 MHz. Vertical divisions are 10 dB each. Horizontal divisions are 10 MHz each. The spurious products close to the carrier frequency are 70 dB down with respect to the operating frequency. Other spurs are down at least 50 dB.

Kenwood TS-180S HF Transceiver

Claimed Specifications

Frequency coverage: 160 to 10 meters, plus WWV and the three WARC-79 bands (see text).
Modes: Ssb, cw and fsk.
Power (dc input): 100 to 200 watts (see text).
Power requirements: 13.8 V dc (nom.) at 20 A (transmit). Can be obtained from PS-30 ac power supply.
Receiver sensitivity: 0.25 μV S + N/N, 10 dB or greater.
Audio output: Greater than 2 watts with less than 10% distortion — 4-Ω load.
Mic impedance: 500 Ω to 50,000 Ω.
Weight: 25 lbs (11.5 kg).
Size (HWD): 5-1/4 × 12-13/16 × 11-5/16 inches (133 × 325 × 287 mm).
Price class: $1150.
Manufacturer: Trio-Kenwood Corp., 111 West Walnut St., Compton, CA 90220.

*Asst. Technical Editor, *QST*

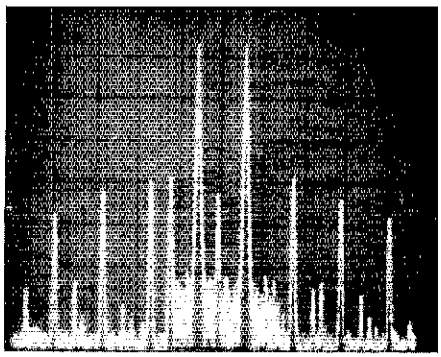


Fig. 2 — Output display of the '180S during a full-power 14-MHz two-tone test. Each vertical division is 10 dB and each horizontal division is 1 kHz. The third-order distortion products are down 38 dB from the PEP level.

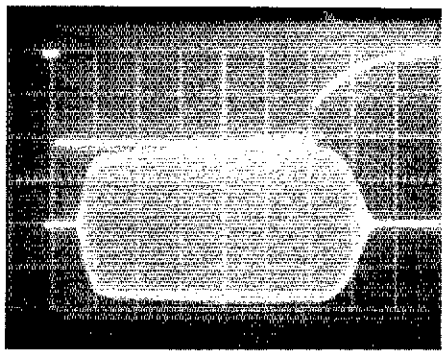


Fig. 3 — The keyed cw waveform of the Kenwood TS-180S. The horizontal divisions are each 5 ms. The upper waveform displays the actual key-down time. Such a smooth waveform should not have any clicks.

suggested. During a period of 1 hour after initial warm-up (1 minute) the maximum frequency change on 20 meters was 40 Hz.

The spectral output of the transmitter is shown in Fig. 1. It complies nicely with the FCC regulations. The 3rd- and 5th-order IMD products from the transmitter are shown in the spectrograph in Fig. 2. The distortion level is low, thereby ensuring a clean signal if the transmitter is operated in accordance with the manufacturer's instructions.

Fig. 3 shows the waveform during cw keying. On-the-air reports indicated that the TS-180S produced a clickless note that was neither "too hard" nor "too soft." Most of the solicited comments came back as, "the rig sounds excellent." Similar reports were received during ssb operation, with and without the speech processor activated. But, as is the case with all processed speech, the so-called "naturalness" of one's voice is degraded noticeably.

The usual testing ground this reviewer uses for receivers was utilized during the practical analysis of the '180S — just two blocks from the W1AW "onslaught" on 80 through 10 meters. The W1AW 10-, 15-, 20- and 40-meter beams are boresighted on the writer's QTH (at the 1-kW power level). No desensitization or cross-modulation effects were noted on any band, except when the W1FB triband Yagi was pointed toward W1AW. It then became necessary to use 20 dB of receiver front-end attenuation to clean up the weaker signals being received. It was noted during these tests (and simulated later by means of two signal generators) that the PIN diode attenuator in the TS-180S actually made the cross-modulation effects on weak signals worse than with no attenuation at all. The two-step PIN diode attenuator used in the '180S is shown schematically in Fig. 4. It is unlikely that this phenomenon would be experienced in normal amateur environments. Laboratory tests of the receiver dynamic range (based on test methods described by Hayward in July 1975 *QST*) revealed that the MDS is −139 dBm, the blocking commences at −114 dB and the IMD is 83 dB on 20 meters. For 80 meter operation the numbers are, respectively, −139 dBm, 112 dB, and 82 dB. These figures result in input intercept figures of −14.5 dBm on 20 meters and −16 dBm on 80 meters. The 500-Hz cw filter was used during these tests.

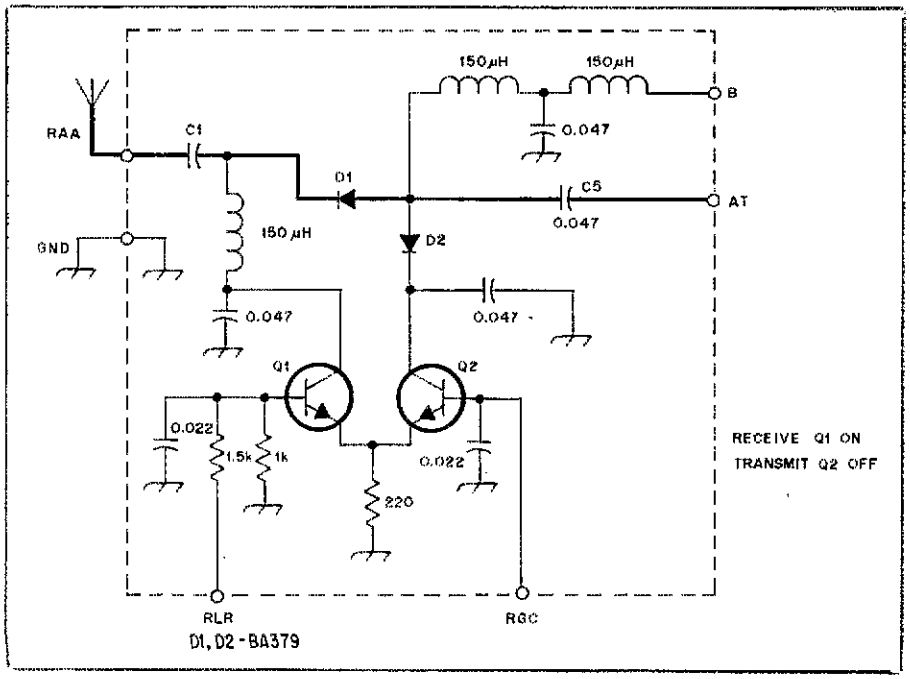


Fig. 4 — Schematic diagram of the PIN-diode rf attenuator (see text).

Other Features

The DFC module mentioned earlier in this report permits digital frequency control with four tunable memories. These memories can be used during the transmit or receive periods. Split-frequency operation can be effected by using the internal VFO and the memories, or by using an outboard VFO (VFO-180) and the memories. Frequencies from the TS-180S VFO, the outboard VFO or the "fixed channel" can be stored in the memories. Also, frequencies can be transferred between the memories. A unique feature is the memory-shift paddle on the front panel. It enables the operator to tune the memories up or down in 20-Hz steps without disturbing the initial frequencies which have been stored in the memories.

Among the access ports on the rear apron of the unit are I-F OUTPUTS 1 and 2. These are used for observing waveforms from within the circuit. There is an XVTR jack for use when attaching transverters. The ACSY (accessory) terminal permits the connection of linear amplifiers and other outboard gear. A jack is available to allow connection of an outboard receiver to the receive-antenna line in the '180S. An RTTY jack is also located on the rear of the transceiver for use during FSK operation.

In addition to the two i-f filters already mentioned as accessories, the operator can obtain the PS-30 ac power supply for fixed-station use. An SP-180 external speaker with selectable audio filters is available also. The VFO-180 and DF-180 units were discussed earlier in this report.

Instruction Manual

The TS-180S instruction manual is nicely written in clear English narrative. Detailed information is given concerning the installation of the transceiver and its accessories. A section of the manual is set aside for an explanation of how the various circuits function. This should be useful during trouble-shooting exercises. A trouble-shooting chart is provided in one section of the manual. There is even a three-page treatment of mobile operation. It provides all of the basic details for installation, antenna mounting and tune-up, plus noise reduction. Kenwood seems to have gotten away from the sometimes nebulous and confusing instruction-book passages of yesteryear. The translation from Japanese to English is excellent in this booklet. — *Doug DeMaw, W1FB*

THE OPTOELECTRONICS 8010 FREQUENCY COUNTER

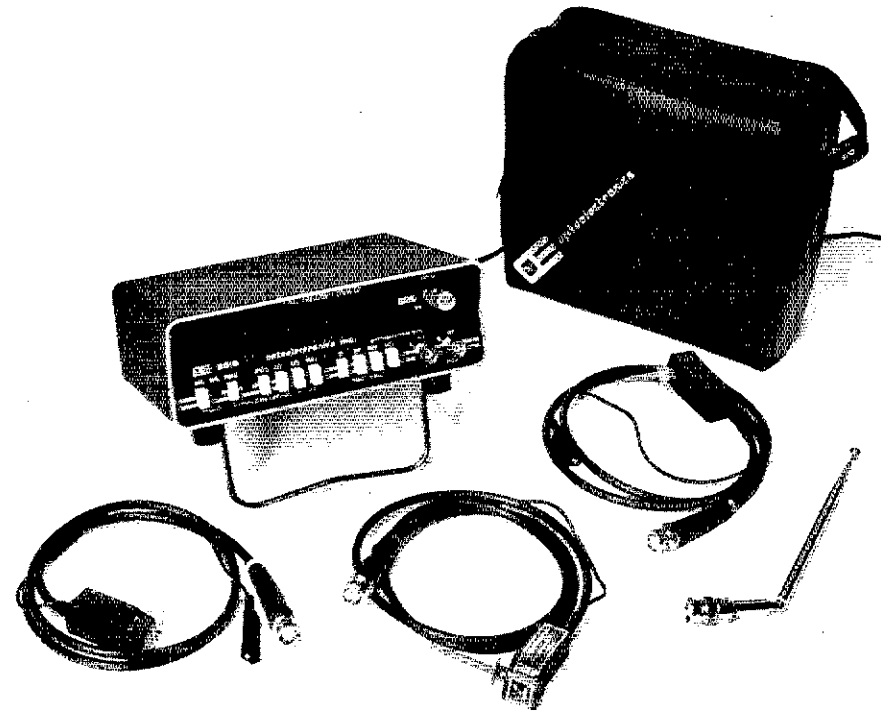
Optoelectronics Inc., Ft. Lauderdale, FL, manufactures a variety of modern digital measurement instruments. A very interesting member of their product line is the model 8010, a 1-GHz frequency counter. The 8010 is available in three versions differing in their maximum frequency range and time-base stability. The basic 8010 is supplied with a 1-ppm, 10-MHz crystal time base, while the model 8010.1 has a precision time base with a stability of 0.1 ppm over the 20° to 40° Celsius temperature range.

For those who find the 1-GHz maximum frequency a limitation, specially selected and tested model 8010.1 counters are available with

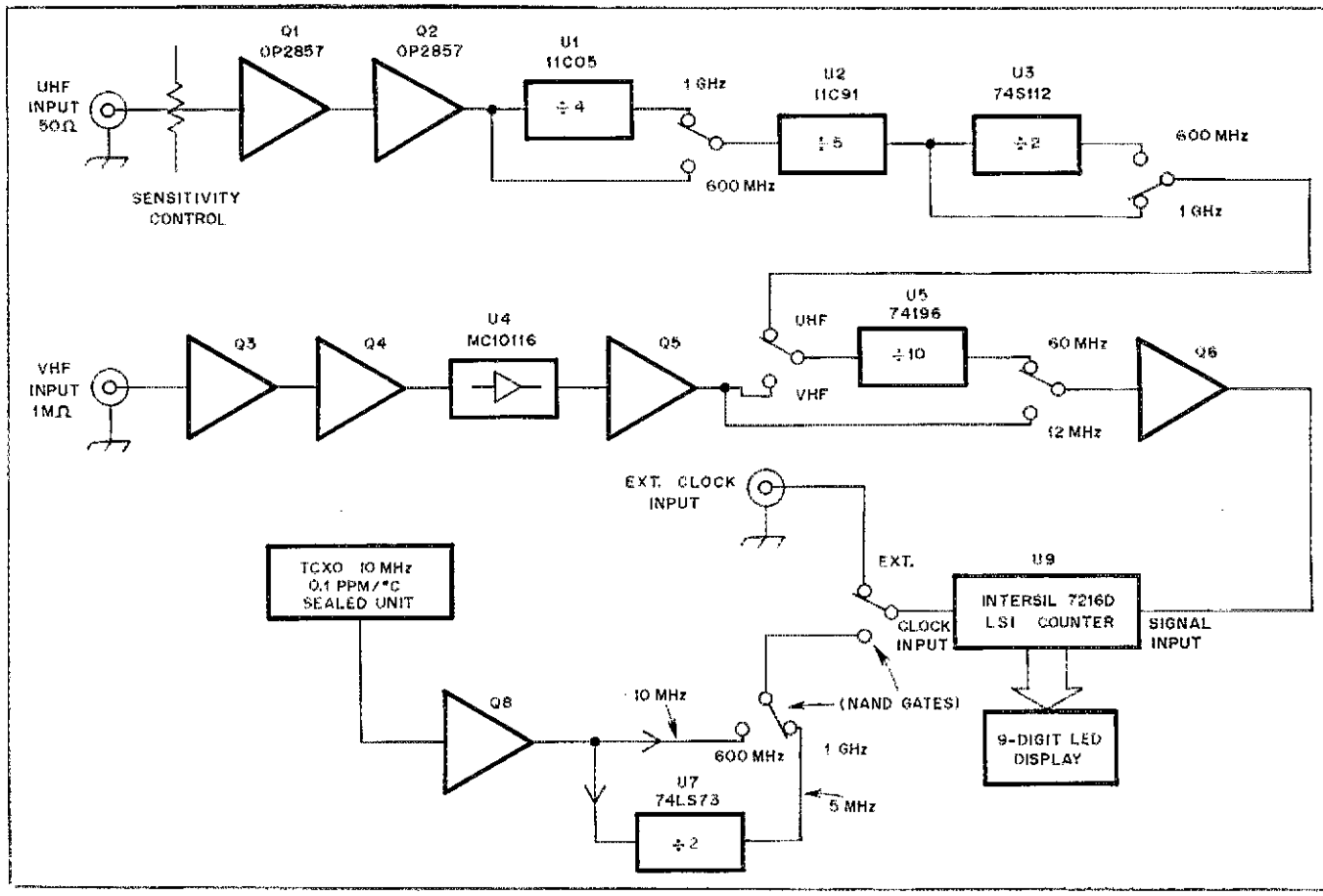
a guaranteed upper frequency limit of 1.3 GHz. These are designated as model 8010.1-13. All models are supplied with three test probes, telescopic pick-up antenna, 117-V ac wall-plug transformer and a 17-page owner's manual. Extra-cost options include a NiCad battery pack and charger for mounting inside the 8010 and a vinyl carrying case. The unit supplied for review was a model 8010.1-13 with the vinyl case.

The 8010's black anodized-aluminum case provides an attractive appearance and good rf shielding. When placed close to a general coverage receiver, harmonics of the 10-MHz time-base oscillator could be detected but were at very low levels. Use of a nearby 1-kW transmitter had no effect on the counter operation when shielded test leads were used. The pick-up antenna on the counter allowed measurement of a transceiver output frequency even while operating into a Heath Cantenna dummy load. A flip-up stand holds the counter at an angle suitable for viewing from most working positions. This and the size of the unit allow for very convenient use on the test bench.

Front-panel switches select one of four gate times from 0.1 to 10 seconds and frequency ranges of 12, 60 or 600 MHz, or 1 GHz. When the 1-GHz range is used, the selected gate time is doubled. This is because the time-base frequency is reduced from 10 to 5 MHz, thus maintaining the same 10-Hz maximum resolution on both the 600-MHz and 1-GHz ranges. Using the 12-MHz range and a gate time of 10



The Optoelectronics 8010 frequency counter and accessories. The probes, antenna and carrying case are optional. A wall transformer is supplied with the counter for ac operation.



Block diagram of the 8010.13 frequency counter. The switching shown is simplified to make the general signal flow more apparent. A complete diagram is provided in the owner's manual.

seconds yields the greatest resolution, 0.1 Hz. Two more front-panel push buttons allow selection of an external time-base signal and a "display hold" function. The hold function inhibits the display update for easier reading of a fluctuating count or retains the most-recent reading after removing the input signal. Two BNC connectors serve as signal inputs to the separate vhf and uhf front ends. Input A, a 50-ohm input, is used with the 600-MHz and 1-GHz ranges. When the 12- or 60-MHz ranges are used, the high-impedance B input must be used. This does not force you to use the HI Z input for all measurements below 60 MHz, as both the 600-MHz and 1-GHz ranges have a specified minimum frequency of 25 MHz. During lab tests, the 600-MHz range was found to function well to below 10 MHz. The only remaining front-panel control is the combination power switch and sensitivity control. The sensitivity control affects only the 50-ohm B input. It was noted that this input is sensitive to input signal level. Using the variable sensitivity control allows a wide range of signal levels to be measured. No variable control is needed with the HI Z A input, as it handles a wide range of signal levels without need for adjustment. On the front panel are nine 7-segment LED displays and two LED indicator lights. One LED indicates that an external time-base signal has been selected and the other shows when the counting period is completed.

The external clock input, a BNC connector, also serves as a clock output making available the internal 10-MHz time-base signal. This connector, along with the power connector is located on the rear panel. Also provided on the rear of the case are the display test and battery charge/operate switches. Access to the TCXO frequency trimmer is made through a small hole in the rear panel.

Examination of printed circuit board reveals that considerable attention has been paid the input stages; this is necessary to insure good sensitivity over the wide frequency range of the counter. The low-frequency B input has a JFET first stage, two bipolar stages and an ECL triple line driver, Q3 through Q5 and U4 of Fig. 1, to provide amplification and waveform shaping. To maintain the input to the 7216D LSI counter below its maximum frequency, an additional divide-by-10 operation is performed by U5 on the 60-MHz range. The high-frequency input A has a two-stage bipolar amplifier using two SOE (stripline-opposed emitter) packaged transistors. As shown in Fig. 1, these are followed by the frequency prescaler composed of U1 through U3, providing division by 10 on the 600-MHz range and by 20 on the 1-GHz range. The actual counting, latching and display multiplexing functions are performed by a single 28-pin IC, the Intersil 7216D. Use of LSI circuits such as this results in great reductions in size, power consumption and cost over that possible using random logic.

Sensitivity checks made using a calibrated 500-MHz signal generator showed that the 8010 was within specifications on all frequency ranges. No sensitivity tests were made above 500 MHz because there was no suitable signal generator, but the output frequency of a 1296-MHz transceiver with a nominal 1-watt output was easily measured after a 40-dB attenuator was placed in the line.

After having used the 8010 both at home and at work in the ARRL lab for several weeks, I found it to be a very accurate, reliable and easy-to-use instrument. The three supplied test probes, offering high-impedance, low-pass and direct coupling were useful, and the pick-up antenna is convenient for checking transmitter frequency calibration. The vinyl carrying case is large enough to hold only the frequency counter; no room is provided for the test probes or wall transformer. The owner's manual provides complete specifications and operating instructions. A minor error was noted in the table of specifications in the manual. The high-impedance input is referred to as input A while the front-panel marking show it as input B. Also included in the manual are seven pages of information on correct frequency counting techniques, a bibliography of articles relating to frequency counting and a certificate of calibration. For anyone needing to make accurate, high-resolution frequency measurements at uhf, the Model 8010.1-13 should fill the bill very nicely. Price class: Model 8010.1-13, $495; CC-80 carrying case, $10; TA-100 telescoping antenna, $10; P100 1X-50 probe, $14; P101 low-pass probe, $17; P102 high-impedance probe, $17. — *George Collins, AD0W*

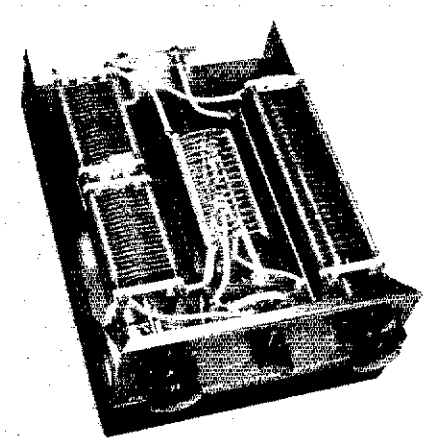
THE APOLLO TRANS-SYSTEMS TUNER 2000X-2

The circuit used in the Apollo Products 2000X-2 tuner is an adaptation of the original McCoy Ultimate Transmatch that appeared in *QST* some years ago.[1] A tapped coil has been substituted for the roller inductor as was done in a follow-up article.[2] Although the front panel doesn't show it, there actually is a 160-meter switch position at 6 o'clock where the lettering "band switch" appears. The tuner is designed primarily for use with coax-fed antennas. No feed-through insulator is provided for single-wire feed, nor is a balun or SWR meter included.

The "works" are housed in a black, clamshell cabinet with a contrasting wood-grain front panel. The enclosure is spacious and there is no crowding of components. This cabinet is also available separately for those wishing to use their own components in constructing an antenna-matching network.[3]

Since the review item was already wired, one could only "guesstimate" how long it would take to bring the '2000 from shipping carton to finished product. At most, three hours should be required. Should a factory-wired unit be purchased, some of the coil-tap positions may have to be altered to fit the individual antenna systems in use at your particular location. During use, it was found that the coil taps on the review model had not been well soldered and it was necessary to remake each connection.

Although it is not mentioned in the construction manual, indenting every other turn along the tapped quadrant of the coil when making the coil-tap connections, will make the job easier. The advertisement mentions the coil for the kit model has indented turns, but the factory-wired unit had no such provision; the indented turns of the coil in the unit shown in the photograph were made when resoldering the coil taps. When selecting the coil-tap positions, use those which provide the lowest SWR readings consistent with the use of the largest amount of capacitance for the two tuning capacitors. These settings will afford the greatest amount of harmonic attenuation. (Remember to turn the transmitter off when changing taps!)



The Apollo Products 2000X-2 Trans-Systems Tuner. Interconnecting wiring is made with glass cloth-covered braid. The bracket at the rear of the unit supports the input and output coaxial connectors.

It was felt that it would be easier to set the taps for the higher frequency bands (15 and 10 meters) if a coil with a lower pitch were used for that part of the matching unit inductor. At the higher frequencies, lead lengths come into play and become a substantial part of the network. The manner in which the coil is physically mounted also means the higher-frequency coil taps are the farthest from the band switch and they require the longest lead lengths. When making the coil connections, attempt to keep the tap leads as near the center of the coil as possible to prevent any possible arcing from the tap lead to another part of the coil.

Without a ground connection on the '2000, hand capacitance affected the SWR meter readings and adjustments made to the unit. Once the unit was grounded, no difficulties were encountered. (Good practice would dictate having all station equipment connected to a good, common ground in any case.)

The stand-off insulators for the coil and capacitors are made of PVC. While PVC may not always exhibit good dielectric qualities in certain applications, no problems were encountered with the test unit at the 1-kW dc and 2-kW PEP input levels. Measured insertion of the tuner while using a commercial 50-ohm load was less than 0.5 dB.

The impedance-matching range of the tuner will be somewhat limited by the initial setting of the coil taps; different antenna systems may require different coil-tap positions be used. Additionally, the setting of the band switch is not sacrosanct. Under certain circumstances one may find a tuner band-switch setting of, say, 40 meters would provide the required match on the 80-meter band when using fixed-tap positions.

The Trans-Systems Tuner 2000X-2 is available from Apollo Products, P. O. Box 245, Vaughnsville, OH 45893. Price class: $125 kit form, $145 wired and tested. — *Paul K. Pagel, N1FB*

[1] McCoy, "The Ultimate Transmatch," *QST*, July 1970.
[2] Myers, "The Rollerless Ultimate," *QST*, November 1973.
[3] The cabinet model is TM-5.

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

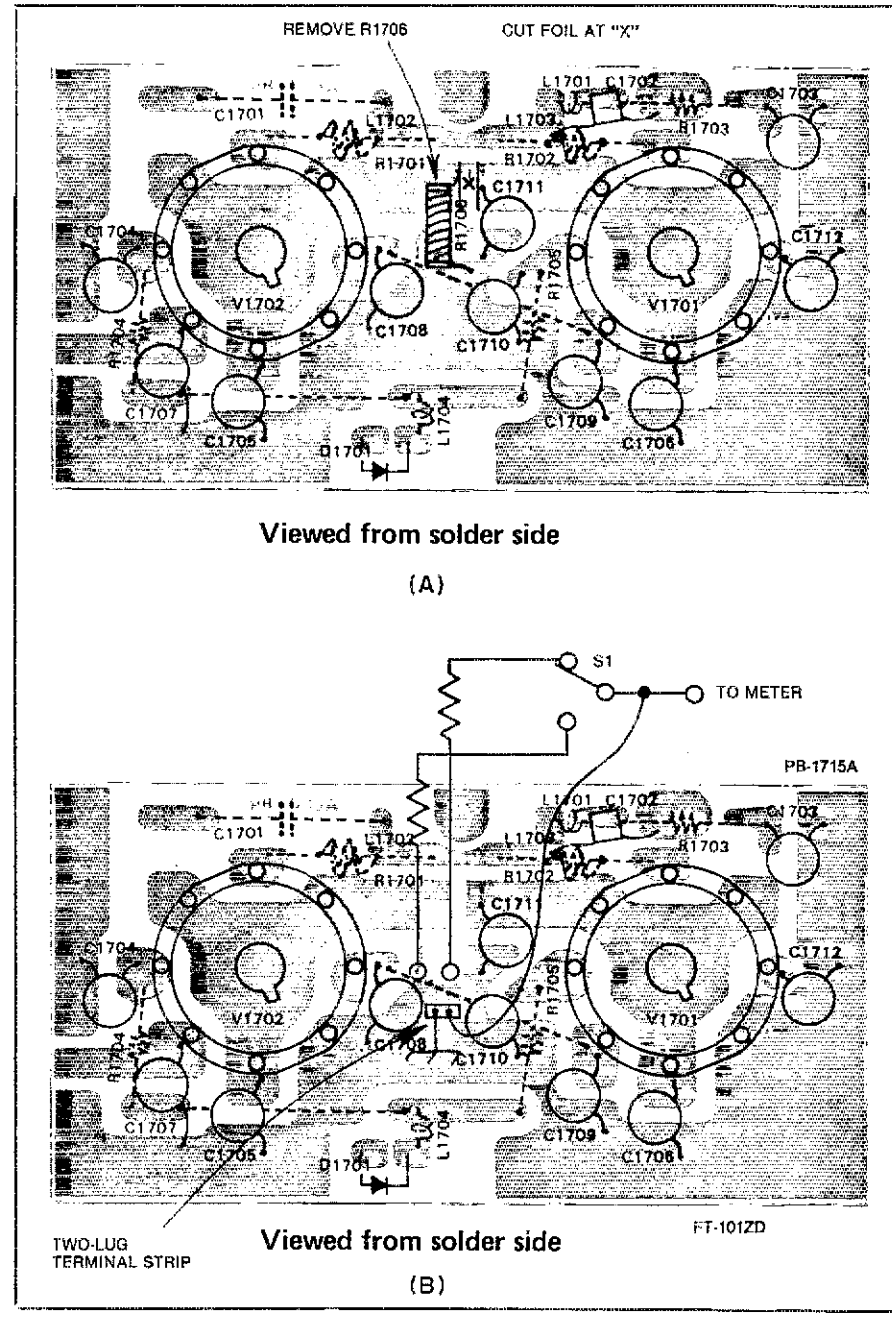
FT-101ZD FINAL-AMPLIFIER CURRENT MONITORING

When using parallel-tube final amplifiers, the "bottles" being used should be closely matched. If they are not, one or more (depending upon the number of tubes involved) may "hog" the current being drawn, resulting in poor performance and eventual troubles. The unsuspecting operator using a single meter to monitor the combined tube currents would discover all too late wherein his problems lie. In every rig the writer has owned in the recent past, a modification has been made to enable observation of the current drawn by the individual tubes in the final amplifier. The FT-101ZD is no exception.

The modification, shown at the right, is simplicity of the first order. An added spdt toggle switch and a couple of meter shunts coupled with an easily repairable cut in a circuit-board foil are all that is needed.

Not wishing to deface the front panel of the new transceiver, I drilled the mounting hole for the switch on the rear panel between the ground lug and the driver output phono jack, J11. The existing meter shunt, R1706, is removed and the meter lead unsoldered from the foil pad. The foil which connects the cathodes of the 6146Bs is cut with a sharp knife. Application of a bit of heat from a soldering iron will aid in lifting the unwanted foil from the board. See the diagram. For the sake of convenience, a two-lug terminal strip (one ground, one insulated) was soldered to the board (ground lug to ground foil). The previously removed meter lead is attached to the insulated lug and a wire connected between this lug and the center terminal of the toggle switch, S1. The meter shunts were each made of five, 10-ohm, 1/4-watt carbon resistors in parallel. The shunts should have a value of 2 ohms each and be as closely matched as possible; this will ensure accuracy. One end of each shunt is connected to a side of the switch. The opposite ends of the shunts are soldered to the amplifier tube cathode connections of the pc foil. The installation process may be easily reversed by simply bridging the foil break with a piece of wire and a "dummy" machine screw may be used to fill the hole vacated by the removed toggle switch.

The meter deflection for each of the tube currents will make it appear as though nothing has been altered. Because only half the current is being measured, the shunt resistance has been doubled. The resulting meter indication is about the same as before the modification. (If the meter shows a particular tube current to be 250 mA, the actual current is 125 mA.) This has the advantage of providing a current indication that is easier to read as well as providing a "psychological salve" by showing the more familiar meter deflection, rather than one lower on the scale. Switching between the two tube currents should show them to be tracking within plus or minus 10 percent of one another if they are closely matched. If not, you've got one "worker" and one "goldbricker." With matched tubes, the meter switch may be left in either position and bias and loading adjustments performed as is normally done. — *Paul K. Pagel, N1FB, Asst. Technical Editor,* QST

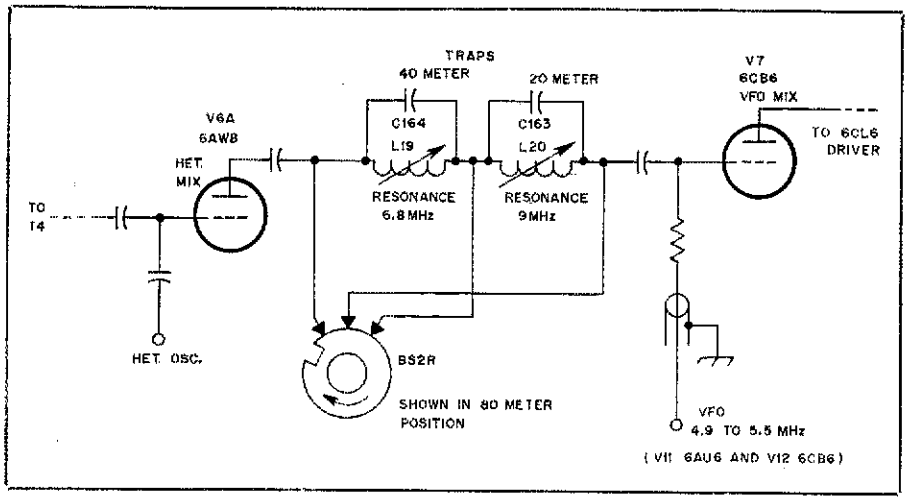


The foil side of the final-amplifier board (PB-1715A) is shown at A prior to modification. At B, the foil cut and added wiring are shown. See text for resistance values.

*Assistant Technical Editor, *QST*

FT-101ZD RF FEEDBACK

When the Yaesu FT-101ZD was reviewed in December 1979 *QST*, it was mentioned that rf feedback into the mic amplifier had been a problem. The factory suggestion of bypassing the mic and PTT leads with 0.01-μF disc ceramic capacitors was followed and the problem was eliminated. It was also reported that Yaesu would be installing these capacitors in all current production models. Further communication with the factory reveals that 'ZDs with lot numbers of 12 or higher have these capacitors installed. If your '101ZD has a lower lot number, you may have to install these capacitors. An even more extensive approach to curing the problem was discussed by Cliff White (WB5DYA) in the November/December 1979 issue of the *Fox-Tango Newsletter*. — *Paul K. Pagel, N1FB, Asst. Technical Editor,* QST



Correct adjustment of the HX-10 traps, shown in the drawing, is essential in order to avoid spurious emissions. Mason provides an explanation in the accompanying text.

SPURIOUS EMISSIONS FROM HX-10 TRANSMITTER TRACED TO MISALIGNED SWITCHABLE TRAPS

I traced the source of spurious emissions from my HX-10 Marauder, noticed near 6800 kHz, to the two switchable traps in the mixer plate circuit. These traps, intended for harmonic suppression, are switched, one at a time, on both 20 and 40 meters. The 40-meter trap should attenuate the second harmonic of the heterodyne oscillator 3.4-MHz output. Apparently this signal can sneak through the final amplifier and be radiated. In my HX-10, I measured this signal at 6797.5 kHz.

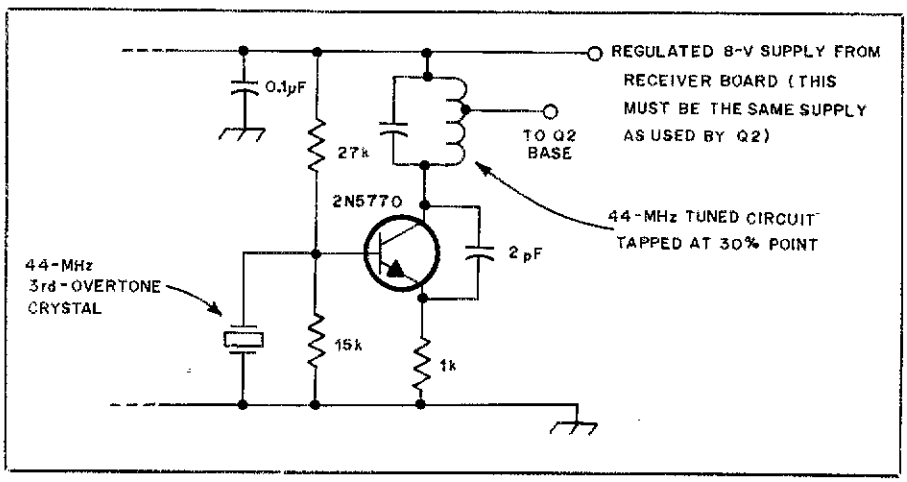
The remedy was to set the HX-10 on the 40-meter band, adjust the VFO to 7 MHz, set the function switch to standby and, while listening to the receiver purposely tuned to 6800 kHz, I adjusted the final-amplifier grid drive for maximum S-meter indication. The rf gain control on the receiver was then adjusted to provide a 40 dB above S9 meter level. Next, I tuned the 40-meter trap for minimum S-meter indication. This procedure dropped the signal level to S5. The trap had been a long country mile out of adjustment.

On-the-air checks with WA8SUW, Grand Rapids, Michigan, and W8PPY in Mt. Clemens, Michigan, revealed no evidence of spurious emission. I proceeded to observe the performance of the 20-meter trap. This too was out of adjustment. It is intended to attenuate the 9-MHz signal that can sneak through the heterodyne mixer and combine with the VFO output, producing spurious signals from 13.9 to 14.5 MHz. The tuning related to these signals is backward to that for those signals normally produced by mixing the 9-MHz signal with the 10.4-MHz crystal output and the 14.5-MHz signal with that on 13.9 MHz. The HX-10 performed in shipshape condition once these corrections were made. — *R. M. Mason, W8NN, Lima, Ohio*

CONVERSION OF SINGLE-CHANNEL RECEIVER TO MULTI-CHANNEL OPERATION

Since my article "A Single-Channel VHF Monitor Receiver" was published in the December 1979 *QST*, I have had a number of letters from people who want to use it as a multi-channel vhf monitor receiver. The method mentioned in the article uses expensive crystals and I have developed an inexpensive solution using low-cost 44-MHz crystals which provides a satisfactory arrangement for this conversion. This solution uses Q2 as a tripler by omitting C12, R5 and R6, increasing the value of C13 to 0.01 μF and driving the base of Q2 from the overtone oscillator shown in the accompanying illustration.

The performance of this modification is as good as that of the original. Standard 2-meter receiver crystals, such as are used in the TR2200 and similar equipment, may be used. I have not developed a separate printed circuit board for the application. — *James M. Bryant, G4CLF, Swindon, Great Britain*



G4CLF uses this modification to convert his single-channel vhf monitor receiver to multi-channel use. See December 1979 *QST*, p. 24. Resistances are in ohms.

A METHOD OF CALIBRATING THE SPEED CONTROL OF AN ELECTRONIC KEYER

This procedure involves the modification of a pocket calculator. The normal functioning of the calculator will not be impaired and the inventive ham will find many uses for the resultant "digital counter." Only calculators that add and display a running total by punching the equals key will work in this application. Most of the inexpensive models do perform in this manner. To test your calculator, punch 1 + 1 =. The display should read 2. Now push the equals button again. If the display reads 3, you have the right type of calculator for the modification.

Open the case. Locate the two conductors leading to the equals switch on the keyboard pad. Carefully solder a piece of hookup wire to each of the conductors. Install a small two-conductor jack in the calculator case. Solder the remaining ends of the two pieces of hookup wire to this jack. Use an appropriate plug to mate the jack and from it connect leads to the output of the keyer. If the keyer has a relay-type output, everything should be ready to go. Should the keyer have a transistor switch in the output, you may have to reverse the polarity of the leads before the keyer will actuate the equals switch.

To determine the keying rate at some given setting of the speed control of the keyer, punch in 1 + 1. Use a clock to monitor the time. Send a string of dits for exactly one minute. According to Downs (see March 1979 *QST*, p. 11), a word may be represented by a string of 25 dits. Dividing the amount shown on the display by 25 should then give you the keying speed in words per minute. It is assumed that the keyer follows the standard 1:3 dit-to-dah duration ratio. — *Jim Pitts, K4EY, Louisville, Kentucky*

MORE ON IMPROVING THE SB-104A/644A

☐ Laurence David, W4YEJ, one of several amateurs who wrote to *QST* regarding the modification article about improving the SB-104A/644A presented in the August 1979 *QST*, points to a need for an update on the article because of a manufacturer's production change. That change, confirmed by Heath's Technical consultant, Ed Mosher, means that amateurs with recent versions of the SB-104A should follow the procedure outlined by W4YEJ. David writes:

"I completed building my SB-104A in May of last year. It was great, therefore, to see the modifications by Harlan Bercovici in the August issue of *QST* with additional notations in the September 'Feedback.'

"I uncovered a wiring problem after the specified leads were removed from the audio board (F-19) according to the instructions. Subsequently, I learned that this problem applies to any SB-104A that was wired from assembly instructions with serial numbers starting with 03 or 04 and later. The 13.8-V source

lead from the power plug goes directly to F-19. From there, it is connected to G-2, then to B-2 and the collectors of Q1 and Q2. This line is then connected to pilot lamp 1, pin 1. An extension of the lead goes to F-19, RY-11 and finally K-3.

"Therefore, I suggest removing all the wires on F-19, tying them together at an added terminal strip and connecting a new wire from F-19 to RY-3. This will keep 13.8 V on K-3, RY-11, G-2, B-2, the collectors of Q1 and Q2 and the pilot lamp. Doing so also enables one to key 13.8 V to F-19 as wanted."

Ed Mosher of Heath makes these additional suggestions. "For better protection change the 560-ohm resistor, mentioned in the tenth step of the August article, to 1000 ohms. Owners of sets with serial numbers beginning 03 and before should change R578 to 1.8 kilohms and R581 to 1.8 megohms. If necessary, both of these resistors are found on the 'F' circuit boards."

If Harlan Bercovici, WØMYN, author of the SB-104A/SB-644A article, has provided supplemental information concerning the modification for removing talk-back. He states that one of the changes is to remove the 13.8 volts from pin F-19 (the receiver i-f/audio board) during ssb transmission. While this change does eliminate the talk-back problem, it introduces another, namely that of erroneous frequency readings while the TUNE button is depressed. This is a display error only. The actual frequency is shown on receive. The reason for this condition is that before modification, the counter preset inputs had separate switches for usb, lsb and cw. But there was no switch or input for TUNE. (Reference is made to pins 2, 4 and 6 of switches S3A, S3B and S3C.) When the TUNE button is depressed, the counter preset would use whichever of the other three buttons was also depressed. Actually, the TUNE function automatically selects the same carrier frequency as for cw. While there would be a slight error in the frequency reading under these circumstances (use of TUNE and either usb or lsb), the difference would only be a few hundred Hz. The reading, nevertheless, would be correct the moment the TUNE button was released.

After the ten-step modification to remove the 13.8 V from pin F-19 is completed, the counter preset for the cw mode is obtained from pin 3 of switch S3C. This is the 11-volt section of the cw switch. The switch logic is so implemented that this line goes to 11 volts whenever either the cw switch is depressed or whenever the TUNE switch is pushed. The preset signal at pin A-24 will be present whenever either the CW or TUNE button is activated. Now, if either the USB or LSB button is depressed and you push the TUNE button, you will actually present two presets to the counter at the same time. That results in an incorrect frequency reading.

If your transceiver happens to be in the cw mode and you push the TUNE button, the frequency reading will be *correct*. If it is in the USB position and you pushed the TUNE button, the reading will increase by 4.1 kHz. Use of the lsb mode in conjunction with the TUNE position results in a reading change of 3.2 kHz. The important point to remember, Harlan states, is that these incorrect readings are present *only* when the TUNE button and either the LSB or USB are activated together. As soon as the TUNE button is released, the reading again becomes correct. Logic was investigated as a means of eliminating this problem, but Harlan reports that after consideration he determined such a solution was not worthwhile.

Simply remember this. Set the SB-104A frequency *before* you push the TUNE button. If the TUNE button is depressed first (except when associated with the cw mode), the frequency display is wrong. By referring to the circuit diagram, you can derive a more meaningful impression of why this is so.

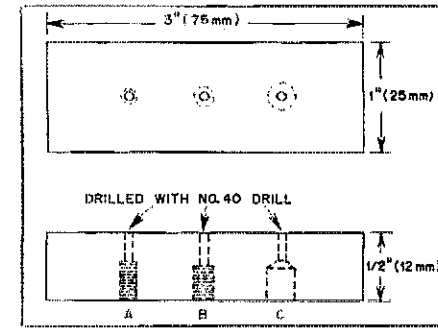
By way of conclusion, Bercovici recommends that the following correction be made for step 2 on page 31 of August 1979 *QST*. The directions should be changed to read, "Disconnect the jumper from lug 3 of the TUNE switch to lug 2 of the cw switch." Delete the words "and reconnect it." Ed Mosher points out, however, that as long as the operator realizes that he is seeing a *display error* only, and *not* a *frequency shift, there is no need to perform this last step.*

OLD TIMER'S NOTEBOOK: FIXTURE FOR CENTERING HOLES IN SHAFTS OR SCREWS

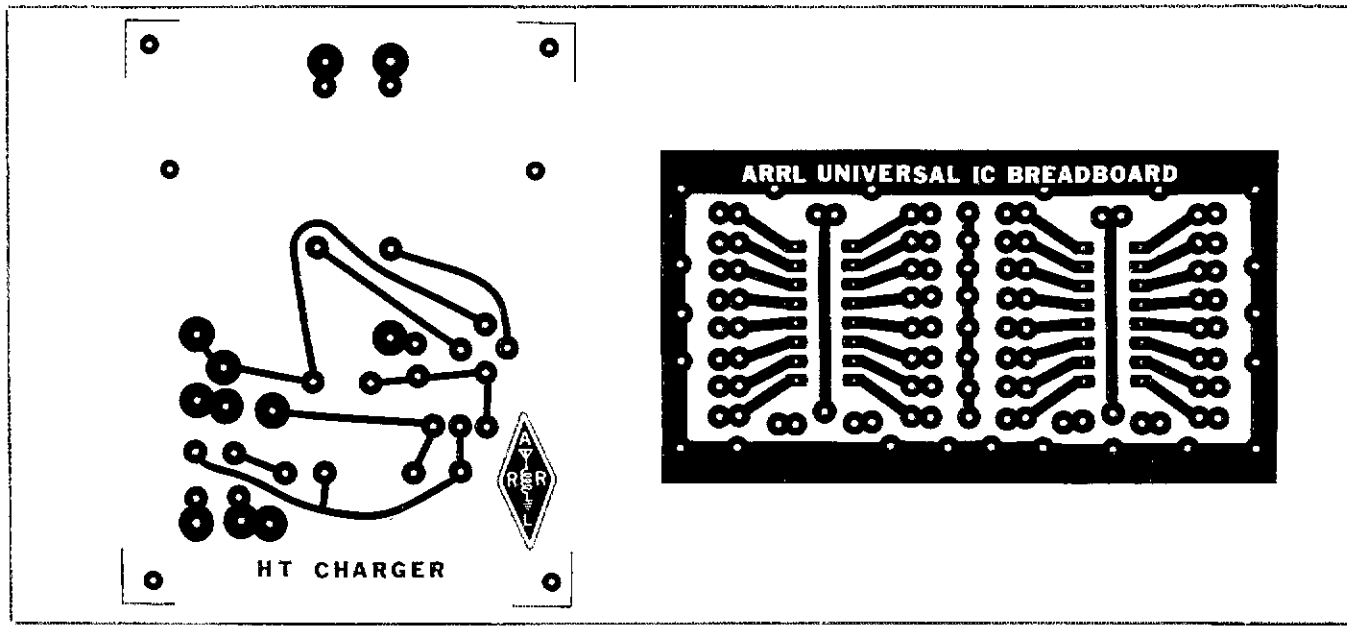
Many times I have tried to drill a hole in the end of a screw or a volume-control shaft, but I always have had difficulty centering the hole. I finally devised a fixture which permits the drilling of an accurately placed centering or starting hole.

The fixture, shown in the drawing, consists of a piece of soft iron or brass, about one by three inches and one-half inch thick. I first drilled three holes clear through the block using a no. 40 drill. One of the holes, A, was then redrilled halfway with a no. 35 drill and tapped for 6-32; B was redrilled halfway with a no. 29 drill and tapped for 8-32 thread. The third hole, C, was redrilled halfway with a 1/4-inch drill to accept the standard-sized shafts of variable controls.

The small holes serve as guides for a small drill which will make a centering or guide hole in the end of the screw or shaft. — *Felix W. Mullings*, Hints and Kinks for the Radio Amateur (1949) QST



A fixture for use in drilling a centering hole in the end of a screw or shaft.



Circuit-board etching patterns for projects appearing in this issue of *QST*. The patterns are shown at actual size from the foil side of the board, with black representing copper. Each board has copper on one side only. At the left is the pattern for the NiCad battery charger (Fig. 2, p. 29), and at the right is the Universal IC Breadboard used for the keyer in "The NOR-Gate Break-In," Fig. 5, p. 24.

Rollerball — Amateur Radio-Style

The inside story of how the Olympic flame was brought from Virginia to Lake Placid.

By Bobbie Chamalian,* WB1ADL

It's January 31. All vehicles have arrived. A day-long installation of equipment is complete. We have met our team family and been wined and dined in style. Expectation runs high. In a crowded motel room in Yorktown, Virginia, the most exciting event in our amateur careers is about to begin. Thirteen yellow-suited ham radio operators and three Virginia logistics assistants, WA4CCK, WB4SHK and WD4FTK, eagerly work out the last-minute details for this historic test of skill and stamina — the first United States Olympic Torch Relay, Yorktown to Lake Placid, New York. The room fills up with other people — Technical Director Gariyan Butler, Convoy Manager Connie Butler, the ceremonies coordinator, runner coordinator and other decision-making personnel.

My watch says 1:30 A.M. but it feels more like 3. This is the fourth consecutive 21-hour workday and it's snowing. What has taken a year of planning may all be changed by mother nature. It's a complex system that is to transform 98 strangers into a family that will maintain and ceremoniously transport the Olympic flame until it presides over the Winter Games. Now comes word that, because of icy runways, Air Force 1, which is carrying the sacred flame ignited in Helena, Greece, may have to be rerouted to New Jersey.

The communications team for the 1980 Winter Olympics Torch Relay. L-r, front row: WA2DHF, KA2CNN, WB2SPK, K2AV, WB3LGC, KA2BAU, WB2BXP. L-r, rear: AK2E, WB3EOU, KA2DBW, KB3HF, WA2SPE, WA2EQW, WB2VUK, K2AMU, WA2SPL, KA2DVK, WB1ADL, W1RM. Off camera — WB3HWZ, WA3PZO.

An Unrelenting Pace

At 3 A.M. lights begin to glow in the rooms of the Yorktown Motor Lodge. The flame is on schedule after all; we are to proceed as originally planned. The caravan of 10 vehicles will split, one group proceeding to Langley Air Force Base to greet the flame, while another will head directly to the Yorktown monument, where the flame is to arrive by Navy craft.

It is bitter cold. Driving snow makes visibility difficult and road conditions hazardous as we make our way to the air base before dawn. Tension mounts as the

*ARRL Olympics Coordinator

word comes that the plane's landing will be delayed. Something is jamming the ground-to-air communications. Amateur Radio is blamed. Air Force personnel soon locate the actual source of trouble — an unauthorized commercial radio used by some media people.

As the plane lands, a spirit of elation comes over the communications net: "Com (command) from G1 (Gariyan's shadow). The plane is on the ground. We are proceeding toward it now."

"Congratulations, G1. Com out."

After a brief ceremony a moment of fear sets in: "Com from G1. I'll need a new 'talkie or a fresh battery pack before boarding the boat."

"Com from PR with info."

"PR, go."

"Please advise of G1's location. I have the battery pack."

In a few minutes the pack is delivered. Communications go on uninterrupted. Net control and all communicators on frequency will know, from moment to moment, the exact location and condition of the torch, torch bearer and technical director. We learned later that this would be the kind of demand and pace we would be experiencing for 11 days.

The System Worked — With the Help of Local Hams

The first nonstop 36 hours, from Yorktown to Baltimore, was an exhilarating, enlightening, nerve wracking and exhausting learning experience. There wasn't one minute of "dead air." Communications for the relay were equivalent to participating in Field Day and the DX Contest simultaneously.

In the six months of ARRL's planning, the ARRL hq. coordinator and team members worked out some highly sophisticated systems. It was to be, and indeed became, a directed net. The situation demanded rapid, accurate and constant communication to maintain the safety and schedule of the team. There were two net control positions and three net control operators for the first six days. With Jeff Young, KB3HF; Steve Mendelsohn, WA2DHF; and Pete Chamalian, W1RM, as net controls in the command vehicle, we began, and remained, a fluid and professional team. Our tactical call signs system, which we used in addition to the usual amateur calls, was patterned after airport tower communications. Net controls 1 and 2 were the equivalent of air and ground control. According to Brian Fovel, W2PBJ, deputy director of Communications for the XIII Olympic Winter Games, the Torch Relay had a more complex and sophisticated communications system than that at the Olympic event sites. Brian should know: He sold the idea of amateur communications service to the Lake Placid Organizing Committee, and designed the original communications

Using two tri-band UV3 units lent by the R. L. Drake Company, W1RM, WA2DHF and KB3HF (off camera) commanded the net-control positions from Yorktown to Albany. Accompanying the UV3 units were an MA-1000B mobile kw amplifier donated by Magnus Electronics Corp. and two mobile antennas for 10- through 80-meter operation lent by Swan.

basic plan implemented by ARRL hq. and the caravan crew.

A Look At the System

It worked well. Net 1, the intra-convoy net, operating 1-watt simplex, consisted of four main vehicles accompanying the torch bearer — Command (Com), Pace (Pace), Torch Arming (Torch) and Police (PD). Net 2, operating simplex or repeater when the situation demanded it, consisted of the remaining six vehicles at distances of from 0 to 30 miles from Command — Emissary Runner (Bus), Ceremonial (Ceremony), Convoy (Convoy), On and Off Duty Runner (Red and Yellow) and Public Relations (PR).

Thirteen operators manned these positions; each had a specific demand based on the vehicle's function. In PD, Sandra Kaynes-Ernest, KA2DBW, alternating with Bob Strickland, WA3HWZ, relayed information between Command and the police in matters of traffic and crowd control as well as pace limitations. The Pace vehicle, with Paul Vydarney, WA2VUK, at the microphone, kept the caravan on course and on schedule. Torch, led by Bob Josqweit, WA3PZO, kept the 100 liquid-propane torches ready through over 100 ceremonies. Com was the nerve center, housing the brains of the operation. From here, the technical coordinator, convoy manager and net controls were linked by low-band relay to Lake Placid and Albany through WØRAN, the Winter Olympics Radio Amateur Network station, manned by K2GDX, K2TTI and K2DFS.

Bus, manned by James Arnold, WB3EOU, transported half the running team and played shuttle craft for the runners' sleep cycle during the first 36 hours. Each day this vehicle would carry the emissary runners to towns in advance of the caravan. The ceremonial vehicle required two operators — Guy Olinger, K2AV, and Dwight Ernest, KA2CNN. They provided the "shake down" procedure links among the ceremony-site authorities and Com and PR vehicles. Red and Yellow were the motor homes that carried the day's 26 on- and off-duty runners. PR, manned alternately by this writer and Bob Fern, K2AMU, relayed requests to and from the Public Relations motor home and sought out publicity opportunities for ham radio. The Convoy transport, handled by Stephen Shearer, WB3LGC, would weave in and out of the "parade." Its purpose was to ensure that each vehicle received its boxed breakfasts, lunches and snacks without slowing the caravan pace.

Murphy Strikes

But even the best plans cannot anticipate everything. We all felt it was going to be "Lake Placid or bust!" But as the time wore on, "bust what?" became the issue. One by one, vehicles met with accidents. Runners were down for minor injuries. Ham equipment refused to function. Luckily, we had had the foresight to procure a mechanic for the vehicles, a doctor, a dentist and a psychologist for the people, and a mobile repair shop for the equipment. The repairs were compliments of WA4CCK and his team of mobile operators. When terrain and equipment malfunction would normally have prevented a contact between remote vehicles and Command, WA4CCK's mobile and stationary ops kept the system working. When WB1ADL's 2-meter transceiver broke down, WB4SHK and KA4FVB, working out of N4CCF's mobile ham shack, repaired it while the others relayed between WB1ADL's handie-talkie and Command.

W1RM aptly named our mission "Rollerball."[1] Unscheduled events beset us all along the route and we "rolled" with the action. In the Philadelphia area, a truly Olympian effort was generated by WA3PZO and eight amateur clubs. Close to 200 hams had an elaborate and finely tuned support system that handled local communications as the torch approached. As Murphy would have it, at Independence Mall, 1000 unscheduled runners joined our caravan. The police certainly took notice of the hams' assistance then. Of course having the computerized voice i-d of the WA3UNG repeater welcoming us to Philadelphia and serving us well to the Delaware line helped alleviate the tension of having the "marathon group" in our midst.

The system continued to be fine-tuned. We worked around Murphy. Our efforts were even recognized on the W3RUN

[1] A 21st-century team game, played to the death, where the rules, announced just before playing, change throughout the game.

To support our need for portable communication, Trio-Kenwood supplied us with four of their 2400 handie-talkies and spare battery packs. Special Amateur Radio Torch Relay patches, like the one displayed here by K2AMU, were donated by WA3JMN.

(normally WR3AFM) machine, which greeted and served us admirably through Baltimore. Elaborate support systems in New Jersey, New York City and Westchester County kept our spirits high, too.

By the time we reached Albany, the point at which our caravan would change structure, we had been on the road for six days. Rollerball was a way of life. But the final two days would be quite different from our earlier experiences. To envelop the entire Adirondack region in the Olympic spirit, the caravan would double and split into two caravans — one going east, one west — to meet in Lake Placid exactly at the same time. The communications team expanded to include Dennis Connors, WB2SPK (Command West with W1RM); Gary Kantor, WA2BAU (PD); Dick Kitchen (Red); Armand Canestraro, WA2EQW (Pace-west); Joseph Krone, WA2SPL (Bus); Hal Post, AK2E (Pace-east) and Daniel Marcella, KA2DVK (Red-west). None of these operators had the opportunity to benefit from the experiences of the first six days. Some had participated in the 12-hour test run from Ticonderoga, New York, to Lake Placid in December, but all of them blended in and the family spirit expanded and spread.

Carrot, celery and pepper sticks accompanied by cheese and apples on whole wheat bread does not a lunch make. We had our fill of such food. We were ready to trade our rigs for just one burger. Luckily, WA2GGI saw our plight and supplied us with burgers and soft drinks after the nerve-rattling caravan split in Albany.

True Olympic Spirit

Transporting the Olympic flame meant spreading the Olympic ideals of excellence, brotherhood, peace and freedom. The overwhelming spirit of patriotism displayed throughout the Olympic games *began* with the Olympic flame and accompanying Torch Relay. Hams all along the route displayed this attitude. There were dozens of support networks composed of local amateurs operating as relay for local officials at ceremony sites. Prearranged stationary operators monitored our net 2 and WØRAN frequencies, ready to relay to Lake Placid as necessary. Thousands of interested local operators stood by on frequency ready and willing to help in any way. When some were needed, the response was heartwarming. Over 50 repeater owners gave us their permission for machine use, some even scrambling to get new machines ready in time for the relay. Clubs made sure back-up repeaters were at our disposal. In Philadelphia a group of ATV enthusiasts called Paravision retransmitted the caravan's movements. Local assistants, either Section Communications Managers or their delegates, donated hours of preparation and relay. *These* are the silent, unsung heros, too many to list individually.

The hams provided the technical and psychological support, while others gave us the emotional lift for times such as those when we thought we just couldn't spend another hour cooped up in a van with only a porta-potty for relief. Of course, much credit goes to our co-family of runners, who expressed disbelief that such a reliable communications system could have been created. All these people combined to give us the confidence that this mission, however full of rollerball, would be a resounding success.

Thousands of people lined the route. Whether it was 3 A.M. or 6 P.M., communities and cities let their generosity and imagination flow. There were banners, homemade international flags and costumes, fire-company ladder salutes, fireworks, marching bands, bell choirs, vocal choirs, a musical play, candlelit corridors of people, flowers, guest runners in special uniforms, personalized boxed lunches decorated by local school children, huge ice sculptures, homemade placemats at evening meals, murals and oil paintings by local children — virtually anything you could imagine was used to make us feel welcome.

What were the highlights? Each ham would respond differently. For W1RM it was the thrill of providing communications for the torch bearer at the steps of the Capitol building in Washington, while members of Congress looked on. For KB3HF and WA2DHF it was the thrill of

WB1ADL checks on the status of her team with one of four Tempo S1 units lent by Henry Radio for the relay.

running the torch across the closed Verrazano-Narrows bridge in New York City, while overlooking the Statue of Liberty, another torch bearer.

Other highlights? Who could forget the Revolutionary War cannon shot off in our honor at 2 A.M. in Spotsylvania, Virginia, or the memorable repeater i-d, "W3RUN thanks the Olympic Torch rollerball net." Ranking high on the "memorable" scale were the cold showers in the convent in Peekskill, New York, and sleeping on cots in Gerritt gym at Princeton University in New Jersey the night before we had to board our vehicles at 3:50 A.M. Perhaps it was 10 nights of town banquets or 11 days of vegetarian food. For some it was the thrill of taking the amateur operator position known as Flame 1, where, armed with a handie-talkie, the ham would run alongside the torch bearer, directing his or her movements into and out of ceremony sites. Who will forget the l-o-n-g hours of constant tension and being on the alert. Maybe it was knowing you had the responsibility to relay ceremonial information precisely and concisely, or the ceremony would forever be lost for the local townsfolk.

Though tradition demands that the Olympic flame be extinguished at the completion of the games, the memory lingers on. For all the participating amateurs the biggest thrill is knowing that, in whatever capacity, we all made Amateur Radio an *unequalled* communications system, long to be remembered by all it touched.

AMSAT-OSCAR Phase III on the Horizon

Part 3: Be prepared! Here's everything you'll need to understand and construct your own Phase III tracking device.

By Martin R. Davidoff,* K2UBC

Satellites and *Tracking* — these two words have been linked so closely in the past that it is hard to imagine one without the other. But AMSAT-OSCAR Phase III-A is destined to change our thinking about many things.[1] For casual operation, a Phase III-A user will be able to dispense with tracking. Determining if the "band is open" (satellite in range) will just involve flipping on a 2-meter receiver tuned to the downlink passband and listening. If weak signals are present, the operator aims his or her antenna to peak S-meter reading and sits back to relax for at least a half hour before antenna readjustment is necessary. But, a user interested in planning a net, or arranging a schedule to a particular location, will need some sort of tracking aid. This article presents one such device — the Ø3 TRACKER.[2]

A good satellite tracking aid should enable the user to accurately predict (1) times for AOS (*ac*quisition *o*f *s*ignal) and LOS (*l*oss *o*f signal),[3] (2) proper antenna bearing (azimuth) and elevation at any time and (3) the regions of the earth that have access to the spacecraft at any given instant. In addition, the tracking device should be simple to construct, easy to use and cheap. The Ø3 TRACKER was designed with these needs in mind.

The radio amateur literature contains a great many excellent articles describing satellite tracking devices. Why is another one needed? Previous articles have focused on *circular* orbits (satellite height fixed). AMSAT Phase III-A will be in an *elliptical* orbit (satellite height constantly changing). This complicates tracking requirements. When I first looked into this problem I feared that a suitable tracking device might end up a nightmare of lines and numbers. But this fear never materialized. Instead, some modest modifications of the OSCARLOCATOR[4] or Satellabe,[5] which have proved so popular for tracking Phase II satellites, will provide you with a Ø3 TRACKER. (If you're not familiar with these tracking aids you may want to read the references in Note 5 before continuing.)

What is the Ø3 TRACKER?

The Ø3 TRACKER consists of (1) a map

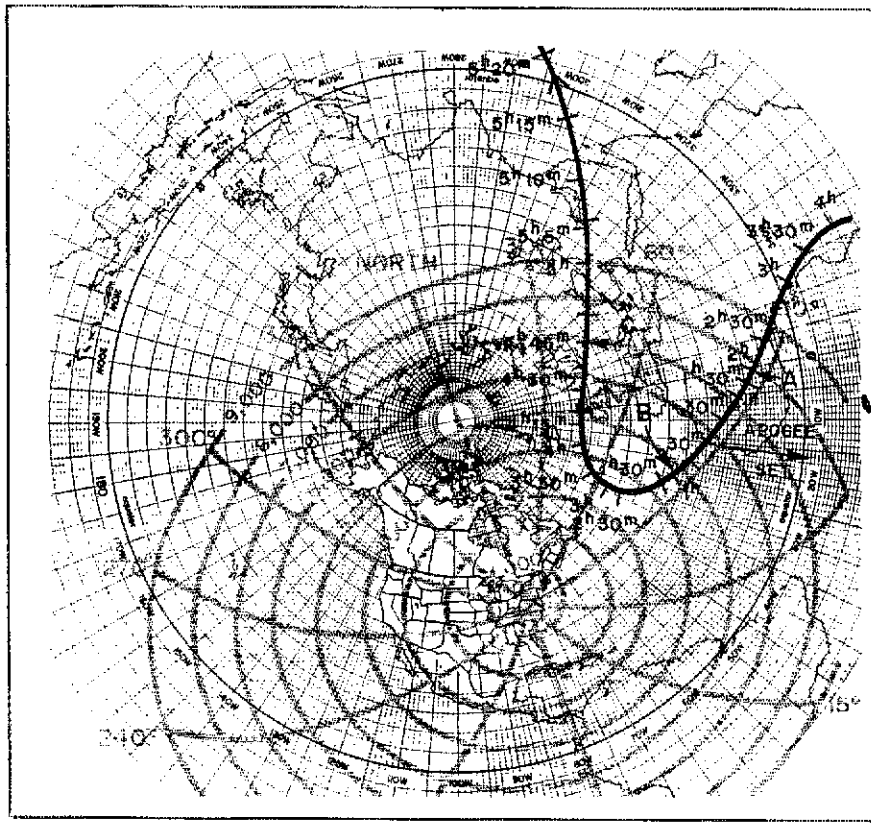


Fig. 1 — Ø3 TRACKER with range and bearing curves drawn about Washington, DC. The ground-track overlay is for the tentative early Phase III-A orbit (described in Table 2). It has been set so that apogee occurs at a longitude of 15° W. Referring to Table 1 and Fig. 2, color the ground track segments and concentric range circles before proceeding.

Table 1

Color coding format for Ø3 TRACKER range circles and orbit overlay

Color	*Map board (range-circle radius, km)*	*Orbit overlay (minimum communication range, km)*
blue	9000	9000
green	8000	8000
yellow	7000	7000
orange	6000	6000
red	5000	5000
brown	4500	4500
black	4000	4000
not coded	3000	— —
not coded	2000	— —
not coded	1000	— —

[1]Notes appear on page 50.
*c/o AMSAT, P. O. Box 27, Washington, DC 20044.

board, (2) a ground track overlay and (3) a table. The following paragraphs describe each part of the ∅3 TRACKER and how the parts work together for tracking AMSAT Phase III-A.

The map board is built around a polar-projection map. Azimuthal-equidistant, polar-projection maps (characterized by equally spaced latitude circles), as used in the OSCARLOCATOR and Satellabe, work well. Stereographic polar-projection maps (characterized by increasing spacing between latitude circles the further one travels from the pole) are also suitable. Amateurs in the Northern Hemisphere should use a North-Pole projection, preferably one extending out to 30° or more past the equator. Each station must mark the location of his or her ground station on the map and draw a series of *color-coded* concentric *range circles* around the ground station. The radii and color-coding format are given in Table I. Note that circles on the surface of the earth usually don't end up looking like circles on a two-dimensional map. Bearing headings radiating out from one's ground station are also needed. A quick glance at Fig. 1 — temporarily ignoring the ground track — should clarify the details of the map board. So far, the ∅3 TRACKER, OSCARLOCATOR and Satellabe are almost identical — the color-coded range circles on the ∅3 TRACKER are similar to the acquisition and elevation circles on the familar Phase II tracking devices.

The ground-track overlay on the ∅3 TRACKER serves the same function as on the OSCARLOCATOR and Satellabe — it shows how the subsatellite point (the point directly below the satellite) moves across the surface of the earth during one orbit. It is drawn on transparent (or semitransparent) material that can be rotated about the pole. A tentative groundtrack overlay for the early days of AMSAT Phase III-A is shown in Fig. 2. The characteristics of the orbit used to generate Fig. 2 are summarized in Table 2. The ground track has a number of important features which should be carefully

This groundtrack overlay is reproduced full scale here for your convenience. Trace it lightly on semitransparent paper or acetate (including the North Pole mark), color the segments as labelled and affix the acetate to the North pole of an OSCARLOCATOR polar projection map. For maps of other sizes and formats, plot your own groundtrack using the data in Table 5. See text for further details.

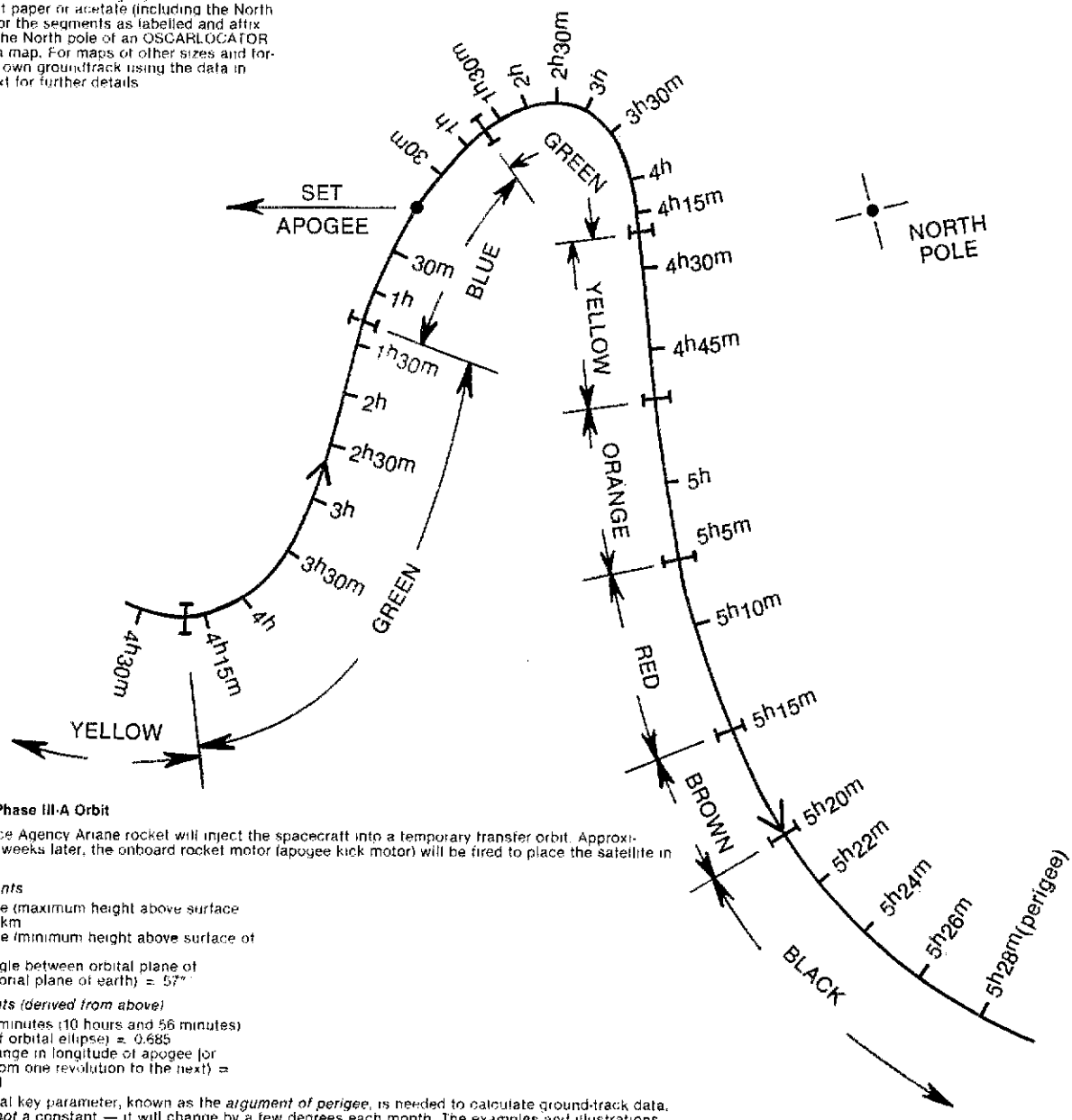


Table 2

Tentative AMSAT Phase III-A Orbit

A European Space Agency Ariane rocket will inject the spacecraft into a temporary transfer orbit. Approximately two to four weeks later, the onboard rocket motor (apogee kick motor) will be fired to place the satellite in the following orbit.

Basic Orbit Constants

1) apogee altitude (maximum height above surface of earth) = 35,800 km
2) perigee altitude (minimum height above surface of earth) = 1500 km
3) inclination (angle between orbital plane of satellite and equatorial plane of earth) = 57°

Additional Constants (derived from above)

4) period = 656 minutes (10 hours and 56 minutes)
5) eccentricity (of orbital ellipse) = 0.685
6) increment (change in longitude of apogee [or ascending node] from one revolution to the next) = 164° West per orbit

Note: One additional key parameter, known as the *argument of perigee*, is needed to calculate ground-track data. This parameter is *not* a constant — it will change by a few degrees each month. The examples and illustrations in this article are based on an argument of perigee of 210°.

Fig. 2 — Ground-track overlay for tentative early AMSAT Phase III-A orbit. If you're using an OSCARLOCATOR for the map board, just trace this figure on a sheet of transparent material. This overlay will have to be changed about every 60 days.

noted: (1) It is color coded (as per Table 1) to show *minimum* access range during each segment of the orbit. For example, during the green section of the orbit the access range will be *at least* 7000 km. This means that any ground station located within 7000 km of the subsatellite point will have access to the spacecraft, and (2) Time is measured from the point on the orbit where the satellite is at its highest altitude, known as the *apogee*, and the direction of satellite motion is shown by arrow heads which appear just north of the equator.

How Does it Work?

The *key* to understanding the operation of the Ø3 TRACKER is contained in the color code. For example: *The green range circle around your ground station is a rough "acquisition circle" during the green segment of the orbit; the yellow range circle is a rough "acquisition circle" during the yellow segment of the orbit, etc.* Note that it is *not* necessary to memorize the distances associated with the various colors.

Now, imagine that the ground-track overlay (Fig. 2) is mounted on the map board using a pin through the pole so that it is free to rotate. To preview a specific AMSAT Phase III-A orbit, the first thing we need to know is where to set the overlay. As with OSCARs 7 and 8, this information will be available in the form of a monthly calendar in *QST*, over W1AW, through AMSAT publications and via a number of other routes. During the early days after launch, W1AW and the AMSAT nets will be the prime data source. A typical calendar entry will include the following information (plus several additional parameters useful for other tracking methods):

July 1, 1980

orbit reference number	*apogee time (UTC)*	*apogee longitude (°West)*
65	0805	15°
66	1901	179°

Carefully note that we're using the time and longitude entries from the calendar which refer to apogee (point of highest altitude), *not* to ascending node (point where satellite crosses from the Southern to the Northern Hemisphere). Orbit reference numbers, however, run from one ascending node to the next ascending node.

An Example

Fig. 1 shows the Ø3 TRACKER aligned for orbit 65 — the apogee longitude has been set to 15° West. From the time marks where the orbit overlay crosses the equator we can determine that orbit 65 begins three hours before apogee (0505 UTC). It ends one period (10 hours and 56 minutes) later at 1601 UTC. The range circles shown are for a station in Washington, DC. The remainder of this example will be easier to follow if you pause at this point to color code at least the two largest range circles (blue and green) and the blue and green segments of the ground-track overlay on Fig. 1 (as per Table 1 and Fig. 2). Our discussion will assume that this has been done.

During orbit 65, acquisition of signal (AOS) for Washington, DC, occurs (roughly) at point A, where the green segment of the ground track overlay crosses the green range circle. The time marks on the ground-track overlay show that this happens about 1 hour and 30 minutes before apogee (0635 UTC). (This estimate can be improved, as we'll see shortly.) The bearing of point A is read directly from the map board — approximately 87°. At AOS the antenna elevation should, of course, be just above the horizon. Now let us look at how the Washington station will determine the position of the satellite at 0905 UTC (same day). At 0905 UTC (apogee plus 1 hour), the satellite will be at position B. The ground-track color is blue, and the satellite is well inside the blue range circle so it is certainly in range. The bearing of the spacecraft is read directly from the map board — about 83°. The elevation of the satellite is obtained from Table 3 in the following manner. The color of the ground-track overlay at point B is blue, so we locate the blue row in the vertical axis of Table 3. The closest range circle to point B is 5000 km, so we locate the 5000-km column along the horizontal axis of Table 3. The elevation angle, 38°, is contained in the box where the blue row intersects the 5000 km column. Loss of signal (LOS) for orbit 65 will occur at position C, about 4 hours

Table 3

Satellite Elevation Angle

GROUND TRACK OVERLAY	ELEVATION ANGLE (DEGREES)																	
BLUE	85	79	74	69	64	58	53	48	43	38	33	28	23	19	14	9	5	0
GREEN	84	78	72	67	61	55	50	44	39	34	29	24	19	14	9	5	0	
YELLOW	83	75	68	61	55	48	42	36	30	25	19	14	9	5	0			
ORANGE	81	71	63	54	46	39	32	26	20	15	9	5	0					
RED	77	65	54	44	36	28	21	15	10	5	0							
BROWN	73	58	46	35	26	19	13	7	2									
BLACK	70	52	39	28	20	13	7	2										
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9

OUT OF RANGE

DISTANCE BETWEEN GROUND STATION AND SUBSATELLITE POINT (x 1000 km)

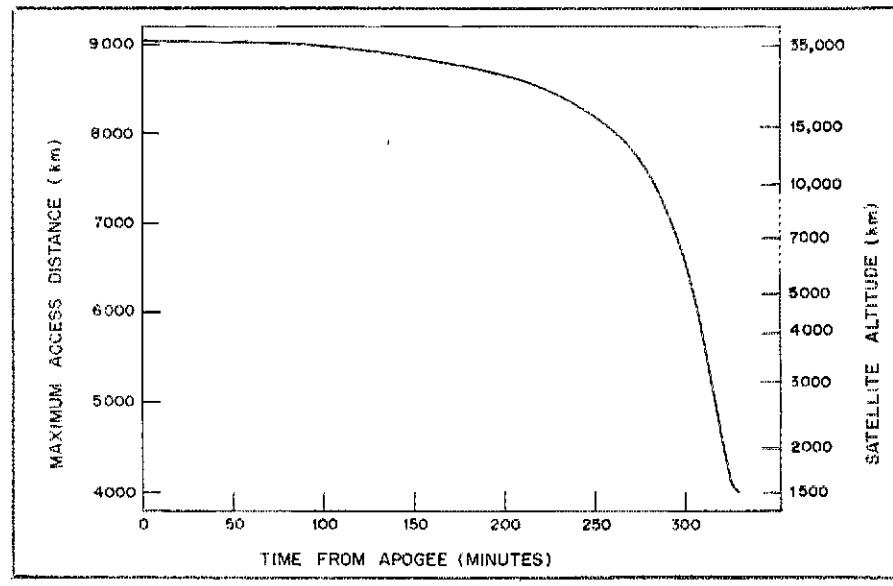


Fig. 3 — This curve can be used to determine the acquisition distance at any time for the projected AMSAT Phase III-A orbit — refer to horizontal and left-hand vertical scales. The relation depends only on orbital eccentricity and apogee altitude, so any change in the final orbital inclination will not affect the curve's validity. The correspondence between acquisition distance and altitude (left- and right-hand vertical scales) holds for any satellite.

and 45 minutes past apogee (1250 UTC) when the yellow orbit-overlay segment crosses the yellow range circle. On this typical orbit the Washington station would have an opening lasting over 6 hours. Near apogee the satellite will be simultaneously available to stations in North America (except for Alaska and the West Coast), Central America, Europe, Africa, the Middle East, a large part of Asiatic Russia and South America (except for the southernmost tip). The next apogee (orbit 66) occurs one period (10 hours and 56 minutes) later — 1901 UTC — at a longitude one increment (164°) further west — 179° West. Given a Ø3 TRACKER and an orbit calendar you should now be able to track AMSAT Phase III-A.

Additional Details

Since the overlay color represents a minimum access distance during the given segment of the orbit, the true acquisition curve at any time will actually lie between the range circle of matching color and the next-larger range circle. Fig. 3 shows acquisition distance as a function of time from (before or after) apogee for the projected AMSAT Phase III-A orbit. Fig. 3 also shows how acquisition distance and altitude are related. Using this graph we see that when AMSAT Phase III-A is 4 hours and 15 minutes from apogee (green segment of orbit), the actual acquisition distance is about 8100 km. The green (8000-km) range circle is therefore a good approximation to the true acquisition circle. At 2 hours from apogee (still in the green segment of the orbit), the satellite altitude is greater but the access distance remains under 9000 km. The actual acquisition distance at this time is about 8900 km — closer to the blue (9000-km) range circle. Referring back to orbit 65, we see that a careful examination would place AOS at approximately 2 hours before apogee. It's questionable whether this refinement is warranted in the real world, where the elevation of one's radio horizon will often result in a larger discrepancy in observed AOS or LOS — especially in the blue and green sections of the orbit where satellite elevation angle changes very slowly. This points up a related fact — although ground station antenna height, by itself, is not important for satellite communications, raising the antenna can have a noticeable effect on AOS and LOS if it lowers your radio horizon by a few degrees.

The Ø3 TRACKER also has other applications. It can, for example, provide a preview of interesting features of the projected early AMSAT Phase III-A orbit. If Fig. 1 had been set so that apogee occurred at a longitude of 175° West, we'd note that the station in Washington, DC, would see the spacecraft rise and set *twice* during this orbit — first for a 2-hour interval just preceding apogee and then again for a 70-minute stretch beginning about 3-1/2 hours after apogee. For a

Table 4

Sources for Polar Maps

1) North pole stereographic projection, multicolor, extends to equator, "USAF Physical-Political Chart of the World"; GH-2A (41-cm diameter) $0.50; GH-2 (82-cm diameter) $1. Source: Department of Commerce, Distribution Division (C-44), National Ocean Survey, Riverdale, MD 20840.

2) North pole stereographic projection, 2-color, 105 cm/100 cm, stock no. DOD WPC xx032004, $0.85. Source: same as 1.

3) South pole stereographic projection, 2 color, 105 cm/100 cm, stock no. DOD WPC xx032007, $0.85. Source: same as 1.

4) North pole azimuthal equidistant projection, black/white, extends to 30° South latitude, 61-cm diameter. Single copies available at no charge from: APT Coordinator, Department of Commerce, NOAA, National Environmental Satellite Center, Suitland, MD 20233. Request "APT Plotting Board" and reference this article.

5) Plain polar graph paper also makes a very effective map board if political boundaries are not needed.

Table 5

Data used to prepare ground track overlay for tentative AMSAT Phase III-A orbit specified in Table 2.

Times after apogee are (+), times before apogee are (−). Northern Hemisphere latitudes are (+), Southern Hemisphere latitudes are (−). Longitudes are in ° West. Updated versions of this Table will be prepared approximately six times per year.

Time from apogee (minutes)	*Color code*	*Subsatellite point*		
		Latitude	*Longitude*	
−310	red	−57.0	55.3	southernmost point
−306		−55.5	39.4	
−305		−55.0	36.6	
−300	orange	−51.1	23.6	
−292		−43.8	10.8	
−285		−38.6	5.1	
−270	yellow	−28.8	358.5	
−260		−23.8	356.7	
−255		−21.4	356.1	
−240		−15.5	355.4	
−210		−6.7	356.9	
−180	green	0.0	0.0	ascending node
−150		5.4	4.1	
−120		10.0	8.5	
−90		14.1	13.1	
−77		15.8	15.3	
−60		17.8	17.9	
−30		21.4	22.7	
0	blue	24.8	27.6	apogee
30		28.1	32.2	
60		31.5	36.4	
77		33.5	38.9	
90		35.0	40.5	
120		38.6	43.7	
150		42.5	46.1	
180	green	46.6	46.7	
210		51.0	44.0	
240		55.3	35.3	
255		56.8	26.5	
260		57.0	22.2	northernmost point
270		56.7	13.2	
285	yellow	52.9	355.2	
292		49.1	346.7	
300		41.3	334.8	
305	orange	34.5	327.8	
306		33.2	326.5	
310	red	25.8	320.7	
315		13.5	312.8	
320	brown	1.1	305.7	
320		0.6	305.4	
320		0.0	305.0	descending node
322		5.7	301.8	
324		−12.0	298.0	
326		−18.6	293.8	
±328	black	−24.8	289.6	perigee
−326		−30.8	284.8	
−324		−36.8	278.9	
−322		−42.2	272.5	
−320		−47.0	264.9	
−320		−47.4	264.2	
−315	brown	−54.5	244.6	
−310	red	−57.0	219.3	southernmost point

satellite moving

discussion of the mathematical and physical basis of the Ø3 TRACKER, see Note 6.

A Simplified Tracker

First, let's cover some basic information. AMSAT Phase III-A will spend about 80% of each orbit in the blue and green segments of the ground-track overlay. Because of geometrical considerations, ground stations will find the satellite in this region more than 90% of the time that is in range. Certain operational difficulties — resulting from rapid satellite motion, and spin modulation and Doppler shifts on the radio links — which aren't of concern near apogee will appear as the satellite approaches perigee. As a consequence, the majority of users will probably tend to confine their operation to an 8-1/2-hour window centered about apogee. Now suppose that a simplified Ø3 TRACKER was constructed with only two range circles — the blue and green ones — and only the blue and green segments of the ground-track overlay were color coded. This "barebones" Ø3 TRACKER would be able to tell us if the satellite were in range during the 8-1/2-hour interval centered on apogee, and provide information on antenna bearing at any time. An amateur using this approach would probably skip Table 3 by scanning antenna elevation to peak received signals.

Construction Hints

The first thing you will need to construct your own Ø3 TRACKER is a map board. The maps of the OSCARLOCATOR and Satellabe are fine. Some additional sources of polar projection maps are given in Table 4. Whatever map you adopt, a set of range circles about your location will be required. Data for these curves can be obtained point-by-point from a globe (a very tedious procedure) or by calculations involving spherical trigonometry. The ARRL has on file a set of computer-generated data tables for producing range and bearing curves for various latitudes. A copy of the table closest to your latitude can be obtained by sending a business-size s.a.s.e. to "Satellite Programs" at ARRL hq. — be sure to specify your latitude. The tables were generated for a longitude of 0° and include instructions for transposing them to your location.[7]

The ground track of Fig. 2 will work directly with the OSCARLOCATOR if it time, so Table 5 and Fig. 2 must be periodically updated. (This isn't necessary for satellites in circular orbits.) With the orbit selected for AMSAT Phase III-A the changes are relatively slow, so an overlay should provide reasonably accurate results for about 60 days. AMSAT and ARRL hq. will try to provide updates as quickly as possible, but please be patient — long-term observations of the spacecraft are needed before reliable long-term predictions can be made. During the early months of AMSAT Phase III-A's operation, copies of the latest version of Table 5 will be made available by ARRL hq. To obtain a copy, mark the lower left-front corner of a business-size s.a.s.e. "Ø3 ground track data" and send it to "Satellite Programs" at ARRL hq. Envelopes received prior to launch will be held until the apogee kick motor has been fired and a reasonably accurate determination of the operational orbit has been obtained. Keep in mind that it's possible that the actual orbit during the first weeks of general operation may be significantly different from the one specified in Table 2.

Acknowledgments

I'd like to thank several people — Kaz Deskur, K2ZRO; Jan King, W3GEY; Karl Meinzer, DJ4ZC; Vern Riportella, WA2LQQ; Pete Thompson; Roy Welch, WØSL and Rich Zwirko, K1HTV — for their detailed comments and suggestions pointing out numerous ways to improve early versions of the Ø3 TRACKER and this article. QST

Notes

[1] Place, "AMSAT-OSCAR Phase III on the Horizon," *QST*, December 1979, pp. 61-64; April 1980, pp. 64-68.

[2] Davidoff, "A Simple Tracking Technique for Satellites in Elliptical Orbits," Event 2560 presented at the American Society for Engineering Education National Conference, Knoxville, Tennessee, June 15, 1976.

[3] Actual AOS and LOS depend on one's local radio horizon. Nevertheless, we follow the usual convention of referencing AOS and LOS to an elevation angle of 0° and say that a satellite is "in range" when the elevation angle is equal to or greater than 0.

[4] To be available from ARRL hq. watch *QST* for details.

[5] Deskur, "Shoot OSCAR with a Satellabe," *73 Magazine*, July 1975, pp. 33-36 and "Track OSCAR 8! Step-by-step Method," *73 Magazine*, November 1977, pp. 86-94.

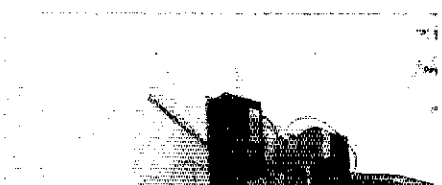
[6] Davidoff, *Using Satellites in the Classroom: A Guide for Science Educators*, Catonsville Community College, Catonsville, Maryland (1978); Supported in part by grants from the U.S. National Science Foundation (SED 75-17333) and Smithsonian Air and Space Museum. Copies of this text are available to the general public on microfiche. Order

Strays

John Browning, W6SP, of Rancho Palos Verdes, California, was chairman of the recent Project OSCAR meeting in El Segundo, California. The meeting included talks on AMSAT/ARRL activities in amateur space communications and descriptions of several circularly polarized 70-cm antenna designs. *(K6PGX photo)*

LISTEN FOR K2KN FROM THE MORSE HOME

☐ The Poughkeepsie (New York) ARC announces that there will be no charge for the commemorative certificate they will award for contacts with the Samuel F. B. Morse home (See April *QST*, page 30.) Call sign K2KN will be used for the celebration. Two-meter operation will be on 146.52 MHz. QSLs to P. O. Box 3070, Poughkeepsie, NY 12603. — *Keith A. Duke, WA2SVN, Wappingers Falls, New York*



Canadian NewsFronts

Conducted By Ron Hesler,* VE1SH

Amateur Rules Amended

Last month in "Happenings" we were able to sneak in a very brief resume of the more important DOC changes to the Radio Regulations affecting amateurs, which became effective February 28. Now we are able to provide you with more of the detail which has been provided by our Ottawa representative, Ray Perlin, VE3FN, the CRRL executive assistant to the president.

Some of these changes were in accordance with previously recommended CRRL proposals. Some *few* others, most notably the 40-meter phone band expansion, had been opposed by the League, for previously published reasons. It just goes to prove that no one can ever expect "to win 'em all"!

The main changes are as follows:

1) We have lost (as expected) 420 to 430 MHz; however, 430 to 450 MHz has been retained for amateur use.

2) A new amateur band has been created at 902 to 928 MHz (as had been solely proposed by CRRL); however, A3 and F3 emissions only are permitted at these frequencies.

3) A3 operation, for Advanced amateurs, is now permitted in the frequency band of 7050 to 7100 kHz.

4) Schedule Five has been amended to permit A3 operation on the frequency band 1800 to 2000 kHz after six months' operation (similar to the previously authorized 28-MHz A3 operation. Now after six months' operation an amateur may have his license endorsed for both frequencies).

5) Deleted are the conditions attached to the operation of portable or mobile installations, *with the exception* of the frequency restrictions applying to operation onboard ships and aircraft.

6) Amateur class certificate holders with six months of operating experience may use F1 emission in frequency bands between 3500 and 28,100 kHz.

7) The license of an Amateur station may operate radio-controlled models:

a) In the frequency bands 40.66 to 40.70 MHz and 2450 to 2500 MHz if the power output does not exceed 5 watts; and

b) In all frequency bands above 53 MHz allocated for use under Section 42.

8) Where an emergency situation exists, the operator of an amateur station may use his station to communicate any type of message for himself or on behalf of third parties, but he shall not accept remuneration in any form in respect to any such communication.

9) No person shall install or operate an amateur station on an aircraft except as may be specifically authorized by the Minister of Communications. The same requirement also affects operation onboard ships.

10) The licensee of an amateur station shall ensure that his radio station is equipped with a reliable means of:

a) Determining the operating frequency;

b) Preventing or indicating overmodulation in the case of a radiotelephone transmitter; and

c) Measuring the dc power input to the anode or collector circuit of the final stage where such power input exceeds 400 watts.

11) The amateur must ensure that the station power:

a) If expressed as dc input power, does not exceed 1000 watts to the anode or collector of the final stage; *or*

b) If expressed as rf output power measured across an impedance-matched load, does not exceed 2250 watts PEP for single-sideband, 750 watts' carrier power for other type of emissions, and 100 watts' peak power and 10 watts' average power for pulse-modulated transmitters at frequencies below 1215 MHz or 2500 watts' peak power and 25 watts' average power for transmitters that are pulse modulated and operate at frequencies above 1215 MHz.

12) United States amateurs may operate in Canada without prior registration but only using the frequencies, types of emission or modes of transmissions *they are authorized in their own country* — provided, of course, that those frequencies, types of emission or modes of transmission are authorized by Canadian regulations. The same requirement also pertains to all foreign amateur operation in Canada except that, *in addition,* a reciprocal agreement must be in effect between Canada and the other country.

This of course means that U.S. amateurs will no longer be able to operate in what has become known as the "Canadian" phone bands. Even worse for visiting amateurs from other countries is this new regulation. For example, a German amateur will only be able to operate from 7.0 to 7.1 MHz while visiting Canada, because this is all his license permits in his own country. Additionally, inasmuch as the German 2-meter band is only 144 to 146 MHz, he will not be able to use any of our 146- to 148-MHz repeaters.

Needless perhaps to say at this point, the CRRL is not at all "happy" over this new regulation pertaining to foreign operation in Canada, and the Executive Committee, at this writing, is studying appropriate action.

In respect to candidates for all amateur classes of license, please be advised that questions on the regulations will be based on the regulations *prior to these changes* until after the June 18, 1980 examination. Thus, the examination of October 15, 1980, will be the first examination with the Radio Regulation questions based upon these new regulations.

A CANADIAN NOVICE CERTIFICATE?

Should we follow the example of at least 13 other countries, including Norway, Australia and the United States, in having a Canadian Novice Certificate, with restricted privileges but which would provide valuable "on the air" experience? As previously reported, the CRRL has formed a special Ad-Hoc Committee to study this matter, under the chairmanship of CRRL Director Tom Atkins, VE3CDM. If there is sufficient interest and support, the League will proceed accordingly. Please talk it over and have a discussion at your local club and then write Director Atkins with your comment. His address: 55 Havenbrook Blvd., Willowdale, ON M2J 1A7.

THE 1980 RSO CONVENTION

This Convention, Canada's largest ham gathering, will take place this year at the Prince Hotel, Toronto, October 3 to 5. The program, although not completed at this date, will include an update on WARC '79, DX and antenna forums, technical lectures and demonstrations, a large commercial exhibit, and special forums for RSO, CARF and CRRL, and many prizes. The annual Friday night Eyeball and Saturday Banquet will be events to remember, as always. For information concerning commercial displays and demonstrations, please write the RSO Convention Committee, P. O. Box 997, Station B, Willowdale, ON M2K 2T6.

Bob Rotenberg, VE3AKN, and Marv Nash, VE3FON, two of the most experienced and talented convention chairmen in the business, will again be the Convention co-chairmen for this important event.

Mark your 1980 calendar *now* and plan to attend the RSO this year — you won't regret it. QST

*President, CRRL

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

An FCC Rulemaking Primer

Over the past several years, the amateur community has witnessed a trend toward deregulation on the part of the FCC. The Commission's goals are to reduce the complexity of the rules, to shorten the total text of the rules by eliminating unnecessary regulations and to stress the basic principles of the Amateur Radio Service. By acting in this manner, they feel that amateurs will have less of a need to seek rule changes. Additionally, the Commission is presently acting under a White House executive order to rewrite the rules in a plain-language manner. To a significant extent, these ends are being achieved. But what about the means — how does the Commission engage in the rulemaking process? This month's installment will attempt to describe this process and explain how you can be a part of it.

Q. How does one go about the task of seeking a change in the rules?

A. You may wish to petition the FCC directly. Send the original and five (5) copies of your petition to the Secretary, Federal Communications Commission, Washington, DC 20554. However, there are a few things you should consider before filing that petition for rulemaking. There is "strength in numbers." Run your idea(s) by the local radio club; perhaps club members have similar feelings. In fact, they may even wish to file your petition on behalf of the entire club. Check to see if there is already a petition on file with the Commission that deals with your particular ideas — if there is, you may simply wish to add your comments (positive or negative) to it.

In many ways, the best method is to try to enlist the support of the ARRL through your division director who represents you. The members of the ARRL Board of Directors affect league policy by directing the Headquarters staff to file a petition or respond to one with comments.

Q. What happens to a petition for rulemaking when it is received by the Commission?

A. When the Commission receives a petition for rulemaking, it either assigns the petition a Rulemaking (RM) number, or files it with other petitions requesting similar action. A public notice is issued. The secretary then files the petition in the FCC Document room in Washington, DC, where it is available for public inspection. Normally, interested parties are invited to comment on the relative merits and demerits of the petition within 30 days following the public notice. You must also send a copy of your comments to the petitioner. In practice, however, it is usually several months before the Commission acts on a petition, and formal comments are often accepted up to that point.

Q. What happens to the petition after it is filed by the Commission secretary?

A. The petition is reviewed by the appropriate bureaus and offices within the FCC. At some point, the Commission will make a determination either to dismiss the petition (if it appears to have no merit or deals with an issue already decided) or, if it appears to have merit, assign it a docket number and release it to the public in the form of Notice of Inquiry (NOI) or Notice of Proposed Rulemaking (NPRM). A Notice of Inquiry means the Commission is interested in conducting further study of the petition, but does not propose any specific changes to the rules. Specific rule-change proposals are handled through a Notice of Proposed Rulemaking. On rare occasions, if a petition for rulemaking requests a minor editorial change to the rules, a lifting of restrictions, or a procedural change of no substantive impact, the Commission may proceed directly to a Report and Order (RO) and bypass the intermediate NOI or NPRM.

Q. What follows the drafting of a NOI, NPRM or RO?

A. Approval of the Notice is required by the chief of the Private Radio Bureau, who then submits it for the Commission Agenda (the seven Commissioners meeting in formal session). However, if the petition is to be denied or dismissed, an Order to Deny or to Dismiss can be signed by the Private Radio Bureau chief, "under delegated authority." Usually, though, the bureau goes to the Commission both to accept or deny petitions. It's a bureau judgment as to whether or not to bring it to the Commissioners.

Q. What happens at the meeting of the Commissioners?

A. At these meetings, the Private Radio Bureau chief represents his bureau. Other offices within the Commission affected by the possible action are represented by their bureau chief. The author of the item presents arguments in support of his bureau's recommendations. After discussion, the Commissioners either send the item back for further revision and refinement, or they adopt it. If adopted, a docket number is assigned, and the action is published in the *Federal Register*, (available in most public libraries). A Public Notice is also issued. At this juncture, public (that's us, gang!) participation is actively sought. In matters of the Amateur Radio Service, the FCC normally allows 90 days or more for interested parties to submit their comments. To participate formally in the proceeding, file the original and five copies of your comments with the secretary. There is also a period of 30 days for Reply Comments, in which interested parties may reply to other comments placed in the docket file. The Private Radio Bureau then reviews all of the comments filed. In the case of an NPRM, it proceeds to draft a Report and Order adopting the new rules — as proposed, or with the modifications suggested by the commenting parties. If the proposals met with well-founded objections, the Commission may simply dismiss the matter completely. After a Notice of Inquiry, the Commission can issue a Notice of Proposed Rulemaking or terminate the proceedings with a Memorandum Opinion and Order.

Now the entire matter is again brought before the Commissioners. They discuss it and either send the rulemaking back for further refinement or adopt and release it. The new rules go into effect about 30 days after publication in the *Federal Register*. A Public Notice is also issued.

Q. What can I do if I am dissatisfied with the outcome of the proceedings?

A. You may wish to file a Petition for Reconsideration.

Q. What are some of the major items affecting Amateur Radio presently before the Commission?

A. *Amateur Satellite Rules* (Docket 19852): In an NPRM adopted late last year, the Commission proposes a Subpart H (Amateur Satellite Service). Filing deadlines have passed; Commission action is pending. *ASCII* (Docket 20777): ASCII use in the Amateur Service has been approved by the Commission. Some provisions in this popular docket have been adopted, others are pending. The *10-Meter Amplifier Ban* and *Type Acceptance* Dockets (21116 and 21117, respectively) have been adopted by the Commission. *Call Signs* (Docket 21135): Most amateurs are familiar with this docket concerning the simplification of licensing and call sign assignment. Some provisions have been adopted, others are pending. In Docket 79-285 the Commission has adopted an NPRM to extend the sub-band on which amateurs may use *standard bandwidth* (16F3) *fm* on 6 meters. This docket is awaiting Commission action. Other dockets include 79-140 (NOI into the creation of a new *Personal Radio Service* at 900 MHz); 78-250 (NOI into the administration of *code tests to handicapped applicants*); and 78-369 (NOI into the *susceptibility of electronic equipment to radio frequency interference*).

This is by no means a comprehensive list, but is provided to lend some perspective on the types of items the FCC holds in consideration concerning Amateur Radio. For current information on pending dockets and petitions affecting the Amateur Radio Service, check the "Happenings" column each month in *QST*, or contact the Membership Services Department, ARRL, Newington, CT 06111.

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been reviewed by FCC staff. Interpretations contained herein concur with those of the FCC's Personal Radio Branch.]

*Membership Services Assistant, ARRL.

The New Frontier

The World Above 1 Gig

Conducted By Bob Cooper Jr.,* W5KHT

The Record — Straight and Otherwise

Now that WARC '79 is past and as a fraternity we have a better feel for what super high frequency (shf) bands we will be permitted to use in the decade ahead, it is time to turn our attention to the great diversity they offer. Amateur interests in shf are not totally different from commercial interests; both recognize that large "chunks" of spectrum lend themselves to wideband and/or high-speed data links much better than, say, hf or even vhf asignments. And just as "commercial" interests view some portions of the shf spectrum as ideal for experiments in such areas as radio astronomy, so do many amateurs who seek to blend their hobby with one relating to astronomy. It turns out that equipment constructed for one purpose can be useful in the other as well, as reported here in February.

In that column I4BER reported on reception from such extragalactic noise sources as Cassiopeia A, and the H-II region in the Orion nebula as well as "closer" noise targets — our sun and the moon. KA3BLO suggests that there is more to this than pointing a Gunnplexer into the sky; as well there is!

John writes: "I4BER's system has sufficient sensitivity to receive the sun. However, in order for him to receive the other radio sources it is necessary to use a technique called radiometry. In its most basic form a radiometer just involves the addition of a low-pass filter after the detector diode. This low-pass filter will usually have a bandwidth of less than 100 Hz, and in some cases may have a bandwidth as small as 0.001 Hz. The effect of the filter is to reduce the noise power in the output of the receiver due to the front-end noise. Often this low-pass filter is implemented as an RC filter."

John goes on to provide a table of the flux density to be expected from some of the stronger radio sources, at our 10-GHz band. The data in Table 1 assumes a 60% efficient antenna of 3-meter size with a 7-dB (1200-kelvin) noise temperature. It should be added that "noise levels" are normalized; the sun noise may double during solar events and the lunar noise increases by as much as 50% during the lunar cycle from the levels given.

John summarizes this way: "The quiet sun is readily detectable without using a radiometer. The moon is easily detected if a simple radiometer is used. Other sources shown could be marginally detected."

Closer to earth, VK6KZ has spent another Southern Hemisphere "summer" investigating the potentials offered by shf ducting across the Australian Bight, that large body of water along the continent's southern shore. Walter reports this past "season" produced yet new records in the upper uhf bands. With the new records comes new knowledge about the potentials for our amateur assignments above 1 GHz.

VK6KZ has made the casual hobby of experimentation in amateur uhf and shf bands into a serious study of weather-related phenomena. In past years he has kept a portable station capable of operating from 144 MHz up through 2304 MHz ready to hit the road on short notice; the notice coming from the weather bureau maps and reports of building high pressure areas over the Bight. This season the right conditions seemed to be building on January 22 — a long-wave pattern in the Southern Hemisphere comprised of four waves with troughs located near 85° East and 170° East with a ridge at 130° East.

Table 1

(S/N) Rf	(S/N) V Bv = 100 Hz	Bv = 1 Hz	Bv = 0.1 Hz	Source
6 dB	—	—	—	Quiet sun
−14 dB	4 dB	14 dB	19 dB	Moon
−31 dB	−13 dB	−3 dB	2 dB	Cassiopeia A
−33 dB	−15 dB	−5 dB	0 dB	Orion nebula
−37 dB	−19 dB	−9 dB	−4 dB	Cygnus A

Each year Walter has moved farther and farther west along the Australian shoreline. His most-recent experience took him to Cape Leeuwin, the southwesternmost point in southern Australia. This "shot" across the Bight from VK6 would head him into eastern VK5 and, hopefully, into VK3 as well.

Results were evident even as he set up his portable station; 800- to 1100-mile 144-MHz signals were present at the time! The first real success came at 0057 UTC when VK5QR was worked by VK6KZ/P on 1296-MHz ssb, a distance of 2146 km (1333.5 miles) with 5-3 reports both ways! In the past this path, which is essentially over water, has rarely been exploited because of the thin density of amateurs along the coastal area of western Australia. It is this "lack of activity" that has prompted VK6KZ to go portable from his home QTH near Perth on the western coast. During this particular opening, however, vhf signals in the 2-meter band did make that overland/overwater path from Perth to Adelaide; the first such occurrence since approximately 1952. This leads to speculation that uhf and even shf signals might also make it across the land mass into the Bight on occasion. A rough parallel would be an extension of the U.S. Gulf Coast tropo openings inland from the Texas coastline to locations in central and northern Texas, paths we do know are covered on occasions in our own spring on both 144 and 432 MHz — and perhaps even higher.

Meanwhile, in Australia, the conditions kept Walter on post at Cape Leeuwin through the 23rd, and with exciting results. At 1200 UTC on the 23rd he managed a 4-3/4-2 exchange with VK5MC on 1296 MHz over a path of 2290 km (1423 miles) — a new world's record! It was at about this time that the lower bands (144 and 432 MHz) were showing signs of lengthening out; a contact with VK3YLR east of Melbourne on 144 MHz clocks in at 2785 km (1730 miles), and the VK3 heard Walter on 432 but no contact was made. The potential certainly existed for stretching the 1296 record out several hundred additional miles, and you can be sure that Walter will be back at it again in the 1981 summer period.

The equipment at VK6KZ/P is the careful result of several years of prior efforts. Everything must be packed into a small auto — and that includes antennas. A modified Kenwood TS-120V transceiver at 28 MHz drives Microwave Modules transverters at 10 watts on 144 and 432 MHz. The 1296-MHz ssb signal was created by starting at 21 MHz; output power at 1296 is about 4 watts which drives a 1-meter parabolic dish mounted above the car! The receiver consisted of a pair of BFR91 rf amplifiers ahead of a Microwave Modules converter.

VK6KZ notes that he believes the potential for extremely long-haul work at vhf, ufh and shf has barely been tapped to date. In particular he would like to encourage systematic checking between say, VK5/6 and ZS, starting off on 144 MHz and then working up into the shf region as results merit. Several studies of the weather characteristics required to produce such extremely long-haul super ducting in the vhf-uhf region by chaps such as VK5TN support the theory that the chances are at least present for such contacts. Are there some ZS stations who would like to dedicate themselves to a try? Contact VK6KZ directly.

Yet another source for data and equipment for the 10-GHz band is brought to our attention by W4YOK. Tom reports that readers might be interested in obtaining a two-sided data sheet from General Electric's Microwave and Imaging Division (Owensboro, KY 42301) describing their C-2126A MCM Doppler Transceiver. This is a 10.525-GHz package (stock) with 3-mW output operating much like the familiar Microwave Associates Gunnplexers. Typical power output is obtained with 8 to 9 volts applied. The data sheet describes both an operational Doppler sensor system and a horn antenna which can, they state, in the Doppler mode detect a walking-man target at ranges of several hundred feet with relatively simple attachment circuitry.

W4YOK adds that he has designed and made operate an a-m technique for the system for those who are stopped by normal fm techniques. A handful of parts (two to be exact) give 50% a-m with some fm also present. He notes the Gunn-oscillator frequency change is typically 6 MHz-per-volt of bias change at 10 GHz, and although a broadband a-m detector won't notice the fm present, the use of spectrum is hardly efficient. Details of this, for those who might like to experiment with either the G.E. Doppler system or low-cost a-m at 10 GHz, can be had from Thomas W. Webb, W4YOK, 231 Bittersweet Ln., Henderson, KY 42420.

Rte. 5, Box 364, Guthrie, OK 73044

Happenings

Conducted By W. Dale Clift,* WA3NLO

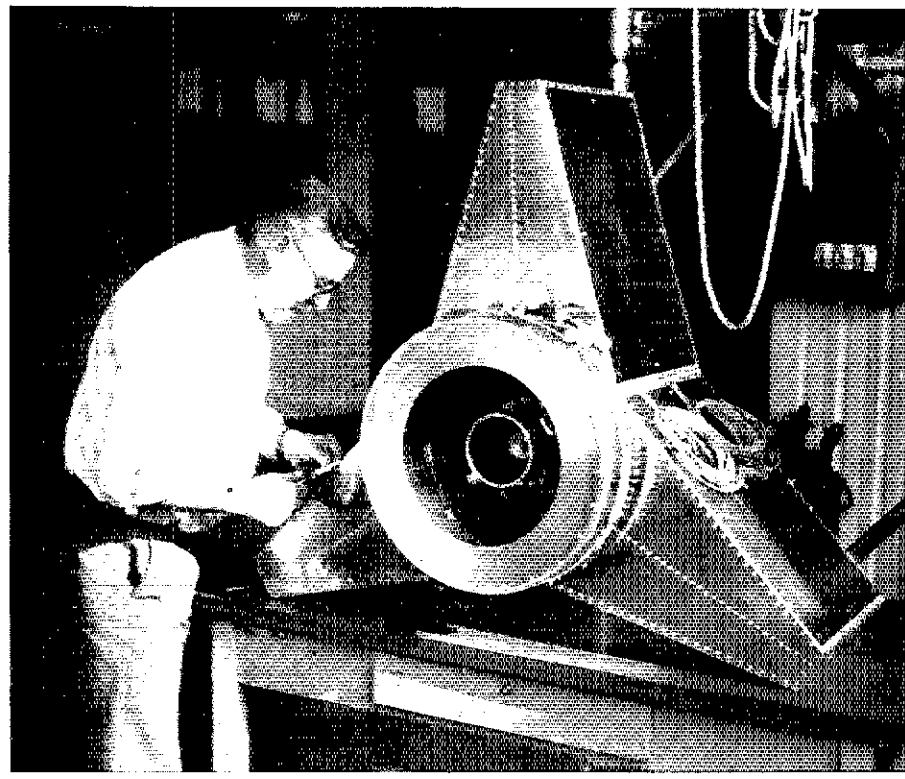
Phase III Launch Day Approaches

AMSAT-OSCAR Phase III will soon be launched aboard the European Space Agency's Ariane LO2 mission from Kourou, French Guiana. The official launch window is May 20 through May 28, 1980, between 1130 and 1400 UTC daily. At the time of this writing, the most probable date was May 23, though this is subject to change at any time up to launch. For the latest information on launch day changes, monitor WIAW bulletins (see April *QST*, page 97), the AMSAT Nets (times and frequencies on the OSCAR Operating Schedule page of each *QST*) or check in on one of the AMSAT Watch Frequencies: 28.88 MHz, 21.28 MHz and 14.28 MHz.

Assuming all goes according to schedule, AMSAT-OSCAR 9 will achieve transfer orbit within about 20 minutes after launch. Users are *not* to use the passband, as AMSAT personnel will be making extremely critical measurements and spacecraft attitude adjustments for several weeks in preparation for the kick-motor firing. Within three to four weeks after launch, with the satellite precisely oriented, the command for kick motor firing will be uploaded into the computer and the satellite will be "kicked" into its final orbit. An additional day or two will be dedicated to testing, and then the passband will be opened for general use. The actual day will be announced shortly after spacecraft insertion into final orbit.

The AMSAT Launch Information Network Service will be on the air beginning one week before scheduled launch and will remain on through launch until about two weeks after. WA2LQQ will coordinate the crew of WA6GFY and W2JT, who will transmit daily worldwide bulletins. Check AMSAT Nets, Watch Frequencies and WIAW bulletins for specifics.

Launch Day will bring expanded coverage of up to several hours of real-time status reports and general information from the European Space Agency in Kourou via landline link with NASA Goddard Space Flight Center in Maryland. Landlines from Goddard will be patched into WIAW (retransmitted on all WIAW ssb bulletin frequencies), WA2LQQ (retransmitted on 14.260 MHz lsb) and WA6GFY (retransmitted on 7.184 MHz lsb and 14.260 MHz usb). As each station in the network will carry the same information and have different geographical beaming responsibilities, determine which signal is best for your QTH. These will *not* be two-way transmissions; please do *not* try to establish contact with the launch day bulletin stations. Queries may be raised on the AMSAT Watch Frequencies after the bulletin stations have terminated operation.



AMSAT/DL technician Konrad Muller prepares the Phase III satellite for a test. *(photo courtesy AMSAT/DL, DJ5KQ)*

Activities will begin between one hour and one-half hour prior to the launch window on launch day — specifics will be announced via all the aforementioned sources as launch day approaches. To make this activity possible, WIAW will forego its morning (EDST) cw and RTTY bulletins for the duration of the launch information service. After launch, WIAW will resume its regular summer schedule. — *Steve Place, WB1EYI.*

NEW FCC EXAMINATION SCHEDULE FOR WASHINGTON, DC, AREA

The responsibility for conducting commercial and amateur operator license examinations in the Washington, DC, area has been shifted from the Field Operations Bureau's Washington district office in Hyattsville, Maryland, to the Baltimore district office. Examinations will be conducted once each month.

Applicants wishing to take an examination in the Washington area must make an appointment at least two weeks in advance by mailing a completed application to FCC, 1017 Federal Building, 31 Hopkins Plaza, Baltimore, MD 21201, Tel. 301-962-2728. Applicants will be notified of the time and place to appear for examination. Application forms may be obtained from the Baltimore District Office, as shown above, or from the FCC Washington District Office, P. O. Box 1789, Hyattsville, MD 20788, Tel. 301-436-7591.

Examinations continue to be offered weekly at the FCC's Baltimore office. Commercial Radiotelephone examinations are administered on Monday and Friday from 8:30 until 12:00 noon. Amateur examinations requiring code tests are on Monday at 8:30 while those not requiring code are on Monday and Friday from 8:30 until 12 noon. A prior appointment is not required to take examinations at the Baltimore office. — *FCC News Release*

CLUB CALLS — THOSE THAT HAVE THEM CAN KEEP THEM

Since 1977 there has been a freeze on the issuance of *new* station licenses for club, military recreation, and RACES stations. Those amateurs presently holding such licenses have been allowed to modify and/or renew them as necessary.

In an open meeting March 12, 1979 the FCC voted to, in effect, make this *freeze* permanent. Out of a number of options presented to it by its staff, the Commission decided to continue

*Deputy Manager, Membership Services, ARRL

renewing and modifying club, military recreation and RACES station licenses, but not to resume licensing new stations of these types.

Other options presented to, but rejected by, the Commission were the resumption of the issuance of club, military recreation and RACES station licenses, and the discontinuance of all such licenses. — *Hal Steinman, KIFHN*

FCC STAFF CLARIFIES RULES FOR GENERATING RTTY ON HF BANDS

In 1953, when FCC decided to allow radioteleprinter (RTTY) transmissions generated by frequency-shift keying (FSK) on segments of the hf amateur bands, it continued its prohibition of audio frequency-shift keying (AFSK) on frequencies below 50.1 MHz. Only on vhf did it permit the use of a carrier with audio tones (AFSK) for radioteleprinter transmissions. AFSK with a carrier is considered to be an F2 emission type.

Today, the amateur rules continue to prohibit F2 emissions on frequencies below 50.1 MHz. However, a recent letter from the FCC's Technical Standards Branch notes that when AFSK is employed as part of a single-sideband (ssb) suppressed-carrier emission, the resulting signal does not have the characteristics of an F2 emission. Rather, the emitted signal has the characteristics of an F1 emission. The letter also states that since regulations for the Amateur Radio Service are concerned with the transmitted signal and not the method used to generate that signal, an AFSK signal on an ssb suppressed-carrier emission is considered to be an F1 emission. This signal would be allowed on any frequency band for which F1 emissions are allowed.

This means Baudot and ASCII transmissions may be generated as F1 emissions by feeding audio tones into the audio input of a high-quality ssb rig having good suppression of the carrier and unwanted sideband. F1 emission is permitted on the following frequencies: 3500-3775 kHz, 7000-7150 kHz, 14,000-14,200 kHz, 21,000-21,250 kHz, and 28,000-28,500 kHz.

FCC PROPOSES PROGRAM: REIMBURSE NEEDY RULEMAKING PARTICIPANTS

The FCC has proposed a program which, if adopted, would provide money to consumers, small businesses and other groups to pay the expenses involved in participating in Commission rulemakings. General Docket 78-205 asks for public comments on whether FCC should set up this program, which would pay for analysis and research, legal and consultant fees, travel expenses to Washington, DC, or other similar expenses. If funds are approved by Congress, the program would be a one-year pilot program that would give a total of $500,000 to eligible participants.

According to an FCC news release announcing the proposal, the test of eligibility "generally would be an expectation that an applicant for reimbursement would contribute substantially to a full and fair determination of the issues." However, an applicant could have his own funds and still be eligible. For example, a participant might be eligible for reimbursement because his own resources were limited and allocated to other uses.

FCC would set up an evaluation panel, tentatively made up of the chiefs of the Offices of Plans and Policy, Science and Technology, and the General Counsel, to issue written determinations on each application for reimbursement. The panel could solicit input from other FCC staff as to whether an applicant is eligible for reimbursement; however, "staff members directly involved in a rulemaking should not decide on reimbursements related to it, lest the accusation of favoritism be raised."

The FCC Consumer Assistance and Information Division of the Office of Public Affairs would be responsible for a comprehensive outreach program to seek out eligible participants. The Division would also help applicants prepare their requests for reimbursements and process the applications for the evaluation panel. Both FCC and the General Accounting Office would be authorized to audit the records of any person or organization receiving funds.

Not all the Commissioners agreed to proposing the program. Commissioner Robert E. Lee issued a sharp dissent entitled, "All that Glitters . . .", which criticized the majority for proposing "more bureaucracy." Lee said that more than $100,000 in new personnel and related expenses, plus the cost of existing staff who must be diverted from their present responsibilities, would be necessary to administer a program giving away $500,000. This is a lot of money to the taxpayers, "who are being hundred-thousand-dollared to death." The Commissioner added that he would prefer using the Commission's resources for staff expertise and contract work, including research suggested by participants in FCC proceedings.

Action by the Commission in Docket 78-205 makes the grant program the subject of a Notice of Proposed Rulemaking. Commissioners Ferris (chairman), Fogarty, Brown and Quello voted in favor of the NPRM. Commissioners Lee, Washburn and Jones dissented. The deadline for public comment on the proposal was April 7, 1980. However, FCC will continue to accept comments on an informal basis. Reply comments were due April 23, 1980. For further information, contact FCC staff Randolph May at 202-632-6444, or Erika Jones at 202-632-7000.

The Muskegon (Michigan) Area Amateur Radio Council has purchased eight sets of ARRL publications for distribution to libraries in the area. Shown here, making a presentation to the Muskegon Community College library, are from left to right, Hank Riekels, WA8GVK, from MAARC; Sandra Yee, college librarian; a library assistant; Jack Thompson, president of Muskegon Community College; and an unidentified assistant.

NEW RULES UNDER STUDY FOR NATIONWIDE CIVIL DISASTER RADIO

In response to petitions for rulemaking, the FCC has begun a proceeding (General Docket 80-7) to reallocate certain frequencies between 2 and 10 MHz and provide standards for operating a nationwide civil disaster radio response program. This proceeding will have no effect on frequencies allocated to the Amateur Radio Service.

The proceeding proposes to delete Part 99 (Disaster Communications Service) of the Commission's rules. It would also amend Part 90 (Local Government Radio Service) to include specific frequencies, restrict eligibility for use of the frequencies to states, territories and possessions, and require approval by the FCC of communications plans to use these frequencies. The League will be filing comments in General Docket 80-7 requesting that provision be made in the proposed state-level disaster radio response communication system for utilization of Amateur Radio stations and operators. — *Hal Steinman, KIFHN*

AMATEUR LICENSE PLATE ACTIONS

Kansas: State motor vehicle laws have been amended to extend the availability of amateur call-letter plates to owners of private trucks licensed for a gross weight of not more than 16,000 pounds. Senate Bill 580 was hurried through the legislature because new five-year license tags are being issued this year.

Nebraska: A bill was introduced in the Nebraska State Legislature with a provision to include amateur call-letter plates in the "Prestige License Plate Class." With the bill still in committee, however, all references to amateur plates being reclassified as "prestige

plates" have been deleted. At press time, the bill had not reached the floor for consideration.

California: Thanks to a California legislator, motorcycle-riding hams in the Golden State may soon display their call letters on motorcycle plates free of charge. Southern California Assemblyman Bob Hayes has introduced legislation that would remove a little-known restriction on motorcyle call plates. While the bill has met no opposition thus far, California hams are urged to contact their assemblymen to lobby for support of AB 1987. — *Bill Tubbs, KB6JM*

Connecticut: A Connecticut ham recently proposed to the State Transportation Committee a bill that would extend the availability of call letter plates to motorcycles and campers. The committee drafted Bill 5299 with the above provision and one of its own deleting the provision that exempts amateurs from having to pay an extra fee for call-letter plates. A public hearing was held March 12. The bill is presently out of Committee, but was still pending at press time. — *Rick Palm, K1CE*

BREWER LABS HIT WITH AMPLIFIER INJUNCTION

On February 27, 1980, Federal Judge Frank Seay of the Eastern District of Oklahoma issued a permanent injunction against Brewer Labs, Inc., of Porter, Oklahoma, for its continued domestic marketing of external radio-frequency power amplifiers and amplifier kits that are capable of operation between 24 and 35 MHz. The injunction followed the seizure of 477 power amplifiers and amplifier kits including such devices designated as "cw transmitters." This is the first instance in which a court has considered it to be illegal to market "cw transmitters" which could easily be modified to be amplifiers. The injunction also prohibits Brewer Labs from modifying existing amplifiers for higher output power.

Engineers from the FCC's Dallas office developed the evidence which led to the injunction. Brewer Labs was found guilty on June 1, 1979, and their actions have been prohibited by the Commission rules since April 28, 1978. — *Bruce Kampe, WA1POI*

FAR SCHOLARSHIPS

The Foundation for Amateur Radio, Inc., a non-profit organization with headquarters in Washington, DC, plans to award seven scholarships for the academic year 1980-81. All amateurs holding a license of at least the FCC General class or equivalent can compete for one or more of the awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college or technical school. The scholarship awards range from $300 to $900, with preference given in some of them to residents of various areas.

Additional information and an application form can be requested by a letter or postcard, postmarked prior to May 31, 1980, from: FAR Scholarships, 8101 Hampden Ln., Bethesda, MD 20014.

The Foundation is devoted exclusively to promoting the interests of Amateur Radio and to scientific, literary and educational pursuits that advance the purposes of Amateur Radio. — *Foundation for Amateur Radio.*

HAWAII AND PACIFIC ISLAND FCC MATTERS TRANSFERRED TO SEATTLE FIELD OFFICE

The Commission has amended Part 0 of its rules by transferring the responsibility for the Hawaii and Pacific Island FCC field installations from the San Francisco Regional Office to the Seattle Regional Office. The Commission said Hawaii and the Pacific Islands were originally assigned to San Francisco because they are closest to that field office. However, experience has shown that a "normal work and travel flow" exists between the triangle made up of Hawaii, the Pacific Islands and Seattle. It said transfer of these areas to the Seattle Regional Office would enhance the efficiency of the Field Operations Bureau. The rule change became effective April 1, 1980. For further information, contact Sylvia Sternstein at 202-632-7591. — *from FCC News Release.*

[Editor's Note: This administrative change will not affect the FCC Hawaii District Office's responsibility for amateur examinations.]

CANADA'S ONE MILLION CB RADIO USERS TO GET COMPUTERIZED LICENSING SERVICE

The federal Department of Communications (DOC) is now introducing a national computerized licensing system for the General Radio Service (GRS, or CB radio). Canada has approximately one million CB users, with the licenses of some 360,000 of them expiring this March 31. First renewal notices are now being mailed from a new central computer facility at DOC headquarters in Ottawa. The computer will process returns and will soon be issuing all licenses. Users still awaiting renewal notifications, formerly mailed from their nearest DOC district offices, should now simply watch the mail for a computer notice from Ottawa.

The move to the new automated licensing system follows a one-year experimental introduction of it in the department's Pacific Region. It is expected to save taxpayers money and improve service by enabling the department to redirect limited manpower resources formerly tied down to the task of handling licenses manually.

FLASH! 420-MHz HIRAN

FCC has proposed to allow continued operations of nongovernment radiolocation devices offshore in 420-450 MHz. Amateurs who have experienced interference from HIRAN or similar devices in the past four years should be in touch with Perry Williams, at ARRL hq. before the May 16 deadline in General Docket 80-135.

STAFF NOTES

The League's Technical Department has added another "mad scientist" to its staff — in the form of Lab Technician Gerald Hull. (No, he is not a clone of *QST* Technical Editor Jerry Hall, K1TD!) Born into a military family, Gerry has spent much of his life in transit, moving from his native Halifax, Nova Scotia, to military bases all over Canada and the U.S. Six years ago his family settled in Virginia

Gerald Hull, AK4L/VE1BXC

Beach, Virginia, where Gerry attended Tidewater Community College for two years, majoring in electronics. A ham since 1975, Gerry enjoys dual amateur citizenship in the U.S. and Canada: an Extra Class license, AK4L, and a Advanced class ticket, VE1BXC. On the air Gerry likes working high-speed cw (you can often find him on 7040 kHz) and 6- and 2-meter ssb. He is also active in the National Traffic System and RACES. Off the air Gerry likes toying with digital circuits (and their application to ham radio), along with software and hardware computers. Gerry, who is single and says he plans to stay that way for a few more years, resides with relatives in Enfield, Connecticut.

Bill Grim, WØMHK, has joined ARRL hq. as Assistant Manager, Training, in the Club and Training Department. Bill's duties will include revising licensing instructional materials and writing an instructors' newsletter and a monthly *QST* column. First licensed at age 12 (also when he started noticing YLs), Bill holds an Advanced class license. His interests are DXing, contests, county hunting (when in season), traveling, current events and coping with the high cost of living in Connecticut. A former senior high school teacher, Bill was named Knoxville (Iowa) Teacher of the Year in 1971 (some would say that anyone who stays in teaching 12 years deserves it). Bill holds a B.A. degree in Social Sciences from Central College in Pella, Iowa. Recently transplanted from New Jersey, Bill has established roots in South Glastonbury, Connecticut, with his wife and their 5-year-old son. — *Andrew Tripp* QST

Bill Grim, WØMHK

Correspondence

Conducted By Bruce R. Kampe,* WA1POI

MALICIOUS INTERFERENCE

☐ I read with much interest the editorial in March *QST* about malicious interference.

A few years ago when working at coast station WCC I had an experience of deliberate interference when copying a string of messages from the Italian passenger ship *Conte Di Savoia*. The several ships participating belonged to a foreign nation whose marine transmitters all used VFO frequency regulation. The operators swished their VFOs back and forth across the frequency. I made no attempt to break the ship and did not mention the QRM. In a very short time they gave up.

One helpful practice would be for those being jammed to make no reference to it, because that is what the jammer wants to hear. I'll admit it won't always work but it sure is worth a try. — *Robert B. Leech, W7LSO, Tucson, Arizona*

☐ I agree with your March editorial 100%. Something must be done. The local QRM committees are a good idea.

QST could publish articles on RDF equipment and techniques and local committees could conduct hidden transmitter hunts to sharpen DF skills.

QST could also publish articles by ham-attorneys about the legal aspects of such activities. We must be most careful not to encourage any vigilante type action lest the cure become worse than the illness.

I have discussed this on the air. The interest is great and the reactions are 100% favorable. Many thanks for your leadership on this most serious matter. — *Tom Feeny, W8KOX, Walled Lake, Michigan*

☐ I have been increasingly upset by the microcephalic kindergarden flunk-outs who spend their hours in ugliness and obscenity on 10, 15 and 20, especially on the nets.

I can realize that FCC has a hard job policing the whole country. If we could advise them on the general area, it would appear that much time could be saved.

With today's supersensitive receivers, it seems to me it should be possible to design a receiving loop antenna capable of a pretty good fix on an offender. A half dozen amateurs scattered around the U.S. as vigilantes could, I think, do a world of good in precisely locating offenders.

What I find in my literature on loops applicable to 10-15-20 is next to nothing. How about putting your technical folks on a crash program to develop a good receiving, direction-finding loop, and see what we can do to wipe out this cancer? — *John Hopkins, WD4CWR, St. Simons Island, Georgia*

*Membership Services Assistant, ARRL

☐ How about unchaining the tech staff and print up some good, basic articles on RDF equipment, how to build it and how to use it!

Please don't overlook the fact that components are almost impossible to obtain. Send the gang down to Radio Shack and design from what is available there.

At the same time, get the legal and advisory staff at their mills and advise the amateurs how to proceed. Fill about the next 10 issues up with articles on the matter.

I have had two cases that I took a "shot in the dark" at a couple of locals. I'll never know for sure that I hit or not, but when I called them by name and asked them exactly what in the hell they thought they were doing, both sources immediately evaporated! I'm absolutely sure that some amateur knows what the source is in most cases. He just doesn't know what to do about it or doesn't want to get involved. Selling these chaps is going to be a staff job. Perhaps it could be so simple as briefing the directors and writing an article on procedure.

I hope that your editorial will put enough heat on the FCC that they will get off their duffs and take some action in the matter. Keep the heat on. *QST* hasn't been out but a couple of days. I think I have heard more noise about it than any editorial in recent history. — *Dan Umberger, W8ZCQ, Columbus, Ohio*

☐ Five or 10 or 50 amateurs in the United States with directional loop antennas will never make much dent in the jammer problem, but 5000 or 25,000 might! I suggest that technically inclined amateurs begin work, *today*, on writing articles on how to construct, calibrate and use directional-loop antennas on the amateur frequencies. Imagine a net being jammed and having three or four members of the net, all set up and ready to immediately take bearings! A minute's conference, and the announcement could be made that the jammer is "somewhere in the Boston area," or "He is right around Dallas." The information could be given to the FCC district covering the particular area, and if a persistent problem seemed to be coming from "somewhere around Atlanta," or wherever, both the FCC mobile monitoring vehicles and the local radio club "bunny hunters" could be on the alert for a problem station in their area. It would then be only a matter of time before the jammer's luck would run out, and his exact location would become known. The once-a-year hit-and-run jammer would probably elude detection, but the nightly or even weekender would eventually get the knock on the door, and the resultant consequences. The more vigorously the ARRL promotes and publicizes this program, the quicker and more demonstrable the results would be.

I urge the ARRL to tackle this problem with both hands at once before it becomes worse. We only have one Citizens Band — we don't need another! — *Gary R. Huff, K9AUB, Springfield, Illinois*

[Editor's Note: See DeMaw, "Beat the Noise With A 'Scoop Loop,'" July 1977 *QST*; and Dorbuck, "Radio Direction-Finding Techniques," August 1975 *QST*. Although these articles do not directly apply to all hf amateur allocations, the information they contain is very useful.]

10-1/2 METER MESS

☐ The problem of intruders on the low end of 10 meters is becoming increasingly more troublesome. The outlaws from the 11 meter region who hold forth just below 28.0 MHz are moving into the cw portion of 10 meters like fire ants.

I am curious why we don't hear more about enforcement. It seems to me there is a passive unconcern about these infractions. These people are well amplified, give QSL information, even ZIP codes. I think it would be a pushover to "burn" a few of these jokers.

I've had my second QSO of the morning interfered with by a kilowatt of overmodulated CB jargon on 28,003 so I wonder if there aren't a few more cw operators out there who are as steamed up as I am? — *Don Longacre, N2AFS, Caledonia, New York*

☐ It is with great dismay that I read in the latest issue of your magazine that the FCC has chosen to look into opening more frequencies for the Citizens Band Radio Service with relaxed rules.

It seems to me that the FCC has lost control of the frequencies that they are supposed to be controlling. How do they combat bootleggers? They simply give the frequencies to them. How appalling it seems to me. Today, one cannot use the Citizens Band Radio Service for what it is intended for. I cannot use the ham frequencies for personal business. I'm supposed to be able to use CB for this. If the FCC can't control these frequencies, I would propose that they do away with the service, give it to the hams once again, and let the hams clean it up.

In closing, I oppose relaxing the rules for citizens radio service. I don't mind having more frequencies available, but no VFOs, and no skip! Let's back the FCC in cleaning up the 11-meter band. — *Stuart Montgomery, WB1CTJ, Concord, New Hampshire*

YOU CAN'T TAKE IT WITH YOU

☐ Let's change "Silent Keys" to the "Big QSY." I for one, and my XYL, for two, don't intend to QRT — we'll just QSY to a higher frequency. — *Jim and Dottie Stephens, K4EBC and KA4GNF, Spanaway, Washington*

Coming Conventions

May 16-18
New York State, Rochester, NY

May 17-18
Alabama State, Birmingham, AL

May 24-25
Midwest/Central Division, St. Louis, MO

May 31-June 1
Kansas State, Salina, KS

June 7-8
Delta Division, Senatobia, MS

June 7-8
West Gulf Division, Dallas, TX

June 21-22
Georgia State, Atlanta, GA

July 5-6
West Virginia State, Jackson's Mill, WV

July 25-27,
Oklahoma State, Oklahoma City, OK

August 1-3,
Florida State, Jacksonville, FL

August 2-3
Louisiana State, Shreveport, LA

August 30-September 1
Pacific Division, San Jose, CA

August 31
Illinois State, Rockford, IL

ARRL NATIONAL CONVENTIONS

July 25-27, 1980
Seattle, Washington

March 13-15, 1981
Orlando, Florida

July 23-25, 1982
Cedar Rapids, IA

NEW YORK STATE CONVENTION

May 16-17, 1980, Rochester, New York

The Rochester Hamfest and New York State ARRL Convention will be held Friday and Saturday, May 16-17, at the Monroe County Fairgrounds, Rte. 15A, Rochester. New this year: Commercial exhibits will open Friday afternoon. Huge indoor and outdoor flea market both days. Forums, technical programs, ladies events and other meetings will be held at the fairgrounds on Saturday. One of the forums will feature ARRL General Manager Richard L. Baldwin, W1RU, discussing WARC. Dick was a member of the IARU Observer Team at the recently concluded Geneva conference.

FCC exams *will* be held on Saturday. Send application to FCC, 111 W. Huron St., Buffalo, NY 14204. Question 19 of Form 610 should be answered "Rochester Hamfest."

Rochester Marriott-Thruway is hotel headquarters. Activities are scheduled there for Friday evening. The annual awards banquet will be at the hotel on Saturday evening. Tickets: $4 in advance, $5 at the gate. Banquet $10. Outdoor flea market space is available at $2 per parking space. Indoor flea market space is $10 per day in advance; $15 at the door. For tickets: Rochester Hamfest-Tickets, 737 Latta Rd., Rochester, NY 14612. For all other information: write P. O. Box 1388, Rochester, NY 14603, or tel. 716-424-1100.

ALABAMA STATE CONVENTION

May 17-18, 1980, Birmingham, Alabama

The Birmingham Amateur Radio Club announces the Alabama State Convention and BIRMINGHAMFEST '80, on May 17 and 18. The 'FEST will once again be held at the spacious Birmingham-Jefferson Civic Center Exhibition Hall, with expansive exhibit space, comfortable meeting rooms, and free parking nearby. Many of the exhibitors at last year's 'FEST will be back, including major manufacturers and distributors. There will be even more room at the huge indoor flea market, along with a full slate of meetings, forums and activities. Prizes will be offered. On site FCC exams will be given Saturday morning.

This year the Saturday night banquet will feature nationally known comedian Archie Campbell. Banquet tickets are available in advance by mail. For more information, write to BIRMINGHAMFEST '80, P. O. Box 603, Birmingham, AL 35201.

MIDWEST/CENTRAL DIVISION CONVENTION

May 24-25, 1980, St. Louis, Missouri

The Communications of Tomorrow will be yours to see *today* when you and your family attend the joint ARRL Midwest/Central Division Convention at the Cervantes Convention Center in downtown St. Louis over the Memorial Day weekend.

You'll hear signals from OSCAR satellites, read radioteletype conversations, see amateur television pictures, and watch fantastically fast microprocessors and even a robot in action.

You'll attend forums on interesting topics, see displays of brand new Amateur Radio equipment and hobby computers, and walk along rows of used equipment at a giant flea market — all indoors and air-conditioned!

Among the many featured forum speakers will be ARRL President Harry Dannals, W2HD, Central Division Director Don Miller, W9NTP, Lew McCoy, W1ICP, Bernie Glassmeyer, W9KDR, and Bill Pasternak, WA6ITF — plus many more.

Admission to the convention, covering both days, will be $3 in advance or $4 at the door for each adult. Children 14 and younger accompanied by an adult are free. Camper parking available for an additional charge.

You and your family will find plenty to keep you busy in St. Louis. Friday night, May 23, you can take part in Amateur Radio week at Busch Stadium for a Cardinals baseball game. Saturday night features a giant convention banquet in the Convention Center with NBC newscaster Roy Neal, K6DUE, as guest speaker. (Original plans for a banquet on the riverboat "Admiral" were changed because the boat was scheduled for repairs required by U.S. Coast Guard.)

With shopping in major department stores, a visit to the St. Louis Zoo, a visit to Six Flags over Mid-America, and if you're daring a suspended-capsule ride to the top of a 630-foot Gateway Arch, you'll love every minute of your visit to St. Louis and the Convention.

For tickets and detail information, write to Gateway Amateur Radio Association, P. O. Box 26, Marissa, IL 62257.

KANSAS STATE CONVENTION

May 31-June 1, 1980, Salina, Kansas

The Kansas State Convention will be presented by the Central Kansas Amateur Radio club at the Red Coach West, Salina. Featured will be a Dayton-style flea market, exhibitor booths, and a trip to the Eisenhower Library. Dick Baldwin, W1RU, and Paul Grauer, WØFIR, will represent the ARRL. Many meetings have been scheduled. His nine-month trip around the world is the DX topic of Bruce Frahm, KØBJ. Film shows will include the new ARRL film, "The World of Amateur Radio." Other events and activities are still in the planning stage.

Registration $3; flea market space $2; banquet $7 (rib eye). Many prizes. Contact John Shoultys, WDØBNC, 2157 Edward, Salina, KS 67401. Tel. 913-823-6624, for information and reservations.

Hamfest Calendar

*California: The Fresno ARC, Inc., presents the 38th Annual Fresno Hamfest, May 9-11, at the Hacienda Inn, Clinton at Hwy. 99, Fresno. Technical talks, swap meet, QLF contest, golf tournament, ladies program, MARS activities, transmitter hunt, eyeball QSOs, commercial exhibits, ARRL forum, CD appointees meeting, prime-rib banquet and prizes.

*ARRL Hamfest

California: The 25th Annual West Coast VHF Conference will be held May 9-11 at the Miramar Hotel, Santa Barbara. Technical sessions, noise-figure measurements, antenna-gain measurements, technical talk-in on 146.34/94. Full registration $20 in advance, $23 at the door. Partial registration $5. Ladies program $7. Advance registration closes May 2. For information write to Fresno Hamfest, P. O. Box 783, Fresno, CA 93712.

California: The Northern Colorado Amateur Club will hold its 2nd annual Colorado Hamfest on June 7, at the Weld County Exhibition Building, Greeley. Satellite TV exhibit. Registration fee $3 for the whole family. Swap tables, prizes, exhibits, code contest. Also, babysitting, airport shuttle and activities for non-hams. Afternoon auction. Refreshments available. Contact Gus Fox, WØEE, Box 895, Greely, CO 80632.

Colorado: The Rocky Mountain V.H.F. Society will hold its annual Swapfest on May 18 at the National Guard Armory, 4750 N. Broadway, Boulder. No table charge, bring your own tables. Auction and exhibits and prizes. Pre-registration fee $4 until May 1, $6 at the door. Registration forms, hotel info and details from Wayne Overbeck, N6NB, 5818 Woodlake Ave., Woodland Hills, CA 91367.

prizes. Talk-in on 146.16/76. Tickets $2 at the door or $1.50 in advance. For advance tickets, send s.a.s.e. to RMVHFS, P. O. Box 1173, Boulder, CO 80306.

***Florida:** The Daytona Beach ARA will sponsor the 2nd annual Daytona Beach Family Funfest May 31 and June 1, at the Desert Inn, 900 North Atlantic Ave., Daytona Beach. Commercial exhibits, swap tables, forums, prizes, ladies activities and auction. Admission $3 in advance, $4 at the door. Swap tables $8 each for both days. Rooms available. Info from Daytona Beach Family Funfest, Dave Rusler, WA4ZTT, 1725 Hope Dr., Ormond Beach, FL 32074. Tel. 904-672-9536.

***Idaho:** Kootenai ARS (KARS) will have its annual Ham Meet on May 17 at Northern Idaho Fairgrounds, Government Way, Coeur d'Alene. Commercial displays, auctions, swap & shop, contest and snack bar. Doors open at 7 A.M., show starts at 9. For table reservations or ticket info write KARS, Rte. 1 — Box 87, Rathdrum, ID 83858. Talk-in on 52 and 146.37/97.

Illinois: The Six Meter Club of Chicago, Inc., will hold its hamfest on June 8 at Sante Fe Park, 91st and Wolf Road, Willow Springs. Advance Registration $1.50, at the gate, $2. Large swappers row, picnic grounds, parking available, displays in the pavillion. Refreshments, AFMARS meeting. Advance tickets from, Val Heilwig, K9ZWV, 3420 South 60th Ct., Cicero, IL 60650.

***Illinois:** The Starved Rock Radio Club, Inc., will hold its hamfest on June 1 at the Bureau County Fairgrounds in Princeton. Registration $2 before May 20, $3 at the gate. Large s.a.s.e. for complete info and/or registration. SRRC-W9MKS, RFD 1 — Box 171, Oglesby, IL 61348. Tel. 815-667-4614.

Illinois: The Egyptian Radio Club, Inc., will hold its 51st annual hamfest on June 8 at the ERC Clubhouse in Granite City, starting at 8 A.M. Prizes, refreshments, overnight camping and activities for women and children. Tickets $1 each or 6 for $5. Talk-in on 146.16/76 and 146.52. Write Gerard R. Pollard, WDØCED, 1990 Jenkee Dr., Florissant, MO 63031 for more info.

***Indiana:** The Wabash County ARC will hold its 12th annual hamfest on Sunday, May 18, from 6 A.M. until 3 P.M. at the Wabash County 4H Fairgrounds, Wabash. Admission will be $3 at gate or $2.50 advance. Food and Parking. Camping spaces available Saturday night. Talk-in on 147.63/03 or 146.52. For tickets or info send an s.a.s.e. to Dave Spangler, N9AIDO, 45 Grant St., Wabash, IN 46992.

Indiana: The Tri-State Radio Society will hold its annual hamfest on May 18 at the Vanderburg County 4H center, Evansville. Grounds open at 8 A.M., CST. Free admission. Prizes. Exhibit tables inside the hall $2.50 each. 4- × 8-foot covered space $1. Overnight camping space and refreshments available. Talk-in on 147.75/.15. Further details from Dave Bradford, N6ACP/9, 313 E. Franklin St., Evansville, IN 47711.

***Indiana:** The Muncie Area ARC will hold its hamfest June 1, on Ball State University campus. Refreshments, awards. Forums: Computers, traffic and nets, the ARRL, etc. Talk-in on 52, 13/73, 223.30/224.90. Advance tickets $2, $3 at the door. Children under 12 free. For registration, please contact M.A.A.R.C., P. O. Box 3111, Muncie, IN 47302.

Maine: The Portland Wireless Association and the University of Southern Maine Radio Club will hold a flea market on May 24, from 9 to 5, at the Gorham campus of the University of Maine. Indoor and outdoor sites available, $1 per person. Talk-in on 52, 73 and 06. For further info contact Jon Taylor, N1SD, 44 Mitton St., Portland, ME 04102, tel. 207-773-2651.

***Maryland:** The Easton ARS will hold its 6th annual hamfest May 18 from 10-4 at the Easton Senior High School cafetorium on Rte. 50 south of Easton at mile marker 66. Hamfest signs will be posted on Rte. 50 North and South. Talk-in on 52 and 146.445/147.045. Donation $2, with additional $2 for tables or tailgaters. Write R. C. Thompson, KA3BKW, P. O. Box 1473, Easton, MD 21601, or Easton ARS, Inc., Box 781, Easton, MD 21601.

Maryland: The Maryland FM Association, Inc., will hold its hamfest from 8-4 on May 24 at the Greenbelt Armory at the intersection of Greenbelt Rd. (MD Rte. 193) and the Baltimore-Washington Parkway, northeast of Washington, DC and off I-95/495. Prizes, catered food, indoor displays and flea market. Separate outdoor tailgating area. Talk-in on 52,525, 146.16/76, 146.28/88, 146.52 and 449.1/444.1. Donations $3, tailgating $2 and tables $5. Tables reserved by paying in advance to Fred Siehert, K3PNI, 8357 Reservoir Rd., Fulton, MD 20759. If acknowledgement is desired, include s.a.s.e.

Massachusetts: The South Shore ARC will hold its auction June 1 at the Viking Club, 410 Quincy Ave., Rte. 53, Braintree. A flea-market will precede the auction from 10-2 in the Viking Club parking lot. $3 to reserve a space. Bring own tables. Auction to begin at 2P.M. For further info contact South Shore ARC, c/o Kristen Johnson, K1WQ, 86 Alton Rd., Quincy, MA 02169.

Massachusetts: The Sixth Annual VHF/UHF conference will be held on May 16-18 at the Sheraton Inn and Conference Center, I-495 at Rte. 111, Boxborough. Technical talks, banquet, noise-figure measurements, EME panel discussion, 70-cm antenna-gain measuring, technical exhibits and prizes. Registration $10 advance (May 1 deadline), $15 at the door. Accommodations: Rooms available at the Sheraton Inn, tel. 617-263-8701. Special conference rates and meals are available at the Inn. Banquet $16.50 with advance registration. Information and registration to Rick Commo, K1LOG, 3 Pryor Rd., Natick, MA 01760.

Michigan: The Wexaukee ARA will hold their 20th annual Swap and Shop on May 17 from 9-4 at the National Guard Armory, 415 Haynes St., Cadillac. Tickets $2, prizes, free parking, lunches available. Talk-in on WR8ANT, 146.37/97. For more info write to P. O. Box 163 Cadillac, MI 49601.

Michigan: The Monroe County Radio Communications Association will hold its hamfest on June 8 from 8-4 at Monroe Community College on Raisinville Rd., Monroe. Tickets $1.50, spouses and children free. Contest, auction, displays, table space. Talk-in on 146.13/73 and 52. For more info, contact Fred Lux, WD8ITZ, P. O. Box 982, Monroe, MI 48161, tel. 313-243-1088.

Michigan: The Chelsea Swap and Shop will be held June 1 from 8-2 at the Chelsea Fairgrounds. Admission is $1.50 in advance or $2 at the gate. Children under 12 and non-ham spouses admitted free. Talk-in on 52 and 37/97. For more info, write William Altenberndt, 3132 Timberline, Jackson MI 49201.

Minnesota: The North Area Repeater Association will sponsor a swapfest and exposition for amateurs and computer enthusiasts on May 31 at the Minnesota State Fairgrounds in St. Paul. Free overnight parking of self-contained campers on May 30. Talk-in on 16/76 and 52. Exhibits, booths and prizes. Admission $3. For info or reservations, write Amateur Fair, P. O. Box 30054, St. Paul, MN 55175.

Missouri: The Missouri Single Side Band Net picnic will be held on June 8 at Binders Lake, Jefferson City. Covered-dish dinner at noon. All amateurs and families are invited. For more info contact Benton C. Smith, KØPCK, R.F.D., Prairie Home, MO 65068.

New Jersey: DeVry Technical ARC will hold its 4th annual flea market on May 17 in the rear parking lot at the DeVry Technical Institute (between Rtes. 1 and 9) in Woodbridge. Admission $3. Talk-in on 146.52. For more info write Frank Koempel, WB2JKU, 68 Orchard St., Keansburg, NJ 07734.

***New York:** LIMARC - the Long Island Mobile Amateur Radio Club, Inc., will sponsor Hamfair 80 on May 18 (rain date June 1) from 9-4 at the Islip Speedway, Southern State Parkway exit 43 (Islip Ave. Rte. 111). No reservations needed. ARRL info, cw qualifying run, prizes, ample parking. General admission, $2, exhibit space $3. Refreshments at track. FM, DX, ATV and other groups. For more info contact Sid Wolin, K2LIH, at 516-379-2861 evenings or Hank Wener, WB2ALW, at 516-484-4322.

***New York:** The Rome Radio Club will hold its hamfest on June 1 at the Ramada Inn, Oneida County Airport, located between Rome and Utica in Oriskany. Slides, movies, demonstrations. Contact Winfred Ballou, 11 Wolcott St., Camden, NY 13316.

***North Carolina:** The Durham F.M. Association's annual Durhamfest will be held May 17 and 18 at the South Square Mall, U.S. 15-501 south. Prizes, flea market, free tailgating spaces, overnight parking, FCC exams (advance registration required), shopping mall, bingo. Motels, restaurant, facilities, tables, power available. $3 admission, including dealers. Talk-in on 147.825/225, 146.34/94. For more info write, Durhamfest, Box 8651, Durham, NC 27707.

North Dakota: The Goose River ARC will hold its annual hamfest on June 8 at Island Park, Mayville. Flea market, auction and door prizes. Free coffee and camping facilities. Club repeater on 31/91. For more info contact Mary Carlson, WAØCSI., Rte. 2, Box 8, Hatton, ND 58240. Tel. 701-543-4287.

***Ohio:** The Sandusky Valley ARC will hold its 3rd annual hamfest May 25 at the Sandusky Fairgrounds. Admission $1. Talk-in on 52 and 146.31/91. For tickets and info send s.a.s.e. to Ron Winke, WB8NMK, 1200 Stilwell Ave., Fremont, OH 43420.

Ohio: Clinton County Area Radio Amateurs will sponsor "Clinton County Area Hamfest 1980" from 8-5 at the Clinton County Fairgrounds, Wilmington. Admission $3; children 12 and under free. Flea market, parking, refreshments available. Talk-in on 72/12. For more info write CCARA, c/o Russ Hidemiller, WD8NPZ, 310 Bethel Ln., Wilmington, OH 45177. S.a.s.e. please.

Ontario: The Central Ontario Amateur Radio Fleamarket and computerfest, sponsored by the Guelph, ARC, will be held on June 7 from 8 to 4 at the Centennial Arena on College Ave. West, Guelph. Admission $1, 12 and under free. Vendors additional $2 (please bring your own table). Displays, indoors and outdoors. Computer software and hardware. Talk-in on 52, 37/97 and 96/36. For further info please contact Rocco Furfaro, VE3HGZ, Tel. 519-824-1157.

South Carolina: The Columbia ARC will hold its hamfest on Saturday, May 31, from 9-5 at Midlands Technical College, Belt Line Campus. Talk-in 34/94. For more info contact Bob Burks, WB4GGC, P.O. Box 5802, Columbia, SC 29201.

***Pennsylvania:** The Second Annual Reading Radio Club hamfest will be held on May 25 at the Hamburg fieldhouse. Take Rte. 22 from east or west, Rte. 61 from north or south. Indoor-outdoor sites. Prizes. Talk-in on 146.31/91 and 52. For info write W3BN, P. O. Box 124, Reading, PA 19603.

Pennsylvania: Milton ARC will hold its 9th annual hamfest on June 8 from 8-5 at the Allenwood Fireman's Fairgrounds, located on U.S. Rte. 15, four miles north of I-80. Advance registration for sellers is $2.50, at the gate $3. Spouses and children free. Flea market, auction, contests, prizes, free portable and mobile fm clinic, supervised childrens activities. Indoor area available. Refreshments. Camping and motels nearby. Talk-in on 37/97 and 52. For further details call or write Kenneth E. Hering, WA3IJU, R.D. #1 — Box 381, Allenwood, PA 17810, tel. 717-538-9168.

Tennessee: The Amateur Radio Club of Knox County, Inc., is sponsoring a hamfest on May 24-25 in Knoxville. Prizes. Talk-in frequencies: 90/30, 13/73, 3.980, 52. Admission is $2; tables $4 one day, $6 two days. For more info send s.a.s.e. to Ron McKean, WD5FUN, 12108 Kings Gate Dr., Concord, TN 37922, or Lee Welch, K4YFF, 2109 Needham Dr., Knoxville, TN 37912.

Tennessee: The Humboldt ARC will hold its annual hamfest on May 18 at Shady Acres City Park, Trenton. Talk-in on 37/97. Flea Market, prizes, ladies activities, light lunches. More info from Ed Holmes, W4IGW, 501 N. 18th Ave., Humboldt, TN 38343.

***Virginia:** The Ole Virginia Hams ARC of Manassas announces its 6th annual Mid-Atlantic area "Quality Hamfest" on June 1 at the Prince William County fairgrounds, located off Rte. 234, 1/2 mile south of Manassas. Talk-in on 37/97 and 52. General admission gates open at 8. Tailgating set-up begins at 7. Admission $3. Children 12 and under free, tailgaters $2 addition per vehicle. Indoor and outdoor exhibit areas, dealers and manufacturers, fm clinic, YL program, breakfast and lunch available. Prizes. For additional info write to Dick Fredrickson, W7MPZ/4, 9511 Sudley Manor Dr., Manassas, VA 22110.

Washington: The Yakima ARC will hold its hamfest at 7 A.M. May 18, in Yakima. Talk-in on 34/94, 25/85, 01/61. Breakfast and lunch. For info contact Kenneth Zahn, KA7DWH, 4 North 16th Ave., Yakima, WA 98902.

Wisconsin: The Green Bay Mike and Key Club will hold its Swaptest May 10 at Ashwaubenon Recreation Center, Ashwaubenon, near Green Bay, from 8:30 to 3:30. For more info contact Robert Duescher, KA9BXG, 1011 13th Ave., Green Bay, WI 54304, tel. 414-497-7880 before 3 P.M.

Strays

E. H. ARMSTRONG NAMED TO INVENTORS HALL OF FAME

Edwin Howard Armstrong, the inventor of fm radio, and a Columbia University professor for 20 years, has joined Thomas A. Edison, Alexander Graham Bell, and Wilbur and Orville Wright on the roster of the National Inventors Hall of Fame. Since his death in 1954, Armstrong has been ranked as the U.S.'s greatest inventor since Edison. At induction ceremonies, Armstrong was cited for his invention during World War I of the superheterodyne receiver, which provided the breakthrough for the future development of fm radio. Today, the superhet circuit is still the basis of all electronics communication, from radio and television to long-range radar and satellite telecommunication.

OPERATION FROM "LITTLE HOUSE ON THE PRARIE"

The Amateur Radio Association of Bloomington (Minnesota) will operate from Walnut Grove, home of Laura Ingalls Wilder, from 1400 UTC on May 17 until 1400 UTC on May 18, 1980. Station call WBØYUA or WDØGOI will be used; operation will be on phone and cw on all bands. Certificates will be awarded for QSL and s.a.s.e. — *Thomas McCauley, KAØAII, Bloomington, Minnesota*

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

A Pause for Station Identification

The fm-repeater mode of amateur communications has a continual influx of newcomers. There are the new Technicians, who have upgraded from the Novice ranks, and there are the brand-newcomers to the hobby who have jumped right in with a Tech license in hand. Also, there are the veterans from other bands and other modes who are trying repeaters for the first time. No matter where they come from, all the newcomers have something in common: unfamiliarity with the operating procedures that are unique to this mode of communications.

Repeater operating practices are often the result of how a local repeater community has responded to the rules and regulations. The rules may say one thing and, sure enough, there will be diverse interpretations of those rules. Nevertheless, once a particular interpretation has gained general acceptance in a repeater community, that interpretation, no matter how liberal or conservative it may be, becomes an operating rule of behavior in that particular community. As a result, different communities may have different operating procedures. This may confuse the newcomer.

The diversity in repeater operating practices is especially apparent when you observe the different ways of checking into a repeater. Those who travel cross country with a 2-meter transceiver in their vehicle may have encountered this situation. It seems that every repeater has its own check-in procedures. There are breakers and beepers, handles and suffixes, and they are listening or monitoring their favorite repeater.

A sage once said that variety is the spice of life. Imagine how boring it would be if all repeaters were run in the same manner; they would all sound alike and would lose their character. Individuality in repeater operations should be applauded, not eschewed. Nevertheless, when individuality borders on illegality, watch your step. You don't want to get bogged down in muddy ground and receive a notice from the FCC for your troubles.

An amateur station shall be identified by the transmission of its call at the beginning and end of each single transmission or exchange of transmissions, and at intervals not to exceed 10 minutes during any single transmission or exchange of transmissions of more than 10 minutes' duration. Sound familiar? The first sentence of this paragraph was cloned from the FCC rules and regs, §97.84(a). How does it apply to repeater operating procedures?

The word "break" is often used when there is an emergency and the breaking station needs access to the repeater immediately. A station that checks into a repeater with a simple "break" is not identifying legally. Without that call sign, it is not a legal i-d. When there is a life or death situation, the violation of this rule is picayune. Nevertheless, it's a fact that a lot of these breakers are not involved in life-or-death situations. There are a lot more fender-benders and flat tires than there are power-plant meltdowns. Use the emergency "break" with discretion, and when it is used, attach a call sign to it.

Unidentified breaking can become a real problem when disaster strikes. North Texas Section Communications Manager K5PC, recalled that during the 1976 Dallas tornado, numerous unidentified double and triple breaks made it impossible for the emergency net control station to figure out who was trying to check in. Each time he tried to get a call sign, all he heard were layers of breaks. If a few call signs had been transmitted, the net control station might have heard parts of some of them, and the net could have functioned with fewer exchanges and less confusion.

This repeater birdie is mascot for the Carolinas-Virginia Repeater Association (CVRA), which represents vhf and uhf interests in five states — the Virginias, Carolinas and Tennessee. The CVRA is one of the largest regional repeater organizations in the U.S. Besides offering assistance in frequency coordination, it publishes the award-winning *Repeater Journal* quarterly. Write to the CVRA at P. O. Box 5655, Greensboro, NC 27403.

As to the confused newcomer who hears the breakers, beepers, listeners and monitors — how can he be safe and not sorry? As K5PC has put it, "in a nutshell, one has the option of saying 'break' or reciting the Gettysburg Address on his first transmission, as long as his call sign appears somewhere in there." That call sign must be transmitted during that first transmission and must be repeated every 10 minutes threafter. And, at the end of an exchange . . . between amateur stations, the call sign shall be given for the station, or for at least one of the group of stations, with which communications was established. This is another cloning of §97.84(a), which requires that when checking out of a repeater, you must identify the station or one of the stations (in a roundtable) that you were conversing with — "K7UGA, this is W1AW clear repeat."

By the way, as it is illegal to start talking on a repeater without identifying, it is also illegal not to talk on a repeater without identifying. (What'd he say?) Every time a repeater is keyed up, someone is responsible; but how many times have you heard a repeater being keyed up and no one admitted to it? If you wish to key up a repeater — whether to try out a new crystal, check out a new antenna or simply to assure yourself that your favorite machine is still on the air — be sure to identify yourself.

Some folks don't identify themselves when they key up because they don't want to get involved in a conversation at that particular time. To do this legally, simply announce your call sign with the word "testing" appended to it ("W1HQ testing"); that should make it clear that you don't want to converse at that time.

The rules for proper station identification are short and simple. Keep them in mind and you should not have problems when you encounter the various repeater operating procedures that abound in this land.

GOOD NEWS ON THE 220 FRONT!

On March 10, the FCC issued an errata to Docket 80-1, which proposed a new automated inland waterways communication system. The errata says: "In paragraph 26 the phrase, 216 to 225 MHz band, is changed to read, 216 to 220 MHz, to be consistent with the document as a whole." Apparently, this threat to the 220-MHz band has disappeared and there is no reason now for hams to file comments in opposition to the waterways proposal. (From ARRL Bulletin number 29.)

Ya-hoo! (From comments on the local 220 machine.)

*72 Stiles St., Waterbury, CT 06706

Club Corner

Conducted By Sally O'Dell,* AE8P

Butte (Montana) Amateur Radio Club erects its homebrew, 60-foot, crank-up tower on Field Day, 1979. *(photo by WA7PZO)*

FIELD DAY'S A-COMIN'

Once a year, all around this wide land of ours, people walk away from their homes with a radio, or long wire, or sleeping bag, and start the trek out to their club's Field Day site. What better way to prepare for an emergency than setting up a station in the middle of a field or atop a mountain — with no power, sleeping quarters or other facilities available. Of course your club is taking part — but will this be the year that you're one step ahead of Murphy?

Now is the time to begin thinking about your Field Day 1980. It is not that far away (see rules elsewhere in this issue). The main idea in May (or before) should be planning. Plan ahead and be prepared. Think about last year's Field Day problems and maybe, with some advance preparation, you can avoid them this year. Of course there might be new problems (Murphy would say "will be"), but at least you can try to avoid the old ones.

Some clubs mentally run through a Field Day trip in the middle of January, as the snow falls. Everyone gets involved in the discussion. All of the newly licensed hams listen to the old timers recite how it was in years past. Finally they get down to discussing the Field Day coming up. The president is ready to delegate jobs and the planning begins.

One club might begin this way. The president appoints FD Chairman Bill, who then chooses his committee. Bill, Susan, Bert (a new Novice who wants to learn all he can), and George agree to meet later in the week to make arrangements.

It's Friday and the coffee is hot. Let's listen in as the group discusses the best location, Elmer Howetzer's farm. George comments:

"Elmer was pleased that nothing was messed up last year. Elmer had said last year that we could use his field again, but we had better make sure he hasn't changed his mind. After all, that abandoned barn is on the property and it would be good for sleeping quarters." Bill says he will contact Elmer for official permission to use the land."

"What bands are we going to operate on?" asks Bert.

George says, "We know we have at least one Novice operator who will be operating 80, 40, 15 and 10. Bert can bring his vertical antenna to cover all bands."

Bert agrees and wants to know about the other bands.

"The rest of us will be on 10 through 80, with separate stations for cw and sideband on 20 through 80," George explains.

Bill asks his group if anyone in the club had volunteered to supply equipment at the meeting last week. Though Clark had offered his all-mode synthesized rig for 2 meters, he won't be able to operate since he already has other plans for that weekend. Peter offered his transceiver and beam for 6 meters.

After several minutes of discussion, Bill stops the flow of conversation to summarize: "It looks like we will have all bands covered. Herman had said at the meeting that he wanted to operate on 2 meters and would bring his quagi. With the rest of us on 10 through 80, and our Novice station set up, we should be in good shape. Of course there are a few other details to cover. Bill asks Sue to pass a paper around at the next meeting. We need to know who is willing to operate and when. Sue can then set up a schedule and provide every operator with a copy. That way, they will know when they are expected to be there.

"Is it time to discuss antennas? We can string inverted Vs through those trees behind the barn for 80," says George. "Also, that 3-element Yagi has been sitting in my basement since I bought it at the hamfest last year. I can bring that, too," George finished.

Bill comments on the fact that there are enough members in the club to be able to supply at least two antennas for 20, 40 and 80, and one each for 10 and 15. "The generator we used last year just won't be enough. We need to borrow at least two more generators, possibly a third kilowatt for a backup."

Sue comments: "I still wish we could use a solar panel. Remember last year when SCATS (WB6LRU, California) was mentioned in the *QST* article for using a solar panel? That is saving energy!"

"Hey!" George interrupts. "Let's get on to one of my favorite subjects, *food*."

Bill explains to Bert that George is a gourmet cook who likes to experiment with new recipies on camping trips. "He usually tries to turn a can of Spaghetti-O's into — Chicken a la King! Therefore, he has been delegated the job of cook on Field Day. George sets his tent up with a cooking stove, and everyone brings lawn chairs. Field Day is all set with a kitchen. Of course George still takes his turn at operating 80 meters late at night. Suitable arrangements are made for procuring food.

Bill directs the group's attention to indoor quarters for the equipment. After all, according to Murphy, it always rains on Field Day. Joe had volunteered his motor home for use, but we will need shelters to set up. In addition, we will need a safe source of heat when folks try to sleep in that drafty barn. It's going to be cool in a barn with permanent "air conditioning." As for operating a station in a tent, we'll need a wood fire or a bucket filled with hot coals outside.

"Finally," Bill says, "we're ready to discuss publicity. Remember, we can get extra points added to our score for being mentioned in the media. We will need to send out a press release. Since Joe did such a good job last year, let's ask him to do it again. But this time, let's send a map. Remember last year when Channel 3 tried to send a mini-cam and got stuck in the swamp? They had to send a tow truck to get out."

George, cynical as always, suggests: "Offer free refreshments to the press. Maybe they'll come for a meal."

Bill comments finally: "We'll need a cleanup crew because we want to be asked back to Elmer's place again next year."

Before everyone left, Bill recapped all the points discussed, the decisions made and the follow-up. Each person on the committee knew what he or she was responsible for and the group was ready to go to the rest of the membership with the plans they had made. And just in case, Furd Thugwump was appointed to remember the obscure little details everyone usually forgets.

Use a check list for ideas and supplies if you think it will help you. Delegate responsibilities to the rest of the club. Don't let one or two people do all the work. Get your new people involved, but don't forget the others. Try to involve as many people as you can. Plan ahead, be prepared, and then you and your club can settle down to enjoy Field Day 1980. QST

Checklist

- ☐ Radio equipment (the obvious things)
- ☐ Backup equipment
- ☐ Backup antennas
- ☐ 500 feet of wire for antenna emergencies
- ☐ Patch cord and hook up wire (plenty)
- ☐ Tent pegs
- ☐ Rope
- ☐ Stakes to anchor tower(s)
- ☐ Tools
- ☐ Ax or sledge hammer
- ☐ Operating table
- ☐ Lawn chairs
- ☐ Beach umbrella
- ☐ Coffee pot/lots of coffee
- ☐ Matches
- ☐ Ice for food
- ☐ Can opener
- ☐ Knife
- ☐ First aid kit
- ☐ Insect-bite/poison ivy lotion
- ☐ Trash bags
- ☐ Pens
- ☐ Pencils
- ☐ Scratch paper
- ☐ Tape

Delegate List

- ☐ Police area before and after
- ☐ Transportation
- ☐ Local 2-meter fm gear/coordinate its usage
- ☐ Extra gas for generator

Make a list your club can use. Delegate responsibilities. Send a copy of your list to the Club and Training Department at ARRL hq.

*Club and Training Department, ARRL

Strays

QST congratulates . . .

☐ Paul Brown, W5IQL, of Shawnee, OK, who turned in weather reports on the Oklahoma traffic and weather net on each of 313 consecutive sessions. A perfect record.

☐ Hugh Morris, WB4GLG, of Frankfort, Kentucky, who recently retired after 10-1/2 years as assistant director of publications for the Kentucky Legislative Research Commission.

I would like to get in touch with . . .

☐ anyone who has alignment procedures, circuit wiring and block diagrams, with voltage and component values, for the following old receivers: HRO type 5TA1 with external power pack; 1155 (ex-WW II Royal Air Force) with built-in 1155B power pack; and 1155 with external power pack. Contact Brian W. Legg, 9 Wingate Rd., Highlands, Salisbury, Zimbabwe.

MYSTERY HILL DXPEDITION

☐ The Mount Moriah Repeater Society will operate from Mystery Hill, North Salem, New Hampshire, from 1800 UTC, June 7, until 1800 UTC, June 8. Mystery Hill is most likely the oldest man-made structure in the U.S. It is a 4000-year old astronomical observatory and prehistoric temple presumed to have been built by Celtic and Iberian cultures. Phone operation will be on 3.980, 7.280, 14.280, 21.380 and 146.52 MHz; cw on 3.550, 3.710, 7.050, 14.050, 21.050, 21.110 and 28.150 MHz using the call sign K1MDX (Mystery DXpedition). A Certificate will be awarded for all contacts. Send a legal-size s.a.s.e. to K1RCT, P. O. Box 123, North Salem, NH 03073.

COAST GUARD AUXILIARY AMATEUR RADIO NET

☐ The 8th Coast Guard District Auxiliary Amateur Radio Net meets on Wednesday evenings at 2000 CST on 3925 kHz. — *James A. McCarthy, WB5DBK, Houston, Texas*

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

A Golden Opportunity for 2-Meter Ops

The summer months provide an unparalleled opportunity which many 2-meter operators may be missing. Yes, tropo conditions are generally much improved over what they have been during the colder months, and there are some pretty good meteor showers. The Perseids in mid-August is certainly known for its normally outstanding performance. But almost all 2-meter operators know about these modes. The mode that is often ignored, apparently because of its seeming unpredictability, is sporadic E, or Es. The mode is often termed "E skip" by 2-meter devotees, and is the same phenomenon the hf gang calls "short skip." Es is caused by very heavy ionization in the "E" region of the ionosphere, about 60 miles (100 km) above the surface of the earth. Just why this higher-than-normal ionization forms is not completely understood, but ionosphere physicists are increasingly coming to the conclusion that wind shear is involved. When high-velocity winds blow at ionospheric altitudes, a rather sharp boundary is sometimes set up between levels with different wind velocities (speed and direction). Such boundaries, apparently, cause the concentration of ions already present in the region. Because of their high ion density, these concentrations reflect shorter-wavelength radio signals than does the normal "background" ionization. Thus 6-meter, 2-meter and even 1-1/4-meter signals may be returned to earth. There is, as yet, no record of Es affecting 70-cm signals, but that doesn't mean that it can't. Since these patches of ionization can bend higher frequencies, they can bend lower-frquency (longer-wavelength) signals more sharply than can the normal ionization. Therefore, these signals come back to earth closer to the transmitter, accounting for Es becoming known as "short skip" on the frequencies below 30 MHz.

Although Es is the "bread and butter" mode for 6-meter operators, and is quite prevalent between mid-May and late August, on 2 meters it is much rarer. This is, of course, because the wavelength involved is one third that of the lower band. Therefore, the ionization must be three times as great to support propagation. Rare as it may be, Es nevertheless does occur frequently enough on 2 meters to make it worthwhile catching when one can. In addition to the sheer thrill involved, the mode provides a good means of working new states, out to perhaps 1400 miles.

Double hop, involving distances of nearly twice that, is rare indeed. I know of only one documented case. That took place last summer and involved a station in Portugal and another in Lebanon. So, the first transcontinental 2-meter contact not involving moonbounce would be extremely exciting. But "normal," single-hop, Es is exciting enough. Meter-pinning signals may appear from nowhere and may disappear just as suddenly; or they may hang in for an hour or more. They can be quite weak when the particular path is not optimum, in which case only the better-equipped stations usually make contacts. On the other hand, when the reflecting patch is in the right place, Es produces propagation which allows almost anyone to get into the act. That is, of course, one of its great attractions.

Just how should one go about looking for E skip on 2 meters? A number of frequencies and bands can be monitored to provide an indication that 2 meters may open.

A TV set tuned to an unused channel between Channels 2 and 6 is quite useful. If skip stations are received, 2 meters may or may not be open, but 6 meters certainly is. Naturally, DX stations received on Channel 7, or above, means that something is happening on 2 meters. An fm broadcast receiver can also be a good monitor, especially in areas where there are not too many local stations. Various aircraft stations above 108 MHz should provide excellent signal sources. Some of the newer scanners cover these frequencies and thus might make worthwhile adjuncts to 2-meter shacks. A 6-meter receiver may provide an indication of the existence of Es, but 50 MHz is certainly too far removed from 144 MHz to be very good for spotting 2-meter openings. Nevertheless, one can learn by experience to spot certain 6-meter conditions that indicate the possibility of 2-meter Es propagation. The existence of very short skip on 6 (less than about 300 miles) is one such condition. Reception of strong signals on 6 meters from stations 300 miles or less away however, may mean that 2 meters is open, but for locations other than yours. Don't despair, however — the ionized clouds can move rapidly. In a few minutes you may be participating in a bang-up 2-meter opening.

It is also useful to observe weather conditions. Es seems to occur often in the vicinity of intense storms, such as thunderstorms, with high cloud tops and tornados. This connection has been pointed out by WA4MVI and others. Jim has suggested that morning TV programs that feature weather conditions across the country, provide a good source of information on the existence and locations of intense storm systems that may signal the formation of Es. Mel Wilson, W2BOC, after years of study has reached similar conclusions concerning a connection between violent weather and the generation of sporadic E. Whether or not one follows the storm systems like a meteorologist, or sets up fancy monitoring gear to herald the possible approach of 2-meter E-skip openings, the best way to catch rare DX is to be active.

With 144.2 pretty well established as the ssb calling frequency, that certainly seems to be the best place to concentrate one's efforts. But don't just listen. Put out a few calls yourself, especially when you think conditions might be favorable. Remember: If everyone is listening, nobody hears anything.

Good hunting on Es this summer. You can bet that I will be in there trying, too, and hope to work many of you.

THE FIRST DAYS OF PHASE III

If all goes according to plan, the Phase III satellite should go aloft only a few weeks after this month's *QST* arrives in your mailbox. Unlike other amateur satellites that have gone before, this one will not immediately go into its final orbit. Instead, it will be placed in an interim orbit, where it will remain for several weeks. During that period, AMSAT ground stations in various parts of the world will track the satellite to determine the exact time the onboard kick rocket should be fired. That firing must be precisely timed if Phase III is to achieve its planned orbit. Indeed, a mistake could cause loss of the spacecraft altogether. If these ground stations are to get the accurate tracking information needed for the ticklish rocket firing, they must have a clean passband. It is vital, therefore, that no stations, except those authorized by AMSAT, transmit on the uplink passband during the time the satellite is in its interim orbit. If you must try out your system, do it outside the passband. In the meantime, keep tuned to W1AW, the AMSAT nets or the downlink passband. You will be informed when it is okay to begin regular use of this newest, and most useful, amateur communications facility.

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730, or call 301-384-6736 and record your message.

ON THE BANDS

6 Meters — Late February and the first half of March did not bring any better conditions, for most of us, than those prevailing the previous month, but there were a few exceptions in some parts of the world. February 20, between 1900 and 2000 UTC, did produce a good opening from the Western part of the U.S. to HC1JX. Among those making contact with the Ecuador station were K7OFT and several other Pacific Northwest operators. In the afternoon of February 29, WA5IYX, San Antonio, heard ZL1AUM but was not able to make contact. The 6s fared much better, with W6XJ snagging four New Zealanders. W7KMA reports that VK7KJ heard his 50.073, 5-watt beacon for about 20 minutes around 2300 UTC the same day.

On March 6, beginning at 0000 UTC, ZL1BQD hooked up with N6RZ, WA6BYA and K6HCP. Another report has it that ZL1BQD was heard in Minnesota on that occasion by K0GUV. March 9 brought a mid-day F2 opening between the UK and South Africa according to G5KW. Ken completed a crossband QSO with ZS6LN on that occasion and heard several ZS beacons. It was also said that VK6OX heard the 48.25-MHz BBC video about 1100 UTC. From 0000 to 0045 UTC the same day the FY7THF beacon was heard up to S9 plus 20 dB in the Solomon Islands by H44PT. More on that later. DK1PZ notes reception of the ZS6PW beacon via F2 on March 4, 7, 8 and 9 as well as evening TEP March 10, with that beacon plus that of ZS6LN being heard.

Considerable excitement was generated in Japan around 0300 UTC March 4 when a number of JAs heard the ZB2VHF beacon. JA1RJU, who heard it for about five minutes, said that it peaked up to S99. In areas a few hundred miles to the west of Tokyo, it was received for almost an hour. ZS6LN reports that he worked 5B4AZ on 50.112 MHz at 1900 UTC March 13. Jack also said that JA1RJU reported to him that his beacon had been heard in Japan on a number of occasions. Despite rumors, however, no two-ways had taken place between JA and ZS as of mid-March.

Just at deadline, the pace quickened considerably. On March 14, about 1300 UTC, this conductor heard

EME Annals

Figures are number of different stations, number of U.S. states and number of countries worked via EME. Compiled March 15, 1980.

6 Meters

K5WVX*'	2	2	1
WA5HNK*'	2	2	1
WB6NMT	2	2	1
W7FN	1	1	1

2 Meters

K1WHS	130	40	20
W7FN	112	45	16
SM7BAE	100	43	15
W7UBI	67	36	7
K5GW	64	34	14
VE7BQH	63	38	14
WA1JXN	58	32	11
WBØQMN	57	18	27
W8IDU	49	29	12
WA7KYZ	45	29	8
K4PKV	43	29	12
WA4MVI†	40	24	12
WA3VSJ	40	22	12
K7NII	38	24	5
K5BMG	37	24	9
W7JF	37	18	6
WAØLPK/KL7	34	33	2
WA7BJU	34	27	2
G5CSZ	33	21	7
K2RTH	33	19	6
K9KFR	32	13	10
WB5LUA†	31	22	10
K5UGM	31	20	8
KAØY	30	21	6
N2MB (WA2BIT)	29	17	7
K3VGX	29	13	6
W4WD	28	18	6
WB9VEM	27	24	3
WA4MVI	27	20	4
VE2DFO	27	14	5
W5FF	25	20	5
WØSD	25	19	9
WB4EXW	25	17	8
W4DFK	23	14	6
K5FF	21	19	4
I4EAT	21	12	7
K5MB	20	14	4
W1JR	19	14	5
DK1KO	16	7	5
K1FO	15	12	4
WB6NMT	16	14	3
K6YNB/KL7	16	13	1
WA9DOT	16	7	3
KØKE	14	9	6
W8WN	14	9	3
WA4GPM	14	8	2
W2AV	13	11	3
ZS5ZY	13	7	4
K6QEH	13	7	4
WB5LBT†	13	5	10
K1MNS	12	9	2
K5MB	12	7	2
WØMDL	11	9	1
VK5MC	11	7	4
K2UYH	10	8	3
W2AZL	10	7	3
K4IXC	10	7	1
KØMQS	10	5	5
WØVB	9	7	4
W7RUC	8	8	1
WØRWH	7	5	2
KP4DJN	7	4	4
N6TX	7	2	2
K6MYC	7	1	6
K5VWW	6	5	3
WA1TZV	5	5	1
SM6CKU	5	4	3
WA7BBM	5	4	2
W3BHG	4	4	1
K3AP	4	3	1
NØJA	4	3	1
N6NB/1	2	2	1
W1FZA	2	2	1
WA2PVV	2	2	1
W5JTL	2	2	1
W6DNG*	2	0	1
OH1NL*	1	1	1
W1MX	1	0	1

1-1/4 Meters

K5FF	4	3	1
W5FF	4	3	1
WB6NMT*	3	3	1
K7NII	2	1	1
W4WD	2	1	1
W7CNK*	1	1	1
K2CBA	1	1	1
WB2BYP	1	1	1

70 Cm

K2UYH	128	44	28
K3NSS	93	25	20
VE7BBG	86	39	21
W1JR	78	34	22
W4WD†	75	35	22
K5JL	67	37	27
WB5LUA	63	32	18
W5FF	47	35	9
F9FT†	36	12	16
WØYZS†	34	18	12
W6ABN	33	21	13
K4QIF	33	19	15
I5MSH†	33	8	17
K8WW†	32	15	12
K9KFR	32	13	10
KØTLM	31	21	9
ON4DY	29	13	13
AD1C	26	14	11
ZE5JJ†	25	9	13
W3CCX†	25	11	12
KH6IHP	23	13	8
K3NSS†	22	10	10
VE4MA	19	12	7
VK2AMW	18	9	8
PAØSSB	18	—	10
W7JF	15	12	3
FY7AS	13	2	11
K5BMG	12	7	5
KØVXM	11	9	4
WØMDL	11	9	1
KØVXM	10	9	1
WØOQ!	10	7	3
KA1GT	11	4	6
W4NUS	9	6	2
WA2WVL	6	5	2
K4QF	4	3	2
W4FJ	3	3	1
K1WHS	2	2	1
W5UPR	2	2	1
W1BU*	1	1	1
W2UK/KH6*	1	1	1

23 Cm

W1BU*	4	2	4
W2NFA	4	2	3
PAØSSB	4	2	3
WB6IOM	2	2	2
G3LTF	2	1	2
HB9RG	2	2	1
W6HB*	1	1	1
KH6UK	1	1	1
W1KZJ/KP4	1	1	1
VE7BBG	1	1	1

13 Cm

W3GKP*	1	1	1
W4HHK*	1	1	1

*Participated in first EME QSO on particular band
†Has earned WAC
'Combined effort of K5WVX (K5CM) and W5WAX (K5SW)
'Combined effort of WA5HNK and W5SXD

the 10-meter side of crossband QSOs between Europe and ZS3E in Southwest Africa. Both G5KW and DK1PZ made the grade on that occasion. The following day saw some more such work but Sunday, March 16, appears to have been the big day so far. G5KW, G3COJ, G4JCC, G4JLH and HB9QQ were all noted hearing or working ZS3E and ZS6LN. In addition to the usual beacons, a new one, ZS6BMS on 50.064, was reported. The South Africans were in and out in G-land for a number of hours beginning around 1100 UTC, and were still being heard after 1600. EI2W was on trying for 6-meter two-ways, but was not successful.

Late the previous UTC day, H44PT called this conductor on 28.885 MHz to say that he had been hearing the FY7THF beacon for the past few minutes. But the real news came a few minutes later when Peter called again to exclaim that he had worked FY7AS at 0000 UTC, March 16, for what must be one of the most interesting contacts of this solar cycle. The path lies nearly along the equator and stretches almost halfway around the globe. An hour later, when the French Guiana beacon was beginning to fade out in the Solomon Islands, VK8GB, in Darwin, reported that he was starting to hear it.

Later the same evening, KH6IAA was treated to a bang-up South American opening. Between 0030 and 0420 UTC, AI completed contacts with PY, LU, CX, HC, TI and HK stations. The HK worked was HK4EB, new on 6-meter ssb. At 0450 PY1RO worked KG6s DX and JKS.

For us in the "black hole," it's nice to know that the old band is not dead everywhere!

Apparently KH6NS is the first outside of North America to achieve WAS. Ed says that he made contact with his 50th state some time ago but it took awhile to collect all of the QSLs. Unfortunately, he did not get his application to League headquarters quite in time for the listing that appeared in last month's column. Congratulations are certainly in order for a real accomplishment.

Speaking of great accomplishments: Who holds the world 6-meter DX record? It's a little hard to tell since there have been many contacts between stations nearly on opposite sides of the earth. HL9TG says his contact with LU3EX or LU8AHW represents the record. LU1DZ, in a letter received last year, contends that Gary's contact with LU8AHW constitutes the record. I would like to hear from anyone who believes that the record may lie elsewhere. Please provide all details such as date, time and the geographical coordinates of both stations. Other information, such as power, antenna and transmission mode (ssb, cw, etc.) would be useful. It would also be instructive to know other pertinent details like beam headings. The record will, however, be determined from the coordinates of the two stations without regard to claims of "long path" vs. "short path." That simply brings forth too many potential arguments.

According to a note from WA2BPE, K2UOP (formerly /4 in Virginia) is now operating as EL2AV. Tom has been attempting to get permission for 6-meter operation but, in any case, he will be on listening for crossband contacts. Now all we need is propagation! Another attempting to assume the status of rare DX is GM3RQO. By the time you read this, Hugh should be in Saudi Arabia. He also has applied for 6-meter permission, but needs equipment. Anyone with ideas may write Hugh Robertson, P. O. Box 7128, Jeddah, Saudi Arabia.

Just a reminder: The annual SM1RK 6-Meter Contest will be held June 7 and 8. The affair will begin at 0000 UTC June 7 and run for 48 hours. An s.a.s.e. to K5ZMS, 7158 Stone Fence Dr., San Antonio, TX 78227, will bring log sheets and rules.

In this column for December 1978, I mentioned the award available from the Greater Pittsburgh VHF Society for those able to show evidence of two-way 6-meter contacts with 25 countries. To date, only eight of these awards have been issued. For information, drop an s.a.s.e. to Edward Lips, W3BWU, 3302 Hazelhurst Ave., Pittsburgh, PA 15227.

2 Meters — W7LUX says that he has had several replies to the mention, in the October 1979 column, of his interest in trying synchronous cw on 2 meters. That's an improvement over the last time the subject was mentioned, when no one responded. Among those who toe heard from are K6ZMW, WB6PKA and GW3NLY/W9. This technique seems like a natural for improving the DX potential of the band, so I hope something comes of it. W7LUX also reports that 2-meter activity in the southwest is down from what it was a few years ago. The March column discusses this trend, which is not confined to one part of the country. Come on, gang, let's put some life back into the old band!

One who is trying to do just that is WA8MIH, New Era, Michigan. Using just an FT-221 with 19-watts' output, Stan has worked 30 states, mostly via tropo. He worked one state using aurora and another on m.s.

Another champion of 2 meters is W2AV, of upstate New York. Mike declares his availability for skeds via m.s. or EME. His setup includes an 8877 amplifier and four 19-element Cushcraft Longboomers. Address is Michael C. McHugh, 322 Cobb Ter., Rochester, NY 14620. Also from the Empire State, WA2PVV is looking for EME skeds. Bill is new to the mode but as of mid-March he had worked K4PKV and N7NW. Rig is a pair of 4CX-250s and the antenna system is similar to W2AV's. WA2PVV can be reached at 518-392-4383.

W1JR reports good success with his new moonbounce antenna consisting of eight 14-element Cushcraft Jr. Boomers. The array uses 10-foot spacing in both directions and Joe says that he can hear echos about 50% of the time. And, that's with 650-watts' output and the preamp in the shack, with a coax loss of around 1.5 dB. So far, he's worked six new states and two new countries with the new array.

WA8ONQ, Middletown, Ohio, wants it known that he is operating attended beacons on 144.06 and 50.06 MHz. Power is about 1 watt to horizontal omni antennas. I-d is by AI, Morse code.

The latest *SWOT Bulletin* states that WB5ERD, Sanger, Texas, is the national winner of the 1979 SWOT Contest and thus is the recipient of the trophy donated by the Arizona SWOT group. Speaking of awards winners, the February issue of *Cheese Bits*, published by the Mt. Airy VHF Radio Club, better known as the Pack Rats, lists the first winner of the Sam Harris Memorial Award as the Mecklenburg Amateur Radio Society of Charlotte, North Carolina. This group receives the award as a result of their performance with W4BFB/4 in the September ARRL VHF Contest. For information on this award, given annually by the Pack Rats, see this column for August 1979.

70 Cm — K2RIW writes concerning results with his new array consisting of sixteen 19-element Yagis at 100 feet. In a word, the results have been "fabulous." Dick can now consistently work low-power, single-Yagi stations at 200 to 300 miles (320 to 480 km). Recently he has been holding skeds with K4CAW, Raleigh, North Carolina, a distance of 480 miles (770 km). Al, like Dick, is running a kW, so the two are quite well matched. In a month or so of nightly attempts they have made contact all but twice. In both of those cases, failure was the result of "cockpit error." Other stations frequently joining the schedules are N4CD, Lynchburg, Virginia, and WD4CXU, Appomatox, Virginia.

W5GVE, near Corpus Christi, reports some good tropo sessions. On February 23, Bill reports, a number of QSOs with stations around Atlanta, Georgia, were made from his area. W4VHH was particularly strong. A few days later, on the 27th, one of the classic Gulf bending sessions took place. Bill's signals were heard by a station at Cape Canaveral, but unfortunately that station's 10 watts and vertically polarized OSCAR antenna could not negotiate back over the 800-plus miles across the state of Florida and the Gulf.

K2UYH, in his *432 EME News*, proposes a new RST system for use on moonbounce. Under this system, the following definitions would apply for readability: 1 — Unreadable, 2 — Barely Readable (less than 5%), 3 — Readable with considerable difficulty, (25 to 75%), 4 — Readable with practically no difficulty (75 to 95%), and 5 — Perfectly readable (better than 95%). For strength, AI's proposed system is as follows: 1 — Barely perceptable, 2 — Very weak, 3 — Weak, 4 — Fair, 5 — Good, and 6 — Very good. AI sees no reason for any higher-strength designations. This system does appear to have more flexibility than the TM05 system, and might work well if people agree, and learn, to use it. K2UYH has been compiling a 70-cm EME directory. Anyone wishing a copy should send him a large s.a.s.e. with sufficient postage for 2 ounces.

23 Cm and Down — It appears that we have a new record on the 23-cm band. W1HR passes along the information that VK6KZ and VK5MC worked over a 1422-mile (2290-km) path across the Great Australia Bight on January 23. This is just 112 miles farther than the record set December 29, 1978 by these same two gentlemen.

Speaking of good terrestrial distances, K6ZMW, in the Los Angeles area, reports that K7GNV, near Phoenix, has been hearing his 200 watts over the 300-mile path, but they haven't made it a two-way as yet. KGNV has about 6 dB less power than he. VE7BBG has been working some DX, but then he is getting a little help from the moon. In fact, Cor has yet to make his first terrestrial contact on 23 cm. Off the moon, he has worked PAØSSB several times on both cw and ssb. He finds that it is not as easy to keep a 20 dish aimed at the moon on 23 cm as it is on 70 cm. Rig consists of an OZ9CR ring amplifier using six 3CX-100A5s delivering about 600 watts. The preamp is a V-244 GaAsFET, which provides a noise figure of 1.1 dB.

W5GVF says that W5LDV, Houston, now has 70 watts of ssb on 23 cm, and that WA5VAJ and K5JRH are putting the finishing touches on their ssb setups. Texas seems to be a hotbed of 23-cm activity.

K3RYI wants it known that he will be operating on 13 cm during the June VHF Contest from a site about 60 miles north of Philadelphia. The rig delivers 300 watts, and receiving is helped by a 1.3-dB noise figure preamp. He can operate anywhere between 2304 and 2306 MHz. For skeds, write Kevin Lesh, 2750 Balaire Rd., Bethlehem, PA 18017.

In Training

OLD AND NEW FCC STUDY GUIDES: A COMPARISON

The following is a general summary of changes between the 1976 and most recent FCC Study Guides for all Amateur Radio written examinations (see March *QST*, pp. 55-58).

The summary is based on a careful comparison between the two sets of syllabi; we have not, of course, seen the examinations. The FCC has stated that the new exams will closely follow the areas listed in the new syllabi. We recommend, however, that instructors and students alike study the materials developed around the old Study Guides, as well as adding those areas that have been added or transferred from one of the other elements. At present, the FCC expects to administer the new exams, based on the new Study Guides, in late April at the earliest.

(Note: Use this index of subheadings to clarify the changes listed below.)

A. Rules and Regulations
B. Operating Procedures
C. Radio Wave Propagation
D. Amateur Radio Practices
E. Electrical Principles
F. Circuit Components
G. Practical Circuits
H. Signals and Emissions
I. Antennas and Feedlines

Novice — Element 2

A. More emphasis is placed on prohibitive practices. Be familiar with new call sign blocks.

B. Note addition of zero beating a received signal.

C. Well covered.

D. Be aware of measures to prevent use of Amateur Radio station equipment by unauthorized persons. Note emphasis on causes of acceptable and unacceptable SWR readings.

E. Be sure to check specific terms and concepts in this section to ensure familiarity.

F. Data on fuses is new.

G. Be sure block diagrams contain all mentioned equipment.

H. Note addition of backwave and superimposed hum.

I. A quarter-wave vertical antenna has been added. Note that parallel conductor line is mentioned, but not just open-wire type.

Technician/General — Element 3

A. Be aware of specific additions in prohibited practices, one-way transmissions, frequency limitations, and selection and use of frequencies.

B. Note shift in emphasis from radio interference theory to more practical procedures involving a variety of operating subjects.

C. Define regular daily variations and also cover scatter, line of sight, ducting and tropospheric bending if not included in the past.

D. Notice de-emphasis on transmitter performance and especially receiver performance from old Study Guide. Safety precautions and electromagnetic compatibility (shifted from Advanced class materials) are new topics. Major changes exist in use of different test equipment. Be aware of additions in the proper use of station components and accessories.

E. Some major changes are here, especially in labeling subtopics. Check off concepts, electrical units and mathematical relationships typically taught. Add those not covered.

F. Note subtopic data asked for and the inclusion of transformers and power-supply diode rectifiers. Characteristics of crystals and vacuum tubes have been deleted here.

G. Class A, AB, B, C amplifiers as a topic have been shifted to Advanced Class Practical Circuits. Power supplies and filters are retained as question material, but be aware of new emphasis on block diagrams for a-m, ssb and fm transmitters and receivers. A major part of solid-state material has been shifted to the Advanced and Extra Class Study Guides.

H. Be sure to include information on AØ, carrier, envelope, splatter and frequency translation: mixing and multiplication.

I. Depending upon examples used in instruction, only small revisions might be necessary. Consider inclusion of physical dimensions, Yagi and quad antennas, major lobes, feedpoint impedance of half-wave dipoles/quarter-wave verticals, and antenna-feedline mismatch.

Advanced — Element 4(A)

A. There is a shift in emphasis here to the areas of repeater and auxiliary operations, as well as remote and automatic control. Watch for individual items outlined in this section.

B. Much coverage of radio interference has been omitted in favor of facsimile transmission and slow-scan television transmission.

C. Note selective fading and radio-path horizon as topics.

D. Vehicular noise suppression and satellite communications are shifted to the Extra Class Study Guide. Note the changes in types of equipment listed in the first sub-topic. Be aware of new topics under electromagnetic compatibility.

E. Some shifting is here from the General and Extra Class Electrical Principles to the Advanced section. Some different concepts are apparent, but also make necessary additions in the area of mathematical relationships.

F. The former material on vacuum tubes is eliminated. Be aware of new solid-state components listed and what knowledge of them is required.

G. Although the material is similar to that previously required, there are a number of changes in specific topics and information asked for. Evaluate changes carefully, and take advantage of clarity in language used in subtopic headings.

H. Again, this material is similar to previous Study Guides, but a number of elements make a new appearance here.

I. Notice the addition of more popular antennas and terminology.

Extra — Element 4(B)

A. Required knowledge is stated in more detail.

B. Note inclusion of Amateur Radio satellites.

C. EME and meteor burst are added.

D. Use of spectrum analyzer and logic probe is new as well as vehicular noise suppression and direction-finding techniques.

E. Photoconductive effect and exponential discharge are new concepts. There is some overlap from old Study Guides, but notice new areas and computations necessary under mathematical relationships and calculations.

F. Major changes here include a significant increase in components mentioned and what data concerning them is necessary.

G. There are many deletions here from the old Study Guide. Notice increased emphasis on solid-state material. Be aware of new circuit-design questions.

H. There are a number of new areas of study under this classification.

I. A definite shift is seen from general vhf-uhf material to the specific topic of space radio communications. Former information in general remains, but more-common antennas and matching systems are mentioned. — *Bill Grim, WØMHK*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AWT, Kenneth B. Dow, So. Portland, ME
K1BCS, J. Langdon Prescott, West Franklin, NH
WB1CDM, Bruce W. Blood, Manchester, CT
K1DLU, Edward J. Deck, West Townshend, VT
W1DPJ, George Levensalor, Bangor, ME
WA1EYY, George E. Anscombe, Quincy, MA
W1HE, Wallace A. Battison, Arlington, MA
WA1HMC, Frederick W. Burleigh, Meriden, CT
W1OB, Royal S. Daggett, Waterbury, CT
W2BEY, Vernon L. Garrison, Clifton, NJ
K2CJQ, Bradford B. Thompson, Albany, NY
W2CWB, Stephen E. Lewis, Medina, NY
W2FFR, David A. Crowley, Sr., Elizabeth, NJ
WB2JIF, Donald W. Butler, Auburn, NY
WA2LRB, Leo M. Prince, Ramsey, NJ
W2OT, Seth D. King, Runnemede, NJ
K2SCY, Thomas V. Le Boutillier, Old Westbury, NY
K2ZZ, Gerard H. Hall, Webster, NY
KB3BX, Delmar W. Sage, Kensington, MD
W3CDL, John H. Pirtle, Oxon Hill, MD
W3EDC, Leonard A. Apfelbaum, North Hills, PA
W3HT, Herman Lukoff, Ft. Washington, PA
W3LKC, George W. Moyer, Franklin, PA
K4AIZ, J. Frank Wise, Sarasota, FL
W4BHG, James H. Millard, Atlanta, GA
WB4BQN, Lawrence C. Askins, Florence, SC
W4CPH, Dr. Archibald W. Reeser, Eden, NC
K4CZJ, G. Lyman Eden, Hudson, FL
WB4DTK, Billy Cliatt, Covington, GA
K4FCX, Robert P. Little, Port Charlotte, FL
WA4FMZ, Lawrence C. Wells, Calvert City, KY
K4FYR, Clyde Hall, Huntsville, AL
W4IM, Ernest F. Schwach, Charleston, SC
K4LTW, Thomas V. Hunter, Boca Raton, FL

*ARRL Life Member

W4NS, George W. Parker, Lakeworth, FL
WB4PFF, William T. Shinn, Sunrise, FL
K4PNU, Wilfred F. Lord, Miami, FL
N4RD, Robert W. Davis, Englewood, FL
WA4TTZ, Dr. Clifford E. Keys, Nashville, TN
W4UFX, Wayne E. Daring, Virginia Beach, VA
K4YC, Elmer E. Enke, Sarasota, FL
W4YCI, Emery B. Gill, Centerville, TN
N4YS, Erlie McDaniel, Oak Ridge, TN
W5BYC, Edward N. Cox, Guthrie, OK
K5CJA, William F. McDuff, Amarillo, TX
W5EKN, George B. Gibson, Conroe, TX
K5GOW, Isaac H. Roland, Malvern, AR
W5HQN, William H. Blair, Albuquerque, NM
W5II, Otto L. Groft, Littleton, CO
W5KXS, Joseph R. Haynen, Waco, TX
WA5LTP, George T. Nickolds, Artesia, NM
K5MBB, Dr. William D. Thompson, Waco, TX
W5RNC, Charles S. Meech, Pampa, TX
*W5SMN, Daniel B. Patterson, Berryville, AR
W5TMY, J. D. Odneal, Oklahoma City, OK
W5TSC, Harold F. McCune, Rio Rancho, NM
W5VLV, Steve S. Setar, Austin, TX
WB6AUQ, Glen R. Shepherd, Santa Ana, CA
WA6DNU, James W. Buchanan, Oxnard, CA
W6DOU, Paul L. Lemon, Santa Rosa, CA
W6EIR, LeRoy A. Ward, Tustin, CA
W6EIQ, John F. Good, Fresno, CA
WB6FRK, Ward E. Kephart, Bell Gardens, CA
K6HM, Martell E. Montgomery, Banning, CA
N6IJ, Elmer F. Wiechmann, Fresno, CA
K6KT, Wallace E. Francisco, Los Angeles, CA
W6LA, Harold V. Joy, Harbor, OR
W6NHB, Frank J. Porter, Vallejo, CA
K6OMU, Robert J. Cole, Jr., Altadena, CA
WB6TPI, Charles Long, S. Pasadena, CA
ex-K6YPW, James H. McGiffin, San Jose, CA

W7AAN, Clarence E. Erickson, Ogden, UT
W7ABO, Francis A. Burnell, Thermopolis, WY
W7FIS, George W. Weeks, Hayden Lake, ID
W7PVD, Robert J. Bronson, Globe, AZ
W7PVT/ex-W6JDR, Louie B. Miller, Vancouver, WA
WA7PWW, Richard O. Phillips, Redmond, WA
WD8AXC, Jerry E. Jarvis, Portage, MI
W8JNR, Virgil G. Carrel, Macksburg, OH
W8NB, Alex Sharoff, Clawson, MI
K8ORC, John T. Stansberry, Miamisburg, OH
W8PYD, Bernhardt, V. Sikkila, L'Anse, MI
W8SQP, Howard Quick, Lansing, MI
W9APX, Herbert S. Wilhelm, Collinsville, IL
WA9DTM, Robert T. Brown, Indianapolis, IN
K9UTC, Oscar L. Klein, Westmont, IL
WB9NMM, Max A. Jeter, Indianapolis, IN
W9RM, W. Turnor Lewis, Racine, WI
W9SF, Ernest J. Necker, Wilmette, IL
WB9TUP, Elbert G. Bissell, Rock Island, IL
K9WSL, Robert J. Potter, Cambridge City, IN
NØAGN, Bert C. Emery, Minneapolis, MN
KØOFI, Earl G. Lockwood, Fort Dodge, IA
WAØRPF, Otis O. Olson, Edna, KS
WØSLQ, Charles Boyd, St. Charles, MO
KH6LX, Everett B. Kopp, Honolulu, HI
VE3PN, Joseph A. Norton, Pakenham, ON
CO8RA, Rodrigo "Rod" Alea, Santiago, Cuba
G8AJ, Eric W. L. Brownjohn, Hants, Great Britain
JA8AA, Takeo Hama, Sapporo, Japan
SMØFY, Nils Sjoberg, Sigtuna, Sweden

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.

How's DX?

Conducted By Clarke Greene,* K1JX

What's That I Hear?

"Dear How's DX,

"I had the good fortune to be sent to France last month by the company I work for. The first weekend after my arrival also happened to be the weekend of the phone ARRL DX Test. I thought it would be interesting to hear how a contest sounds from the "other end." A coworker brought a Yaesu FT-901 along and he kindly loaned it to me for the weekend.

"Armed with the great gray box and about 20 feet of hookup wire, the battle of setting up a listening post was won with no casualties. Since I wasn't going to transmit, only listen, no attempt at impedance matching was even attempted. The stripped end of the hookup wire was simply stuffed into the center pin of the coax connector on the back of the transceiver. One station, ready to go.

"I applied power to the rig, and listened to an Italian station on 20 meters while I was balancing on the desk, bed and window sill in the process of stringing the antenna wire. Signals were dismally weak. One of my cohorts wandered in about then and commented that he had had little success in listening to his portable SWL set the night before. Apparently the hotel acted as a very good shield. The decision was made to heave the coil of wire out the window. Risking life and limb (the room was on the first floor, so the fall out of the window must have been at least four feet), I leaned out the window and threw. Signals jumped about six S units when the wire was horizontal, but when it fell limp to the ground, they fell about five and a half S units. On short notice, one of the hotel tenants generously (and unknowingly) loaned the use of his car to support the end of my wire antenna.

"The contest was to begin at 1 A.M. local time, so there were still several hours to kill. Some were spent in the hotel restaurant trying to convey to the waitress what orange soda was. The rest were spent listening (and dying of thirst).

"The very first striking observation was made on 40 meters, where I first tuned. It comes as no surprise, but broadcast stations are *loud* in Europe. Louder than you can imagine. Many pinned the receiver S meter. As a comparison, the very loudest amateur signal heard all weekend on any band was 5 dB over S9. It's no wonder that 40 is a tough band.

"When the contest began, I started listening on what I thought was the logical choice, 20 meters. Like I expected, the band was crowded with Europeans and North American stations going full bore. The East Coast multioperator stations were definitely commanding in signal strength.

"This all seemed too routine, so I tried 15 meters. Surprise; there were still some W/VE signals coming through, as well as some South Americans. Remember, this was at 1 A.M. local time, with a 20-foot piece of wire for the antenna. Normally, you wouldn't expect to hear much of anything on 15 meters at that time. I then tried 10 meters. Sure enough, there were some South Americans sneaking through. Even with conditions as good as they were that weekend, hearing DX stations that late at night on 15 and especially 10 meters would be unusual from the Eastern USA. The conclusion I came to is that the portion of the world that 10 and 15 would be open to at that hour from the East Coast has a very low amateur population. Even when the band is wide open, there isn't much to hear.

"On every band, 80 through 10, all weekend, the stateside signals were really impressive. Not just the big guns, but lots of guys who I know have only modest stations were really boiling in. They weren't as loud as the guys with big installations, but is that a surprise? It's no wonder that competition in the pileups is so tremendous.

"Now that I've set the scene, let me get on with the show. Even with such obviously good antenna systems, many of the U.S. guys were missing out on a lot of stations in rare countries who were pleading for contacts. Here are just a few examples of what I heard going on.

"There was an HBØ in Liechtenstein who I heard on both 80 and 20 meters. At one point he called several CQs on 20 meters with no response. He called CQ again, worked a station in the Midwest USA, got a 5-8 signal report and then continued on. After a couple more CQs a K8 descended onto the frequency and proceeded to call CQ. The HBØ even tried to work the K8, with no success. The K8 wasn't working anyone either.

"A UK8M called several of the big multioperator stations who were fighting it out in the bottom few kilohertz of the 20-meter band. He tried calling one for a solid 10 minutes with no success. The station was so busy wrestling with the other guys down there for a position that he couldn't hear the Soviet station. The multioperator station didn't make any QSOs, that I could hear, during that 10-minute period. The splatter must have been overwhelming to him. I tuned off and returned a few minutes later and found the UK8 struggling to work this guy. The operator finally heard him, but, in the end, got the call wrong.

"N4HX/TT8 called CQ unsuccessfully for almost 10 minutes at one time. Here he was a solid S5, still using only the short wire.

"There were three Egyptian stations either calling CQ or answering people. I never heard one pileup on any of them, and they were often unsuccessful in calling other stations.

"I know that propagation from southern France is a lot different than from North America, but even on the crummy antenna I was using, the DX stations were very loud. Furthermore, these DX stations were able to hear the Ws and VEs pretty well. Some rare DX would often call a loud stateside station, only to hear the station call CQ again and again.

"The whole scene amazed me. I puzzled over the cause of this situation and listened to the bands a lot more in an attempt to determine the driving factors that were preventing successful QSOs. It's obvious that a lot of guys are missing out on a lot of DX. Listening from over in France proved to me that a lot of countries we in the United States consider as being virtually inactive are indeed often on the air; much more than we think. Stations in these rare countries just aren't getting through to North American hams.

"After spending the rest of the weekend in front of the radio, and a few days pondering my observations, I've separated those observations which may be useful in analyzing why these DX stations aren't making it.

"The simple observations are that most DX stations don't have enormous antenna systems, and don't run high power. While these are very important considerations in achieving high communications reliability over long paths, there is unfortunately very little we can do about those factors from our end.

"There are a few observations I made about stateside operations that could be improved, though, benefiting all. First, there appear to be a lot of very loud stations who also use large amounts of speech processing. Most of these stations are obviously well equipped, using high power and large antennas, if their signal strength is any indication. They are already very loud; marginal signal levels are definitely not the case. Yet, these guys have their processors turned way up, presumably in an effort to raise the average power of their signal; in effect to add more 'punch.' What it really sounds like from the DX end is a muffled version of what might otherwise be a clean signal. The background noise is much more in evidence, and their voices become less-easily understood. It was revealing to hear how a clear, crisp natural sounding signal can be much more easily picked out of a pileup than these overprocessed signals. But that's off the subject a bit. The problem with all this processing really manifests itself in a way similar to the 40-meter jammers I mentioned earlier. The signals are very broad. Although it's theoretically not true, observations lead me to believe that there is a direct correlation between signal bandwidth and the amount of speech processing. More processing yields wider signals. This is probably a case where misapplication of a potentially good thing yields bad results.

"The second observation was that a large troup of stations seemed to be constantly vying for certain select frequencies. Presumably, these particular frequencies offer some advantage over all the rest. To be sure, some frequencies are better than others; however, while these guys were battling to maintain spots, literally dozens of DX stations called who they couldn't hear. It was interesting to note that some guys farther up the band were getting nearly as many calls, but they could pick out the stations who were calling them. Perhaps the potential exists for greater DX success on some of these chosen frequencies, but it can't be realized because of the QRM. I noticed the guys were doing relatively better than the rest, even though they may have had fewer stations calling.

"There's probably very little that can be done to remedy the aforementioned situations.

*7815 Mandan Rd., Apt. 102, Greenbelt, MD 20770

It's tough to convince these guys to turn their clippers down, at least enough so they can be understood, and who wants to referee a tag-team frequency fight? Perhaps the most effective measure a DXer can take is to arm himself with the best receiver he can. Digital readouts, frequency memories, scanning features and the like are fun to have and oftentimes useful, but there is *no* substitute for good selectivity, high resistance to overload from strong signals and clean audio. Be it from foreign broadcast stations, or other ham signals, QRM is tough to fight. Still, no receiver can totally get rid of wide signals, so it's best to simply change frequency and avoid the QRM entirely.

"I'm now totally convinced that there is a tremendous lot of DX to be worked, even with only a modest signal. The DX want to work us as much as we want to work them.

"The old adage that I used to hear when I was first licensed applies probably more today than it ever did, with our large amateur population. *You can't work 'em if you can't hear 'em.*

"73 and Best DX."

The fellow who wrote that letter asked that his call and name not be mentioned. He thought that he might be labelled as being full of baloney. Is he?

DX SURVEY

What, another poll? Well, yes and no. We want to find out what countries everyone needs to make it to the top of the Honor Roll (or at least to achieve DXCC). We'll tabulate our findings by computer and publish a list of the most-sought-after countries on the DXCC list. Perhaps in this way, we might influence someone to make the effort to put these countries on the air.

It's unreasonable to ask all of you to send in a list of all the countries you need. So, we're going to try another approach. Details will follow next month. The whole reason why we're mentioning this now is so you won't fix your vacation plans just yet. Hold tight.

DX CLUB NOTES

Another DX club should have appeared on the list that ran in December *QST*: The Western Washington DX Club, 8627 Fauntlee Crest S.W., Seattle, WA 98136.

W1AW DX BULLETIN

Every Friday (UTC), W1AW transmits a DX bulletin provided courtesy of the Southern New England DX Association. See April *QST*, page 97, for a complete schedule of bulletin times and frequencies. QST

QSL Corner

Administered By Joan Becker

The ARRL DX QSL Bureau System (Incoming)

Within the U.S. and Canada, the ARRL DX QSL Bureau System is made up of 22 call area bureaus that act as central clearing houses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free and ARRL membership is not required.

How it Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL Membership Overseas QSL Service. The member sends his cards to his outgoing bureau where they are packaged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus where volunteer workers sort the incoming QSLs by the first letter of the call sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an s.a.s.e. for a prompt reply.

Claiming your QSLs

1) Send a 5- × 7-1/2-in. s.a.s.e. to the bureau serving your district.

2) Neatly print your call sign in the upper left hand corner of the envelope.

3) A preferred way to send envelopes is to affix a 15-cent stamp. If you expect to receive more than 1 oz. of cards, please affix postage accordingly.

4) When requesting *any information* from the bureau serving your district, always include a s.a.s.e. for a prompt reply.

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of s.a.s.e.'s. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. A period of 6 to 8 months, or longer, may take place before you receive your cards.

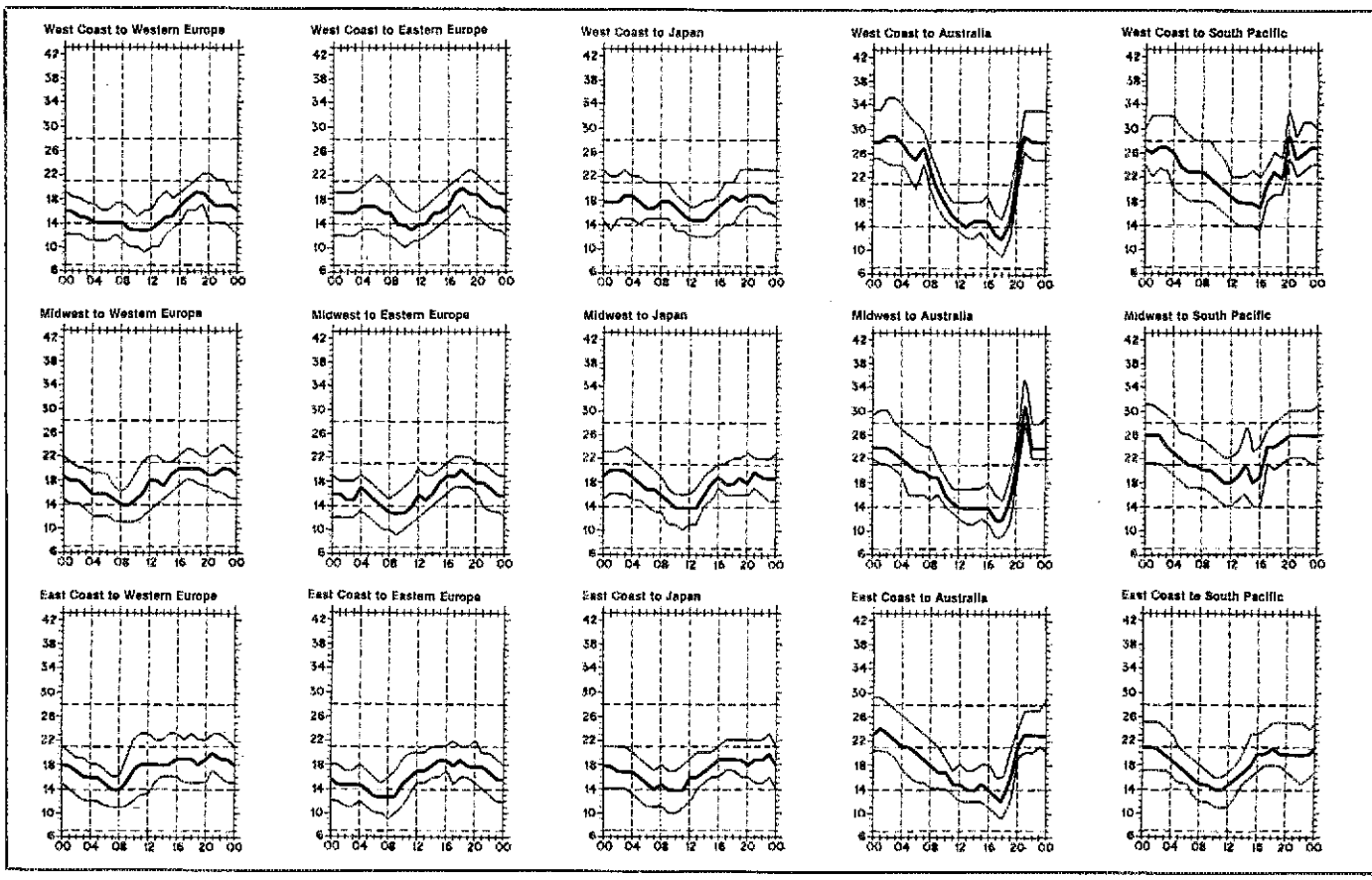
Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

Do keep self-addressed 5- × 7-1/2-in. envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of first-class postage.

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible



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

postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs are the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade.

Do include an s.a.s.e. with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column every other month).

Don't send envelopes to your "portable" bureau. For example, WA1SQB/2 sends envelopes to the W1 bureau, *not* the W2 bureau.

ARRL DX QSL Bureau System

First Call area: all calls* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls* — North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.

Third Call Area: all calls* — Leon Lapkiewicz, K3GM, P. O. Box 6238, Philadelphia, PA 19136.

Fourth Call Area: All single-letter prefixes — National Capitol DX Assn., Box DX, Boyce, VA 22620.

Fourth Call Area: All two-letter prefixes — Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls* — ARRL W5 QSO Bureau, Box 1690, Sherman, TX 75090.

Sixth Call Area: all calls* — ARRL Sixth (6th) District DX QSL Bureau, P. O. Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls — Willamette Valley DX Club, Inc., P. O. Box 555, Portland, OR 97207.

Eighth Call Area: all calls — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

Ninth Call Area: all calls* — Northern Illinois DX Assn. Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls* — WØ QSL Bureau, Ak-Sar-Ben Radio Club, P. O. Box 291, Omaha, NE 68101.

Puerto Rico: all calls* — Radio Club de Puerto Rico, P. O. Box 1061, San Juan, PR 00902.

U.S. Virgin Islands: all calls — Graciano Belardo, KV4CF, P. O. Box 572, Christiansted, St. Croix, VI 00820.

Canal Zone: all calls — LPRA, P. O. Box 9A-175 Panama 9A, Republic of Panama.

Hawaiian Islands: all calls* — John H. Oka, KH6DQ, P. O. Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls* — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.

SWL — Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

QSL Cards for Canada (VE and VO) may be sent to: CRRL Central QSL Bureau, P. O. Box 663, Halifax, NS B3J 2T3. Or, QSL cards may be sent to the individual bureaus.

VE1* — L. J. Fader, VE1FQ, P. O. Box 663, Halifax, NS B3J 2T3.

VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.

VE3 — The Ontario Trilliums, P. O. Box 157, Downsview, ON M3M 3A3.

VE4* — W. A. Stunden, VE4BJ, 578 Oxford St., Winnipeg, MB R3M 3J9.

VE5 — A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, SK S4S 5E3.

VE6* — G. D. Holeton, VE6AGV, 4003 1st St., N.W., Calgary, AB T2K OX2.

VE7* — Howard Martin, VE7AFY, No. 45-9960 Wilson Rd., Ruskin, BC V0M 1R0.

VE8* — Al Sturko, VE8NS, P. O. Box 72, Fort Smith, NWT X0E 0P0.

VO1, VO2 — CRRL V0 QSL Bureau, P. O. Box 6, St. John's, NF A1C 5H5.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

Here is some QSL information for those of you who would like to QSL direct. It is passed along as we receive it and therefore may not be entirely accurate.

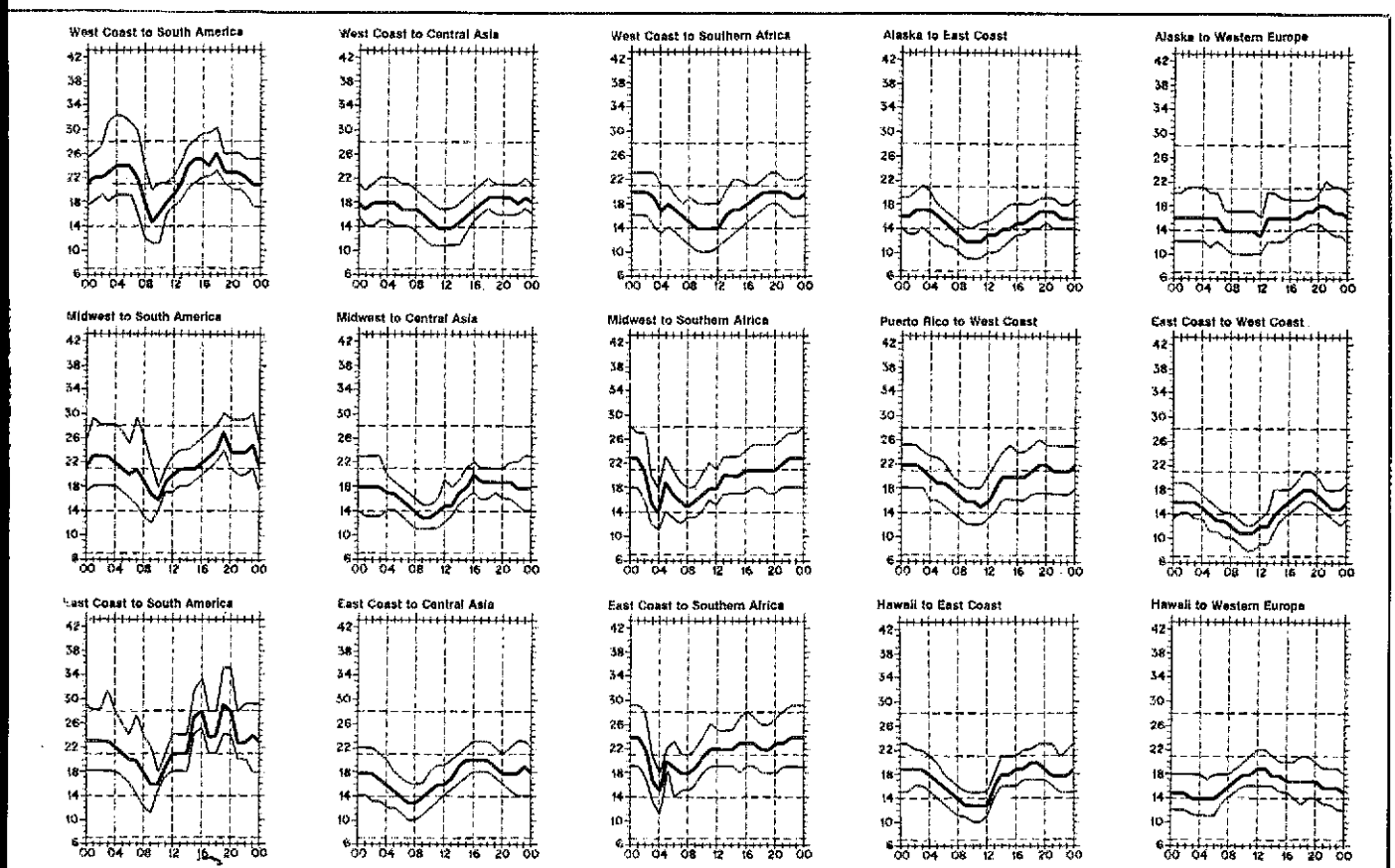
A35OM (N6OM)
DA1ON (AA4NA)
HL9UA (KA4FPP)
HP1XOJ (WB3KGY)
HS1ABD (K3EST)
N6DY/KP2 (N6DY)
N6YK/VP2A (N6NK)
OH2BP/OHØ (OH2PQ)
PPØMAG (PY1MAG)
PR8ZPJ/9 (W7BUN)
PY7CC (W4TAJ)
S2BTF (W5RU, not W5RO)
TG9XGV (K4CLA)
VK9NS (P29JS)
VP2AV (K4PJ)
VP2MFC (K1ZZ)
VP2VFS (W6IGG)
VP2VGC (VE7ZZ)
VP2VFU (K1IJU)
VQ9JJ (W5RU)
W5TIY/TI2 (N5IQ)
WA7JRL/4X (W8LZV)
XE1GBN (Box A25, Quertaro, Mexico)
XE1RL (WD8NKT)
NP4AU/YV5 (YV1TO)
YV1DIG (YV1TO)
YW1AVO (YV1TO)
YX1DIG (YV1TO)
YVØUSB (YV1TO)
ZF1SB (N8AG)
4S7DX (WB2VFT)
8P6NX (WØSA)

QSL Manager Volunteers

KA3ARF — WD5HMX
WA9BZW — N2ARR
K4WYC — KA8AKL

The following QSL managers are *not valid:*
A35AB (Cancel K7CC)
VP2DAY (Cancel WA2DWN)

Thanks to K2TV, AA4MI, W2QL.



lowest curve (optimum traffic frequency, or fot). See January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, CO. These predictions, for May 15 to June 15, 1980, assume a sunspot number of 152, which corresponds to a 2800-MHz solar flux of 195.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 20-country increments through 240, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from December 1 through December 31, 1979. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

DF4FX/253	JH7LVK/132	YU4EXA/182	K3KR/138	WA4GFG/103	N5ANA/102	N6HC/121	WB7ODR/102	WD8JFE/111
DJ2JS/109	JY5ZM/157	ZC4MT/104	K3LDR/112	WA4OKW/107	N5CI/101	N6LQ/110	WB7PKD/102	N9AHL/122
DJ3TF/115	OH3SG/153	ZL2AUP/110	WA3UFI/101	WA4SFN/105	W5JW/KX6/102	W6SBE/102	AB8G/102	N9AQT/109
DK7ML/118	OK3CFA/188	AG1C/100	WB3KUH/100	WB4KCL/258	WA5IEV/329	W6TAG/104	AD8X/101	W9GN/100
DL7UB/110	OK3KJF/110	KA1CH/147	K4KWT/144	WB4ZLK/100	WD5GJB/106	WA6MXD/102	K8YZ/125	KØINR/108
F5JF/111	OZ1ABA/123	WB1DLA/107	K4QMU/105	WD4OCO/111	AJ6O/111	N7AEM/143	N8AAT/101	KØJVN/103
FGØDYM/FS7/135	OZ8AN/102	AA2P/102	K4WGW/100	AA5C/120	K6FS/109	W7ABX/103	N8AQV/110	KØSRL/111
G3SHL/103	PAØRRS/122	WA2OJS/101	KB4FO/114	K5RSG/102	K6HHD/118	WA7PDW/121	N8DL/141	WØANZ/164
JR1ARK/191	VE4UX/104	WB2LCH/103	KF4H/114	K5WA/118	K6MA/180	WB7DOS/100	W8MEL/303	WBØTCQ/212
JA4UDP/114	YU2CTG/106	AI3C/275	N4QL/108	KB5AS/114	K6PWP/102	WB7FBH/103	WB8TXG/104	WDØCNU/100
JH7BDS/184								

Radiotelephone

DK3QV/108	I2HHE/149	OK1AGN/102	AA1Q/139	WB1DLA/107	W3IMJ/132	WB4KDU/105	WB5OFN/104	W8MEL/300
DK6AD/106	I2WTY/127	OK3CFA/178	K1MET/124	WB1ETS/127	K4DDB/314	WB4VLM/103	WB5RQM/111	WD8JFE/105
EA7AOK/110	I2XNC/252	P29GC/100	KA1CH/122	N2AGD/110	K4DMI/102	WD4DJC/106	K6HHD/117	KB9CO/105
G3RAM/118	I2XPD/122	PAØRRS/117	W1BH/105	W2XL/106	KA4ABA/101	AI5X/108	KB6AR/105	N9AHL/122
G3XYJ/107	JR1ARK/102	PAØVST/100	W1DOH/101	WA2FUM/100	N4QL/101	K5BTS/103	W7HSP/101	KØSRL/100
HI8IH/129	LA2FV/104	SM6AOU/180	W1GUW/224	WA2KDB/118	WA4LWL/129	K5RSG/101	WA7BPO/131	KBØBB/114
HI8XJO/119	OE8MOK/119	SP3GEM/183	WA1ZRS/100	AF3T/102	WA4QZX/105	W5UMK/106	N8AQV/105	WBØTCQ/208
I1YJQ/104	OE8WBK/102	VE2LH/100	WB1ASY/100	KB3CQ/KH6/100	WA4ZXA/102	WB5CDW/109		

Cw

DF1NT/105	JH7LVK/101	SV1IW/109	W1MLG/230	W2GA/101	KF4H/105	N6NF/132	K8MVZ/105	W8MD/105
HB9ASN/112	ON5FU/119	VE3JUG/118	KB2FD/100	K4AMC/103	WA4OML/104	W6IC/101	K8YZ/112	W8RSW/273
JH7BDS/181	PY2BBO/100	N1JB/104	W2FP/252	K4DDB/118	K6XN/101	WB7PKD/102	KB8EC/112	WB9UKK/106

RTTY

W7MI

5BDXCC

W1GD	K8IP	PJ2FR	K1WJ	N3RL	DL7VN	WA1JMP	YU3DJK

Endorsements

Mixed

CE6BGZ/266	SM6CMU/298	W1ETV/220	W2YC/160	K4RD/305	W5VFJ/164	K7SZN/170	WD8MOV/192	WD9IIX/220
DJ2MN/272	SM7BOL/252	W1FTX/331	WA2CYQ/232	K4WSB/270	WA5IGD/233	W7AO/339	AA9M/270	KØBJ/275
DJ4AX/328	VE3MV/211	W1GUW/225	WA2KDB/220	N4NX/301	WA5YTX/152	W7ETZ/321	K9BB/275	KØDEW/131
DK5AD/250	VE6EO/220	W1KG/317	WA2QAU/226	N4SU/348	K6BUU/220	W7FF/221	K9BG/260	KØDN/185
DK7NL/169	VE7IG/325	W1MLG/262	K3AER/125	W4AST/313	K6PZ/317	W7JYX/337	K9DID/260	KØIFL/309
EA3NC/318	VE7VX/165	W1NB/260	K3FN/300	W4JVN/240	K6SP/289	W7KE/141	K9MIE/181	KØSGJ/305
F6DHB/252	YU2RJG/186	W1RBU/210	K3OTY/306	W4WSZ/127	K6SVL/315	W7QMU/199	K9MZJ/159	KØTB/1/125
JA1ATF/200	ZL3BK/240	W1SK/201	N3WH/247	W4YKH/260	N6DX/336	W7RYS/159	K9QVB/281	NØAFL/150
JA1ELY/316	AA1K/261	W1VH/225	W3AX/281	WA4GIQ/240	N6NF/158	WA7OSO/259	K9RF/320	NØAT/240
JA6PN/216	AB1P/161	WA1LOU/140	W3CRG/200	WA4WYN/280	W6GMF/334	WA7PQL/142	K9UWA/295	NØZA/170
JA7HMZ/231	K1ALP/206	WB1EMN/230	W3GOH/283	WB4KVM/160	W6KHI/127	K8INV/121	KB9DE/201	WØGKE/310
JA8MS/323	K1GX/200	WB1GOO/160	W3PTV/158	WB4RFZ/250	W6NPY/279	K8WD/175	W9HK/328	WØJCB/214
LA1ND/182	K1KNM/242	K2NJ/242	W3RJ/300	WB4UME/138	W6YB/325	W8NPF/290	W9IVG/320	WØRT/220
OH2KP/201	K1PVB/211	K2UPR/180	W3SQ/273	WB4WHE/140	W6YQ/249	WA8EQP/164	W9KQD/328	WØUBT/175
OK2BJU/140	K1VKO/151	N2MF/220	W3TEF/170	AI5A/121	N6VR/285	WA8LSO/280	W9KXK/340	WAØOVU/138
OK3CO/151	K1WJ/278	N2MJ/158	W3TVB/281	K5BDX/128	WA6TOO/261	WB8YQX/139	W9NGA/284	WAØVKF/270
PAØJJB/121	KA1DJ/173	N2VW/225	WA3WIP/240	K5FNQ/201	WB6WIW/276	WD8BKM/154	W9TKR/323	WBØHAI/272
SM5AQB/322	N1CQ/120	W2KI/201	WB3EWB/129	K5GY/154	AD7Z/220	WD8KKF/200	WA9REC/182	WBØNAA/220
SM5DQC/320	N1TZ/270	W2PK/256	K4DDB/251	K5XE/126	K7AA/305	WD8KZS/149	WB9UKK/120	WDØBNC/225
SM6AOU/332	W1EOA/310	W2RS/311	K4KBL/274	W5JC/317	K7EG/201	WD8MGQ/250		

Phone

CE3GN/250	JA4CUY/250	VE3MV/211	K1KNM/241	K3OTY/306	WB4KCL/255	K6SD/203	W7QK/322	K9RL/212
CE6BGZ/244	JA4DLP/287	VE3UX/327	KA1DJ/173	K3VAX/156	WB4KVM/160	K6SVL/315	WA7PQL/141	KB9DE/201
CT4IB/180	JH6NUR/166	VE4AS/291	N1TZ/245	W3GE/311	WB4VHE/159	N6DX/306	K8GWM/270	W9DOR/262
DJ5LA/326	JA7HMZ/165	XE1J/302	W1CRL/180	W3GG/319	AE5E/126	W6AED/7/288	K8ONV/332	W9GBC/159
DL7EN/323	JH8GWW/162	XE1NI/220	W1KSZ/271	WB3CHS/144	K5GY/141	W6FET/316	K8TB/312	W9IVG/294
EA1IY/314	JA8ZO/322	XE1XF/182	W1NG/297	WB3FSN/127	K5HT/139	W6HYG/339	K8WD/175	W9KXK/280
EA3NC/308	LA1ND/165	ZL1AMN/301	W1YRC/298	AC4B/280	K5IH/256	W6KUT/328	W8ARH/328	W9RKP/260
EA7ABV/120	LU1BAR/W3/309	ZL1BD/181	WA1OUB/125	K4AIM/341	K5JW/320	W6KYJ/314	W8COG/312	W9VNG/205
G3YJI/200	LU8CW/251	ZL3BK/233	WA1SMI/125	K4PDV/333	N5WH/180	W6KZS/322	W8PCA/252	WB9VDX/225
IV3YRN/221	OZ4TT/183	ZS6RM/339	WB1GOO/137	K4XO/318	W5KC/331	W6QOG/328	W8RT/320	KØHSC/193
I4KET/175	OZ3PZ/315	6Y5MC/206	K2BK/305	N4NX/295	W5VFJ/156	WB6WIW/276	WB8VZX/216	KØIFL/262
I5BDE/267	PAØKB/271	9G1JI/199	K2CM/325	W4AST/313	WA5HLQ/139	AD7Z/210	WB8YQX/139	KØSGJ/301
IØOLK/280	PY4AKR/264	9G1JU/248	N2VW/225	W4BQY/302	WA5MLT/181	K7EG/155	WD8BKM/151	NØAT/236
IØWN/173	SM5AQB/303	K1ALP/204	W2FP/319	W4EEU/329	WD5DBV/232	W7CMO/331	WD8MOV/183	WØBN/309
JA1BWA/236	SM6CMU/263	K1CMI/284	W2PQZ/180	W4JVN/238	K6AO/290	W7EPA/331	AI9J/256	WØJCB/208
JA1DM/316	SM7BOL/249	K1EFS/200	W2RS/227	WA4HSE/281	K6EXO/329	W7FF/219	AI9U/150	WØTJ/328
JA1ELY/313	VE3AAZ/321	K1PVB/211	W2UI/254	WA4JDI/258	K6PZ/298	W7JYX/337	K9RF/302	WØYZQ/204
JE1XRZ/186	VE3MC/269	K1WJ/242	WB2JEZ/151					

Cw

F2IU/220	JA8JL/282	K1WJ/163	WA1FCN/119	W2RS/183	N4MM/240	K5XE/120	N6VR/165	K8MFO/283
I5BDE/175	JA8ZO/262	W1FZ/145	K2BZT/218	W3ODJ/200	N4NX/212	N5DX/175	W6PT/287	W8ZCQ/257
JA1IBX/266	SM6CMU/176	W1NG/277	K2FL/286	K4PI/284	K5GO/151	WA5YTX/140	W6YQ/173	W9BG/260
JA7HMZ/175	AA1K/151	W1WKP/125	N2MJ/151	K4XO/274	K5UR/263	K6JG/261	WB6ZUC/260	WØCAW/200

Strays

NATIONAL NOVICE DX NET

☐ The National Novice DX Net meets on Saturday and Sunday at 1500 UTC on 28,105 kHz.

I would like to get in touch with . . .

☐ amateurs who have operated in former European colonies or territories. Gary Mitchell, WA1GXE, P. O. Box 1003, Fairfield, CT 06430.

☐ anyone who has or has built "A Phasing Type Sidebander," originally described in November 1959 *QST*. This unit also appeared in the ARRL's *Single Sideband for the Radio Amateur,* third and fifth editions. George K. Hudson, W2BHZ, Box 133, Rte. 4, Pine City, NY 14871.

☐ anyone who has photos of or knows of sources of photos of, rare DXCC places. Floyd Gerald, N5FG, 4706 Washington Ave., Gulfport, MS 39501.

☐ Novice- and Technician-class operators to set up a schedule for crossband operations. Write to Nathaniel Robeson, AK9Q, 6625 N. Sacramento Ave., Chicago, IL 60645.

Honor Roll

The DXCC Honor Roll is comprised of those call signs which have been credited with at least 310 countries of the 319 current countries on the DXCC list.

Mixed

319
DL1HH/349
DL1JW/352
DL1KB/360
DJ2BW/357
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K6YRA/336
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YV5BBU/331
W2GKZ/334
WA3IKK/328
K4BBF/328
W4EPZ/331
WA4WIP/332
W5SJ/329
WA5IEV/328
N6UC/327
W6ARJ/328
W6CCB/325
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WB2HXD/333
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W6ISQ/333
W6ZKM/329
WA6AHF/326
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W8GMF/336
W8BEK/335
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DL7AA/339
F5II/326
G3UML/330
JA1ADN/331
JA2JW/332
KH6BB/330
ON8XA/327
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50 Years Ago

May 1930

☐ Secretary Warner reports on the new Federal Radio Commission regulations. These include the mandatory "adequately filtered direct current power supply or equivalent" rule, and the opening for radio telephony use of 14,100 to 14,300 Kc. to holders of an Extra First Class Amateur grade license. ('Phone was also permitted on 1715 to 2000 Kc., 3500 to 3550 Kc., and 56.0 to 60.0 Mc.) A station log book must be maintained.

☐ Assistant Editor Rodimon, W1SZ, tells of international communication on 10 meters, with all continents represented, more or less. Rod thinks perhaps G5BY or W2JN may soon grab the first 10-meter WAC (Rod was wrong. It wasn't until late 1935, when W3FAR claimed it.)

☐ C. H. Vincent of W8XB-W8RD reports on plane-to-ground radiotelephone experiments. Secret of the success was the complete elimination of electrical noise in the 'plane — by using a Packard *diesel* engine on the Stinson-Detroiter!

☐ The Sweepstakes Contest held in January was a big success. Complete (preamble, signature) messages were exchanged (10-word minimum text) by the contestants. Winner W1ADW exchanged messages with 153 stations in 43 sections during the two-week period.

25 Years Ago

May 1955

☐ Some ham named Dick Baldwin, W1IKE, bought his way into the cover photo by writing a good article on a band-switching TVI-proofed all-band transmitter he designed and built. (Some years later he joined the hq. staff and got a two-letter call: W1RU.)

☐ The 8-foot base-loaded whips used for 75- and 40-meter mobile operation must be readjusted for any significant frequency excursion within the band. Hargrave, WØIGP, describes the remote *self*-resonating system he uses for VFO work; it combines a discriminator and d.c. amplifier for phase sensing and a motor-adjusted coil for loading control.

☐ Taylor, W8LVK, shows how a vertical antenna can be used over a 3:1 frequency range (e.g., 7-21 Mc.). The secret is to use a "fat" antenna, which he approximates with a 4-wire arrangement.

☐ Tschannen, W9LUO, describes a "two-tone test" oscillator using phase-shift oscillator circuits. With proper adjustment, the audio outputs have only 0.1% distortion in the audio range.

☐ Phil Simmons, W1ZDP, reports on the c.w. portion of the 1954 Sweepstakes Contest. The low-power category was 100 watts or less, and 77% of the 1394 logs showed this classification. The top score of W4KVX represented 1147 contacts in all 73 sections during 39 hours' operation (out of a possible 40). — *By Goodman, W1DX*

YL News and Views

Conducted By Jean Peacor,* K1IJV

Galena and Cat Whiskers

In hearing about the "galena and cat whisker" days of Amateur Radio, one gets the feeling that newcomers have missed so much. Professing ignorance on the subject, I made a phone call to a knowledgeable friend (W1BVR) to clarity just what those days were. Galena, the chief ore of lead, came in chunks. By using a chunk of it mounted in a holder, and attaching a fine curved wire, the cat whisker, it acted as a crystal. Provided the wire touched the galena in just the right spot, you could then receive radio signals. During a JSO, it was often necessary to find that right spot many times.

Australia's Austine Henry, VK3YL, first became interested in radio in the '20s using a small crystal receiving set of the galena and cat whisker variety. Therein lies the excitement of the times.

Golden Anniversary This Month

On the 13th of May, Austine celebrates her golden year in Amateur Radio. First licensed in 1930, she found few Australian women interested in radio at that time. It was an OM-oriented hobby — as far as is known, Austine became Melbourne's only licensed YL. The local OMs have always been helpful and willing to lend a hand, particularly in assisting with her all-important antenna system.

With little commercial gear available, homebrewing was the order of the day. Austine used all-homebrewed equipment until the outbreak of WW II. She can still recall going the rounds of the opticians in Melbourne acquiring old quartz spectacle lenses and grinding her own crystals when self-excited rigs became taboo. In her words: "Soldering bus-bar and hook-up wire was also a new experience for me and it took some persevering before I acquired the necessary level of proficiency. You could say that I learned all about the evils of dry joints at a very tender age. I always liked winding coils and operating on the plates of B/C variable condensers; finding the correct frequency was sometimes a problem." She has known the thrill of hair-raising operating from the primitive aircraft of the '30s as a member of the Royal Australian Air Force.

Good, Bad or Indifferent

With little known about the solar cycle and vagaries of propagation during the '30s, conditions were deemed to be good, bad, or indifferent. Unpredictable DX communications added enthusiasm to every DX contact. You never knew what might lie around the corner. With primitive gear, by present day standards, and a plate-power-input limit of 25 watts, every contact held some sense of awe.

All of these factors made an avid DXer out of VK3YL. She talked with ships' operators (sparks) throughout the world. If their destination was Australia, she met and talked with them. She succeeded in contacting a ham in South Africa using portable gear, a UV199 tube fed with dry batteries with less than 1-watt power input (real flea power); another highlight of operating in the '30s.

Cw is Austine's first love. She believes "it is still the surest means of maintaining communication with weaker DX stations when the going gets tough." In recent years, in order to improve her DXCC rating, Austine has found it necessary to revert to ssb from time to time but she prefers a key to a microphone.

Austine Henry, VK3YL, was on hand recently when the Australian scientific ship, the *Nanok S.*, sailed for Antarctica. She is shown with Finn, the *Nanok*'s radio operator, during a visit to the ship's radio shack.

Looking Ahead to Phase III

When war-surplus gear became available, the ardent homebrewers turned their talents to modifying this equipment for home use. This she did until, with the increased use of ssb, Austine graduated to the Collins S line; more recently, this has been supplemented with a Kenwood 820S. As sophisticated as today's equipment is, Austine questions whether it improves operator skills or provides as much personal satisfaction as she has known. Knowing that nostalgia trips are not productive and that technical progress cannot be halted, Austine plans to cooperate with the inevitable. To this end, the excitement of DXing via satellite looms great in her eyes. She's gearing up for the Phase III satellite.

Austine feels that Amateur Radio is the premier of hobbies. It's extremely heartwarming for her to see the undiminished enthusiasm of those who have spent a lifetime with this hobby, which is still serving them well into their retirement years.

Congratulations on your 50th anniversary, Austine. From galena and cat whiskers to Phase III, you've had all the best of experiences in the prince of hobbies.

DOROTHY W. EVANS, W1FTJ

It regretfully record the passing, on February 22, of Dorothy W. Evans, W1FTJ, an outstanding amateur, charter member of Women Radio Operators of New England (WRONE), YLRL 1st District chairman, president of YLRL for two terms when it was a young organization, and past SCM of New Hampshire.

First licensed in 1931, Dot's fist on cw became well known, particularly in the DX world. She enjoyed the rhythm of code and had no microphone in her shack. She earned many awards. In 1938, Dot married Carl Evans, W1BFT, and joined him in his business at Evans Radio. Our deep sympathies are extended to Carl, W1BFT, and family.

YLRL SCHOLARSHIP

The Young Ladies' Radio League is again offering a $300 scholarship to any U.S. YL holding a General class license (or higher) who intends to pursue studies in communications/electronics or a related scientific field. Preference is given to handicapped persons, but need and potential are also major considerations.

The scholarship is financed by YLRL and administered (without cost) by the Washington, DC, Foundation For Amateur Radio. The Foundation also administers six other scholarships; applicants for the YLRL award can be considered for any of the programs for which they can qualify.

Applications for the 1980 award are now being accepted. Full details and application forms are available by writing (prior to June 1): FAR Scholarships, 8101 Hampden La., Bethesda, MD 20014.

Donations for this worthwhile effort will be gratefully accepted. They may be sent to: YLRL Scholarship Fund, c/o Ruth Jank, K5POT, Receiving Treasurer, 100 N. Winston La., San Antonio, TX 78213.

A fifth-grade student in Yellow Springs, Ohio, Swala Abrams; KA8HIL, received her license in October at the age of 10. She is the youngest ham in her county and spends much of her on-the-air time explaining her name. Swala is the KiSwahili word for gazelle. Born in Nairobi, Kenya, Swala moved to the U.S. when 3-1/2 years old. Her overseas origins have brought her good luck with DX. Swala's mom is a chemical engineer, firefighter and paramedic. Her dad, KA8HLE, is a professor at Antioch College.

*Country Club Dr., Monson, MA 01057

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE MEETING

No. 379

March 9, 1980

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at 0856 on Sunday, March 9th, 1980, at the Washingtonian Motel, Gaithersburg, Maryland. Present were President Harry J. Dannals, W2HD, in the Chair; First Vice President Carl L. Smith, WØBWJ; Directors Gai Anderson, KØGA, William J. Stevens, W6ZM, L. Phil Wicker, W4ACY, and Stan Zak, K2SJO; and General Manager Richard L. Baldwin, W1RU. Also present as observers were Vice Presidents Max Arnold, W4WHN, and Noel B. Eaton, VE3CJ; Directors John Sullivan, W1HHR, Paul Grauer, WØFIR, and Jesse Bieberman, W3KT; Vice Director Hugh Turnbull, W3ABC; Washington Coordinator Perry F. Williams, W1UED; General Counsel Robert M. Booth, W3PS; and Chris Imlay, N3AKD, of the General Counsel's office.

After discussion, moved by Mr. Stevens that the General Manager continue to keep informed in reference to Docket 80-1, a proposal for a new Inland Waterways Service at 216-220 MHz. Should there be a failure of FCC to correct a reference in paragraph 26 to "216-225 MHz," the General Manager is instructed to file comments in the docket aimed at protecting the Amateur Service from encroachment. VOTED unanimously.

After discussion, including the possible effects of actions taken at WARC-79, moved by Mr. Zak that the General Manager file appropriate comments in Docket 80-7, establishing a disaster radio response program in the local government radio service for states, territories, and possessions. The comments are to include the request that provision be made in the proposed state-level disaster radio response communication system rules for utilization of Amateur Radio Stations and Operators. VOTED unanimously.

After extensive discussion of various matters relating to the Canadian Radio Relay League and the Canadian Division of ARRL, on motion of Mr. Anderson the Executive Committee recorded its concurrence with the recommendation of the Editor of *QST* to list officers of the Canadian Radio Relay League on the "Canadian Newsfronts" page.

In addition, the Executive Committee accepted the recommendation of the ARRL President that the President of CRRL continue to be seated as an observer at meetings of the ARRL Board of Directors.

On motion of Mr. Anderson, the Committee accepted the change in dates of the 1982 National Convention, necessitated by the lack of availability of the convention hall for the originally agreed-on dates.

On motion of Mr. Anderson, it was VOTED to provide additional support up to a maximum of $2500 for the so-called Sleeper antenna case on Cape Cod.

On motion of Mr. Stevens the Committee recognized the names of 84 members who had recently been elected to Life Membership, and directed the General Manager to list their names in *QST*.

On motion of Mr. Zak, the affiliation of the following clubs was approved: Atlanta Chapter QC WA, East Point, Georgia; Carthage Amateur Radio Society, Carthage, Missouri; Cowlitz County Amateur Radio Club, Kelso, Washington; Ebonaire Amateur Radio Society, St. Albans, New York; Garden City Amateur Radio Club, Garden City, Michigan; Hendricks CO Ham Club, "(HC)", Danville, Indiana; Nerds Amateur Radio Club, Cannon AFB, New Mexico; P. S. 91 Amateur Radio Club, Bronx, New York; Rocky Mountain Radio League, Golden, Colorado; Stanford Linear Accelerator Center (SLAC), Stanford, California; Sussex Amateur Radio Association, Georgetown, Delaware; Thorne Junior High Radio Club, Port Monmouth, New Jersey; West Georgia Amateur Radio Society, Temple, Georgia. (With this action there are now 1859 Category I clubs, eight Category II clubs, and 343 Category III clubs.)

On motion of Mr. Stevens, approval was granted for the holding of the following five ARRL conventions: Alabama State, May 17-18, 1980, Birmingham, Alabama; Oklahoma State, July 25-27, 1980, Oklahoma City, Oklahoma; Florida State, August 1-3, 1980, Jacksonville, Florida; Dakota Division, September 26-28, 1980, Fargo-Moorhead, North Dakota; Virginia State, October 3-5, 1980, Virginia Beach, Virginia.

On motion of Mr. Stevens the Committee VOTED in favor of the admission of the Montserrat Amateur Radio Society, the Radio Society of The Gambia, and the Solomon Island Radio Society to the International Amateur Radio Union, and approved the reactivation of IARU membership in Cuba by the Federacion of Radio Aficionados de Cuba.

The Committee considered the opinion of the court in the matter of the ban of 10-meter linear amplifiers and authorized an investigation of alternative solutions to the problem other than further court appeal.

After extensive discussion, and noting that this was to be an FCC agenda item on Wednesday, March 12, the Committee authorized the President, the General Manager, and the General Counsel to take all feasible action to preserve club and RACES call signs.

After extensive discussion, on motion of Mr. Wicker, it was VOTED to support the requests from Attorney Fred Lawson for an additional sum of $10,000 in pursuit of favorable decisions for certain West Coast cases involving radio amateurs now under litigation.

During the course of the meeting the Committee discussed, without formal action, the matter of the involvement of Amateur Radio in certain political considerations, the recently authorized Canadian operation on phone between 7050 and 7100 kHz, IARU representation of our members in Canada, the status of response to various actions at the January Board meeting, the ARRL Hall of Fame, the 1980 National Convention Program, and the matter of the display at ARRL conventions of certain types of equipment which might bring discredit on the Amateur Service.

The next meeting of the Executive Committee will be held in Rochester, New York, on Sunday, May 18.

The meeting was adjourned at 1335.

Respectfully submitted,
Richard L. Baldwin, W1RU
Secretary

LIFE MEMBER APPLICANTS
March 9, 1980

Mark Albert, WB9UZO; Marvin G. Baker, W9KGE; Robert E. Bass, III, WB5WOE; Robert G. Beaudet, W1YRC; Zack J. Beckwith, WA1PTS; Derrick J. Belbas, VE4VV; David W. Bennett, KBØKD; Franklin D. Benson, KH6GJ; John M. Bokoles, W2KI/K3ANA; Henry C. Brote, Jr., N8AKX; Ronald W. Brown, WB5PKB; Rex D. Chambers, WAØUPB; Jeffrey M. Cornblatt, WBØYXC; Fred G. Cornish, VE3DYC; L. A. Coward, VE3FGV; John Michael Cox, K3GEG; William T. Croghan, Jr., WBØKSW; Gregory K. Cypher, WD8NST; Don Daso, WA8MAZ; Paul F. Dorey, WA6FIL; Phyllis S. Douglas, K7SFC; Kenneth P. Elsberry, WD4ERM; Randall F. Faile, KA4CJX; Michael D. Ferraro, K6ZSR; William L. Flynn, AIØC; Gordon G. Fraser, VE3HSF; James M. Fraser, N6LI; Nancy D. Frederick, WB3EZG; Jerry Frisbie, WBØUNC; Thomas F. Gallagher, Jr., WB3DJF; Herbert W. Gareau, WA2HIE; Reinhard G. Geissler, DL1UP/W7; Donald A. Gilhamsen, K4EAU; Bernard D. Glassmeyer, W9KDR; Thomas E. Gohm, N7RV; Ben J. Green, WD8CZP; Robert E. Green, N6AUG; Donald L. Harp, WBØUBN; Raymond J. Harshman, WIGIK; Carroll E. Hayden, WAØBGV; John L. Herty, WD5BIG; Robert R. Hill, K5HMS; Jay Jackson, WB9VIN; John Russell Jackson, WA4DEP; Ken James, K1GA; Bobby R. Johnson, WD4JDI; Daniel T. Johnson, WB7CCY; Edward E. Kennedy, WB6IMN; Derrick Ian King, VE3KDI; William A. Kuechler, N9ACQ; Robert E. Kuhnle, Jr., WB8ENR; Robert J. Kunesh, WA5NRM; Richard S. MacDonald, ADØI; Clayton Melanso, WB5DBF; Peter D. Morico, WA1OII; Daniel T. Morris, WB4KYL; Wyatt F. Nance, W6MN; Neil P. Newstem, WD4RDF; Joseph J. Norwich, Jr.; Rodney L. Parks, N9AFM; Creeden Pratt, WA4PSG; J. P. Rhodes; Mac M. Robbins, WA3KDJ; Don E. Robinson, WA4YYM; Chester G. Ross; Edward A. Sanders, WA6VJP; Wilson F. Sellner, WB7RRZ; Kathleen S. Seward, KA4FID; Sheldon I. Shalett, W9TDQ; Howard M. Shepherd, Jr., WA7HVK/KL7HIG; Marjorie Shipley, W4UVL; Ronald P. Smith, WA4PCJ; Christopher N. Snively, WA3QHR; Jeffrey Wayne Stewart, N6JJ; Charles A. Stiles, Jr., K5MRK; Oliver O. Thigpin, WD4KGY; Ronald G. Thomas; Leonard A. Todd, N8AGS; Richard S. Townes, W2INJ; Larry B. Utz, WB3GZC; Joseph P. Visalli, N9BD; Michael B. Walton, VE7CEW; Edward J. White, WA3BZT; Louis G. Wiegan, AI2I.

DST

Strays

WEST VIRGINIA'S BIRTHDAY AWARD

☐ A special 117th birthday award is available to any ham, worldwide, who works a West Virginia amateur between Flag Day, June 14, and June 20, West Virginia's birthday. The award will be a certificate from the Secretary of State of West Virginia, bearing his signature and the West Virginia seal. Send your QSL report of contact to the attention of the Secretary of State, The Honorable A. James Manchin, Room 157, State Capitol Building, Charleston, WV 25305, and wish West Virginia a happy 117th birthday. — *Lovell Webb, N8LW, President, Kanawha ARC, Charleston, West Virginia*

JANUARY CD PARTY HIGH SCORES

Both scores and activity were up substantially during the January CD Party. More than twice as many people found the time to go the full 10 hours than in October. There was no room in the April "Operating News" column. Complete results appeared in the Spring issue of "QCD," sent to all ARRL appointees and officials. Listings below indicate call sign, score, QSOs, multipliers and section. — *Tom Frenaye, K1KI*

Phone

N6RO	21,476	364-59-10-EB
N6TR	20,862	366-57-10-LA
W2RQ	18,178	298-61-10-NNJ
N6NF	16,874	286-59-10-SCV
N7DF	16,740	310-54-10-UT
WA2OVE	13,475	245-55- 9-NNJ
AEØM	10,608	204-52- 9-MN
K1GQ	10,200	200-51- 4-NH
KØAL	9950	199-50- 8-IA
K5TM(K5ZD,opr)	9180	180-51- 8-ST
K8ND	8379	171-49-10-OH
K2OY	7695	171-45- 7-EN
W9OP	7693	157-49- 4-WI
N4CCT	7056	144-49- 5-AL
K3ORW	7497	153-49- 8-MD
KØGND	6912	144-48- 5-NE
K6XO	6664	136-49- 6-EB
K2SGU/5	6439	137-47- 7-NT
W9TG	5428	118-46- 3-IN
N6PZ	5418	126-43- 7-LA

Cw

N6TR	34,524	548-63-10-LA
N6RO	33,550	550-61-10-EB
K1KI	31,980	533-60-10-CT
K5TM(K5ZD,opr)	31,868	514-62-10-ST
K6LL/7	30,480	508-60-10-AZ
W2RQ	29,460	491-60-10-NNJ
AG7M	26,291	431-61-10-OR
W5XX	26,196	444-59-10-MS
WN4KKN	25,664	401-64- 9-AL
AEØM	23,142	399-58-10-MN
N1EE	22,680	405-56-10-EM
K1GQ	21,006	389-54-10-MH
K6WI	20,862	366-57-10-ORG
W9OP	20,520	360-57-10-WI
N7DF	20,328	363-56- 7-UT
WB4QBB	19,992	357-56-10-NF
W4UQ	18,386	317-58-10-VA
AA3B	16,632	297-56-10-EP
K6XO	16,610	302-55- 8-EB
WA2OVE	15,785	287-55- 6-NNJ
K8DL	15,120	280-54- 7-OH
W9TG	14,960	272-55- 5-IN
AF2L	14,820	260-57- 7-NNJ
KA1BJY	14,092	271-52-10-EM
W6BIP	14,000	250-56- 5-SF
AB4S	13,550	271-50-10-NC
W1PL	13,408	253-53- 7-EM
WB1HIH	13,250	250-53-10-WM
W9FC	13,230	245-54- 9-IN
N7RV	12,852	238-54-10-WA
W6UQF	12,852	252-51-10-SDG
WØLQ	12,324	237-52- 7-CO
AF3B	11,934	234-51- 7-WP
K3NB	11,515	235-49- 6-EP
WA5YTX	11,280	235-48- 3-NM
WA3PXA	11,169	219-51- 5-WP
WB9JSR	10,950	219-50- 7-IL
WB2JAY	10,848	226-48-10-NL
AFØO	10,764	207-52- 7-MN
WB6AKR	10,241	209-49- 9-ORG
N6PZ	10,047	197-51- 9-LA

Field Day Rules

Field Day 1980 is just around the corner. Surprised? It's not too late to start planning for that last weekend in June. Imagine how well prepared you would be should your electrical power be cut and your antennas come down in strong winds. How prepared would you be? A little planning ahead of time could be very important.

A number of minor changes (limit on pre-FD set-up time, change in the exchange, natural-power bonus, WIAW-bulletin bonus and relaxed requirements for signing portable) were made for this year's Field Day. They were outlined in March *QST* and have been incorporated into the rules which follow.

Make sure you send ARRL an s.a.s.e. for FD forms. A public relations packet, which will give you some ideas on how to get Amateur Radio and your group some recognition for your public service and emergency preparedness efforts, will be sent along with your FD forms. The rest of the "how to do it" part of Field Day is up to you and your group to learn. It may take another try next year to get it just right, but you'll find that with enough advance planning, your group will have a great time.

Note that Field Day groups do not have to sign portable if they operate in their own "traditional" call areas. Those outside of their "historic" call areas should sign portable, however.

FD groups intending to use the OSCAR satellites will find the June schedule with the "Operating News" column of June *QST*. OSCARs 7 and 8 should both be available, but satellite users are cautioned not to try to use the Phase III (OSCAR 9) satellite, as transponder testing may not be complete until mid-July. OSCAR 8 should be in mode AJ for the FD period.

Ready, get set, *go*!

Field Day Operating Period — 1980

Starts	*Ends*
Saturday, June 28 1800 UTC	Sunday, June 29 2100 UTC

Rules

1) Eligibility: Field Day is open competitively to all amateurs in the ARRL Field Organization (plus Yukon and N.W.T.). Foreign stations may be contacted for credit but are not eligible to compete.

2) Object: To work as many stations as possible and in so doing learn to operate in abnormal situations under less-than-optimum conditions. A premium is placed upon skills and equipment developed to meet the challenge of emergency preparedness and acquaint the public with the capabilities of Amateur Radio.

3) Dates: June 28 and 29, 1980 (traditionally, the last *full* weekend of June).

4) Field Day Period: From 1800 UTC Saturday until 2100 UTC Sunday. Class A and Class B (see below) stations who do not begin any setting-up operations at the Field Day site until 1800 UTC Saturday may operate the entire FD period of 27 hours. Others must begin their set-up no earlier than 1800 UTC Friday, and may operate no more than 24 consecutive hours; i.e. once on-the-air FD operation has started it must end 24 hours from that point.

5) Entry Categories: Field Day entries are classified according to the maximum number of transmitted signals simultaneously on the air during the FD period, followed by the designation of the nature of the individual or group participation. Once a transmitter is used for a contact on a band, it must remain on that band for at least 15 minutes. During this 15-minute period, the transmitter is considered to be transmitting a signal, whether it is or not, for purposes of determining transmitter class.

(Class A) Club/nonclub portable: Club groups (or nonclub groups with three or more licensed amateurs) set up specifically for Field Day. Such stations must be located in places that are not regular station locations, and must use no facilities installed for permanent station use, nor any structures installed permanently for FD use. Stations must be operated under one call sign (except when the Novice/Technician position is used) and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a circle whose diameter does not exceed 300 meters (1000 feet). All contacts must be made with transmitter(s) and receiver(s) operating independent of commercial mains. Entrants who, for any reason, operate a transmitter or receiver from commercial mains for one or more contacts will be listed separately at the end of their class.

Any class A group whose entry classification is two or more transmitters (non-Novice) may also use one Novice/Technician operating position without changing its basic entry classification. This station (including antennas) should be set up by Novice and Technician licensees, though assistance, guidance, advice or instruction from higher-class licensees is encouraged. Such assistance serves to pass along hints from those more experienced and to prevent a potentially unsafe situation. The Novice position may only be used for QSOs in the Novice bands and operated only by Novice/Technician operators, who must keep their own log and check sheets. QSOs made at the Novice position will count toward the FD group's final point total.

(Class B) One- or two-person portable: Nonclub stations set up and operated by not more than two licensed amateurs will be placed in Class B. Other provisions are the same as for Class A.

(Class C) Mobile: Stations in vehicles capable of operation while in motion and normally operated in this manner, including antenna. This includes maritime and aeronautical mobiles. A Class C station may not be used as a station in any other class. The operator of a Class C station may also operate from another station during the FD period, but scores for his mobile operations must be submitted separately.

(Class D) Home station: Stations operating from permanent or licensed station locations, not portable or mobile, using commercial power. Class D stations may count contacts only with Class A, B, C and E Field Day groups for points. The exchange received from each station will tell you whether or not the QSO counts.

(Class E) Home stations — emergency power: Class E is the same as Class D, but using emergency power for transmitters and receivers.

6) Exchange: Stations in the United States, U.S. possessions and Canada will exchange their Field Day operating class (1-A, 5-A, 2-B, 1-D, etc.) and ARRL section (see page 8 in any *QST*). For example, if your club group was planning to operate in the three-transmitter, Class A category from Missouri, you would send "3 A Missouri." If it turns out that you don't get all three transmitters on the air, or you get an extra one going, feel free to change your exchange to 2-A or 4-A if necessary. Valid contacts with stations outside of an ARRL section require you to transmit your normal FD exchange and to receive a signal report and the QTH of the foreign station.

7) Miscellaneous rules:

a) Operators participating in FD may not, from any other station, contact for point credit the FD portable station of a group with which they participated. This is intended to outlaw any kind of manufactured contacts.

b) A station used to contact one or more FD stations may not subsequently be used under any other call during the FD period. This rule is intended to outlaw multiple contacts on the same band with the same station, using different calls. It is not, however, intended to prohibit the use of jointly owned stations which are normally used under different calls by members of the same family.

c) Each phone and each cw segment is considered as a separate band. All voice contacts are equivalent and RTTY/ASCII is counted as cw. A station may be worked once on each band. Crossband contacts are not allowed. The use of more than one transmitter at the same time in a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. Contacts made by retransmitting either or both stations do not count for scoring purposes, i.e. no repeater contacts.

8) Scoring: Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the FD period, plus bonus points. Phone contacts count one point each, and cw contacts count two points each. Power multipliers: If *all* contacts are made using a dc input power of 10 watts (20 W PEP) or less *and* if a power source other than commercial mains or motor-driven generator is used (e.g., batteries, solar cells, water-driven generators, etc.), multiply by five. If any or all contacts are made using a dc input power of 200 watts or less on cw and 400 watts PEP or less on ssb, multiply by two. Multiply by one if any or all contacts are made using a dc input power over 200 watts

dc (400 W PEP) and up to 1000 watts dc (2 kW PEP). Batteries may be charged while in use for Class C entries only. For other classes batteries charged during the FD period must be charged from a power source independent of the commercial mains.

a) Bonus points: The following bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class A and B stations are eligible for bonuses. Just check the box on the Field Day summary sheet to indicate that you qualify for the bonus, and attach the necessary proof.

1) 100% Emergency power: 100 points for 100% emergency power per transmitter classification. *All* equipment and facilities at the FD site must be operated from a source independent of the commercial mains.

2) Public relations: 100 points for public relations. Publicity must be obtained or a bona fide attempt to obtain publicity must be made, or operation conducted from a public place (example: a shopping center). Evidence must be submitted in the form of a clipping; a memo from a bc/TV station stating that publicity was given or a copy of material was sent to news media for publicity purposes.

3) Message origination: 100 points for message origination. A message must be originated by the club president or other FD leader, addressed to the SCM or SEC, stating the club name (or nonclub group), number of operators, field location and number of ARES members participating. The message must be transmitted during the FD period, and a fully serviced copy of it must be included with the FD report. The message must be in standard ARRL message form as explained in *Operating an Amateur Radio Station*. The message must be correct in all respects or no credit will be given.

4) Message relay: 10 points for each message received and relayed during the FD period, up to a maximum of 100 points. Copies of each message, properly serviced, must be included with the FD report.

5) Satellite QSO: 100 points can be earned by completing at least one QSO via satellite during the FD period. The repeater provision of rule 7c is waived for satellite QSOs, as is the 15-minute provision of rule 4. A satellite station does not count as an additional transmitter. On the summary sheet show satellite QSOs as a separate "band."

6) Natural power: FD groups making a minimum of five QSOs without using power from commercial mains or petroleum derivitives can earn 100 points. Intuitively, this means an "alternate" energy source of power such as solar, wind, methane, grain alcohol, etc. A separate list of natural-power QSOs should be enclosed with your entry.

7) W1AW Message: A bonus of 100 points will be earned by copying a special ARRL FD bulletin sent over W1AW. Bulletins will be broadcast periodically over W1AW on its regularly announced frequencies just before and during FD (see chart on this page). This message can be received directly from W1AW or by any relay method. The important concept is to "get the message." An accurate copy of the received message should be included in your FD report.

9) Reporting: Entries must be postmarked by August 1, 1980. Each year a number of entries are received late or are incomplete, so make sure your group puts the right person in charge of the paperwork. Enclose a self addressed postcard with your entry and we'll mail it back when your entry arrives so you can make sure it arrived. A complete entry consists of a summary sheet and a list of stations worked on each band/mode during FD plus bonus proof. Send an s.a.s.e. to ARRL for forms. Incomplete or illegible entries will be classified as checklogs. A copy of FD logs should be kept by your FD group but are *not* required to be sent in unless specifically requested later by ARRL.

10) Conditions of entry:

(a) Each entrant agrees to be bound by the provisions of this announcement, by regulations of his licensing authority, and the decisions of the ARRL Awards Committee.

(b) Disqualifications: Criteria for disqualifications are found on page 90 of January *QST*.

W1AW Field Day Bulletin Schedule

In addition to the regular bulletin schedule detailed on page 97 of April *QST*, extra cw bulletins will be run at 1400 UTC (10 A.M. EDST), and extra phone bulletins at 1500 UTC (11 A.M. EDST) both Saturday and Sunday mornings.

Rules, 1980 IARU Radiosport Championship

Help Us Celebrate Radiosport's Fourth Birthday — July 12-13.

All amateurs worldwide, in single-operator and multioperator, single-transmitter categories are eligible. No multitransmitter allowed. Separate categories of competition for single-operator stations will include the following: cw only, phone only, and mixed phone and cw. In the single-operator category one person performs all operating and logging functions. Use of spotting nets is not permitted. Multioperator single transmitter stations must observe a 10-minute-per-band rule. If a contact is made on a band, the transmitter must remain on that band for at least the next 10 minutes.

Contest Period: July 12 and 13, 1980 (UTC). Maximum 36 hours for single-operator entries. Off times must be *at least* 30 minutes in length. No time limit for multi-single stations, although once a multi-single station commences operation on a particular band, it must remain on that same band for *at least* 10 minutes.

Valid Contacts: All amateur bands, 160 through 2 meters. Each station may be worked once per frequency band, regardless of mode. Crossband contacts not allowed. Contacts made by retransmitting either or both stations do not count for contest purposes. Contacts within one's own ITU zone count one point; outside of one's ITU zone but within one's own continent count three points; and outside of one's own continent count five points.

Multipliers: The sum of the number of different ITU zones worked on each band.

Exchanges: Signal report and ITU zone.

Scoring: Final score equals number of QSO points times the zone multiplier.

Reporting: All entries worldwide to be sent to IARU Headquarters, Box AAA, Newington, CT 06111, USA. All U.S. and Canadian entrants *must* use official log sheets and summary sheets, or a *reasonable* facsimile. Entries must be accompanied by dupe sheets if 200 or more QSOs were made. Entries *must* be postmarked no later than August 25, 1980. Any entry received after mid-October 1980 *may* not be in time to be included in the printed results. All entries become the property of the

Listed by prefix, alphabetically, are the countries of the world and the ITU zone of each.

A2	57	FS	11	KG4	11	TI9	11	VP2K	11	3B6, 7	53
A3	62	FW	62	KG6/KH2	64	TJ	47	VP2S	11	3B8	53
A4	39	FY	12	KG6R, S, T	64	TL	47	VP5	11	3B9	53
A5	41	G	27	KH1	61, 62	TN	52	VP8	16	3C	47
A6	39	GD	27	KH6	61	TR	52	VP8	73	3CØ	52
A7	39	GI	27	KJ/KH3	61	TT	47	VP9	11	3D2	56
A9	39	GJ	27	KL	01	TU	46	VQ9	41	3D6	57
AP	41	GM	27	KM/KH4	61	TY	46	VR6	63	3V	37
BV	44	GU	27	KP4	11	TZ	46	VS5	54	3X	46
BY	42, 43	GW	27	KP6/KH5	61, 62	UA, UK, UV	19, 20	VS6	44	3Y	67
C2	65	H4	51	KS6/KH8	62	UV/1,3,4,6	29, 30	VS9	41	4S	41
C3	27	HA	28	KV/KP2	11	UA1, UK1	75	VS9K	39	4U1ITU	28
C5	46	HB	28	KW/KH9	65	UA2, UK2F	29	VU	41	4U1UN	08
C6	11	HBØ	28	KX	65	UA, UK, UV, UW9-Ø	20-35	VU7	49	4W	39
C9	53	HC	12	KZ	11	UB, UK, UT, UY5	29	VU7	41	4X, 4Z	39
CE	14, 16	HC8	12	LA	18	UC2, UK2A/C/I/L	29	XE	10	5A	38
CEØA	63	HH	11	LU	14, 16	O/S/W		XF4	10	5B, ZC	28
CEØZ	14	HI	11	LX	27	UD6, UK6 C/D/K	29	XT	46	5H	53
CEØX	14	HK	12	LZ	28	UF6, UK6F/O/Q/V	29	XU	49	5N	46
CM, CO	11	HKØ	11, 12	OA	12	UG6, UK6G	29	XV	49	5R	53
CN	37	HL, HM	44	OD	39	UH8, UK8H	30	XW	49	5T	46
CP	12, 14	HP	11	OE	28	UI8, UK8	30	XZ	49	5U	46
CR9	44	HR	11	OH	18	UJ8, UK8J/R	30	Y2 9	28	5V	46
CT	37	HS	49	OHØ	18	UL7, UK7	30	YA	40	5W	62
CT2	36	HV	28	OJØ	18	UM8, UK8M, N	31	YB	54	5X	48
CT3	36	HZ, 7Z	39	OK	28	UO5, UK5O	29	YI	39	5Z	48
CX	14	I, IT	28	ON	27	UP2, UK2B/P	29	YJ	56	6O	48
D2, 3	52	IS	28	OX, XP	05	UQ2, UK2G/Q	29	YK	39	6W	46
D4	46	J2	48	OY	18	UR2, UK2R/T	29	YN	11	6Y	11
D6	53	J3	11	OZ	18	VE1	09	YO	28	7O	39
DJ	28	J5	46	P2	61	VE2	04, 09	YS	11	7P	57
DU	50	J6	11	PA	27	VE3	04	YU	28	7Q	53
EA	37	J7	11	PJ	11	VE4, 5	03	YU	12	7X	37
EA6	37	JA	45	PY	13, 15	VE6, 7	02	YVØ	11	8P	11
EA8	36	JD	45	PYØ	13	VE8	02, 03	ZA	28	8R	12
EA9	37	JT	32	PYØ	15		04, 75	ZB	37	8Z4	39
EI	27	JW	18	PZ	12	VK1, 2, 3, 5, 7	59	ZD7	66	9A(M)	28
EL	46	JX	18	S2	41	VK4, 8	55	ZD8	66	9G	46
EP	40	JY	39	S7	53	VK6	58	ZD9	66	9H	28
ET	48	W1	08	S9	47	VK	60	ZE	53	9J	53
F	27	W2	08	SM	18	VK9	60	ZF	11	9K	39
FB8Z	68	W3	08	SP	28	VK9	54	ZK1	62	9L	46
FB8W	68	W4	08	ST	48	VK9	55	ZK2	62	9M2	54
FB8X	68	W5	07	SU	38	VKØ	68	ZL	60	9M6, 8	54
FC	28	W6, 7	06	SV	28	VKØ	60	ZM	62	9N	42
FG	11	W8, 9	08	T2	65	VP1	11	ZP	14	9Q	52
FH	53	WØ	07	T3K-P	62	VP2E	11	ZS	57	9U	52
FK	56	KC4	67, 69, 70, 71, 72, 73	T3L	61	VP2A	11	ZS2	57	9V	54
FM	11			TA	39	VP2V	11	ZS3	57	9X	52
FO	10, 63	KC6	65	TF	17	VP2M	11	1S	50	9Y	11
FP	09	KC6	64	TG	11			3A	27		
FR	53			TI	11						

IARU and none can be returned. In cases of dispute, the decisions of the IARU/ARRL Awards Committee are final.

Conditions of Entry: Each entrant agrees to be bound by the provisions as well as the intent of this announcement, the regulations of his licensing authority and the decisions of the IARU/ARRL Awards Committee. Incomplete or illegible entries will be classified as check logs.

Disqualifications

If the claimed score of a participant is reduced by two percent or more, the log *may* be disqualified. Score reduction does not include correction of arithmetic errors.

Score reductions may be made for taking credit for unconfirmed QSOs and/or multipliers, duplicate contacts, banned countries, and/or other scoring discrepancies.

An entry with more than two-percent duplicate contacts left in the log or an entry where more than two-percent "rubber clocking" (altering the actual time to increase the operating time so that it is greater than the allowable limit) is detected *will be automatically disqualified.*

If a participant is disqualified, he will be barred from submitting an entry in the next Radiosport Championship. The calls of all disqualified participants will be listed in the *QST* contest report. Any participant on the border line of disqualification but not actually disqualified may receive a warning letter.

For each duplicate contact or miscopied call sign found by the log checkers, a penalty of three additional contacts will be exacted. The penalty will not, however, be considered part of the two-percent disqualification criterion.

In all cases of question, the decisions of the IARU/ARRL Awards Committee are final.

Awards: A certificate will be awarded to the highest scoring cw-only, phone-only and mixed-mode entrant in each ARRL section, each ITU zone, and each DXCC country. In addition, achievement-level awards are available. A certificate and/or endorsements are available for making 250 QSOs, 1000 QSOs, and/or making a total of 50 or more multipliers. In the case of multiple award levels achieved, only the highest award will be issued. Additional awards may be made at the discretion of each country's IARU member-society. QST

Rules, June VHF QSO Party

If you missed the June vhf bash last year, we won't tantalize you with the stories of those incredible record-breaking single and multi-operator scores and the fine weather conditions enjoyed by most of the mountain-toppers. Let's just say if you weren't there you'll never know what you could have done. Why take a chance of missing that monster tropo opening? Don't find out after the contest that Es was double-hopping to that last state that you need for WAS. Be there on the weekend of June 14-15 for the June VHF QSO Party.

Any station, whether or not it is manned by only one operator, that receives or gives assistance to another station during the contest

(this includes spotting or coordinating nets/repeaters) is classified as a multioperator station.

There should be only one valid entry under one call sign during the contest. This is meant to prevent an operator from working stations, then jumping into the car with the rig and working the exact same stations from the same ARRL section, signing the same call/M. This type of QSO will not count for the person making them or for those who work this station.

Remember to note complete exchanges — signal report, section and serial number — in the log and check for duplicate QSOs. Watch the deadline for mailing your log.

Send an s.a.s.e. in early to get summary, dupe and log sheets. Please ask for only one of each unless you are unable to make copies.

Rules

1) The 1980 June VHF QSO Party begins at 1900 UTC, Saturday, June 14, and ends at 0600 UTC, Monday, June 16. Entrants may operate no more than 28 out of the 35 hours. The seven hours of off-time must be taken in increments of 30 minutes or more. Listening time counts as operating time. All contacts must be made on amateur bands above 50 MHz using authorized modes of emission.

2) Name-of-section exchanges must be acknowledged by both operators before either may claim contact point(s). A one-way exchange does not count.

3) Fixed, portable or mobile operation under one call, from one ARRL section only, is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC) and then *one* operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts. Contest operations are limited to *only one signal per band* (6, 2, 1-1/4, etc.) at any given time.

Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters (1000 feet).

While no minimum distance is specified for contacts, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile).

Contacts made by retransmitting either or both stations do not count for contest purposes. In addition, use of the 146- to 148-MHz segment of 2 meters is restricted as follows: Contest contacts may be made only on these recognized simplex frequencies: 146.49, .52, .55, .58 and 147.42, .45, .48, .51, .54, .57 MHz. Contest contacts may *not* be made on any other frequency between 146 and 148 MHz; this restriction includes all repeater frequencies (including 146.76 and 146.94 MHz). Also, use of the national calling frequencies (146.52 and 223.50 MHz) is restricted to four hours total operating time for each participating station during the contest period (including both listening and transmitting time). These four hours may be taken in operating periods of not more than one hour each and must be clearly indicated in the log. After each operating period on 146.52/223.50, the participating station may not transmit on 146.52/223.50 MHz for at least 15 minutes. Multioperator stations may not include QSOs (for scoring credit) with their own operators except on frequency bands higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

4) Scoring: 1 point for *completed* two-way exchanges on 50 or 144 MHz; 2 points for such exchanges on 220 or 420 MHz; 3 points for such exchanges on the higher uhf bands. The sum of these points will be multiplied by the number of different ARRL sections and different DXCC countries *not* included in an ARRL section, worked per band. Crossband work does not count. Aircraft mobile stations cannot be counted for section multipliers. Complete exchange, call and QSO information must be recorded in an entry for *every* QSO that is claimed for contest credit.

5) Foreign entries: All contacts with foreign countries count for score. Each different DXCC country (*not* included in an ARRL section) worked per band counts as a separate multiplier. Foreign stations may only work stations in ARRL sections for contest credit and will give their country name as part of the exchange.

6) A contact per band may be counted for each station worked. Example: WD4LGR (North Carolina) works K1ZZ (Connecticut) on 50, 144 and 220 MHz for complete exchanges. This gives WD4LGR 4 points (1 — 1 — 2) and also 3 section-multiplier credits. (If WD4LGR contacts other Connecticut stations on these bands, they do not add to his section multiplier but they do pay off in additional contact points.) Each station may be worked only once per band, regardless of mode.

7) Each section/country multiplier requires a complete exchange with at least one station. The same section/country can provide another multiplier point only when contacted on a new vhf band.

8) Awards: Entries must be postmarked no later than July 14, 1980, and should be made on official ARRL VHF QSO Party forms or a *reasonable* facsimile. A certificate will be awarded to the high-scoring single-operator station in each ARRL section. In addition, the high-scoring multioperator station will receive a certificate in each section from which three or more valid multiple-operator entries are received or where exceptional effort has been displayed.

9) Disqualifications: See January 1980 *QST*, page 90.

Armed Forces Day, 1980

The 31st running of the annual communications tests will be held May 17.

This year's observance of Armed Forces Day marks the 31st anniversary of communications tests between the Amateur Radio fraternity and military communication systems. Since 1950, this event has been scheduled during the month of May and has emphasized a continuing climate of mutual assistance and warm esteem. Saturday, May 17, 1980 has been designated as the 31st Annual Armed Forces Day. The theme for Armed Forces Day 1980 is "The U.S. Armed Forces — Strong and Ready."

A featured highlight of the nationwide celebration will be the traditional military-to-amateur crossband communication tests. These tests give amateurs an opportunity to demonstrate their individual technical skills and to receive recognition from the Secretary of Defense or the appropriate military radio station for their proven expertise.

The proceedings will include operations in continuous wave (cw), single-sideband voice (ssb), radioteletype (RTTY) and slow-scan television (SSTV). Special commemorative QSL cards will be awarded to amateurs achieving a verified two-way radio contact with any of the participating military radio stations. Those who receive and accurately copy the Armed Forces Day cw and/or RTTY message from the Secretary of Defense will receive a special commemorative certificate from the Secretary.

The military-to-amateur crossband operations will be conducted from 1300 UTC May 17 to 0245 UTC May 18. Military stations will transmit on selected military frequencies and listen for amateur stations on those portions of

the amateur band indicated below. The military operator will specify the particular frequency in the amateur band to which he or she is listening. Duration of the contact should be limited to 3 minutes.

The cw receiving test will be conducted at 25 words per minute. The broadcast will be a special Armed Forces Day message from the Secretary of Defense to any amateur or SWL operator desiring to participate. A 10-minute CQ call for tuning purposes will begin at 0300 UTC May 18 (11 P.M. EST May 17). The Secretary's message will be transmitted 0310 UTC from the Stations listed at the right:

The RTTY receiving test will be transmitted at 60 words per minute. Radio station "AIR" will transmit using 850-Hertz (wide) shift. All other stations will transmit using 170 Hertz (narrow) shift. A 10-minute CQ call for tuning purposes will begin at 0335 UTC May 18. The special Armed Forces Day message from the Secretary of Defense will be transmitted at 0345 UTC. This test is to exercise the technical skill in aligning and adjusting equipment by the amateur operator. Transmission will be from the same stations and frequencies as previously listed for the cw receiving test.

Transcriptions of the cw and/or radioteletype-writer receiving tests should be submitted "as received." No attempt should be made to correct possible transmission errors.

Time, frequency and call letters of the military station copied as well as the name, call sign and address (including ZIP code) of the individual submitting the entry must be indicated on the page containing the message test. Each year, a large number of acceptable copies are received with insufficient information, or the necessary information is attached to the transcription and was separated, thereby precluding the issuance of a certificate.

Entries must be postmarked no later than May 23, 1980 and submitted to the respective military commands.

Stations copying NAM, NAV or NPG send entries to: Armed Forces Day Test Chief, Navy-Marine Corps MARS, 4401 Massachusetts Ave. N.W., Washington, DC 20390

Stations copying WAR send entries to: Armed Forces Day Test, Commander, United States Army Communications Command, Attn: CC-OPS-MARS, Fort Huachuca, AZ 85613

Stations copying AIR send entries to: Armed Forces Day Test, 2045th CCG/DONJM, Andrews Air Force Base, Washington, DC 20331 QST

Table of Frequencies

Station	*Military Frequency*	*Emission*	*Amateur Band*
NAV	7385 kHz	RTTY	7090-7100 kHz
HQ Navy-Marine Corps MARS Radio Station, Cheltenham, Maryland	13,975.5 kHz	SSTV	14,225-14,250 kHz
NMH	4005 kHz	cw	3500-3650 kHz
U.S. Coast Guard Radio Station,	6970 kHz	lsb	7150-7300 kHz
Alexandria, Virginia	14,455 kHz	RTTY	14,080-14,100 kHz
	20,988.5 kHz	usb	21,270-21,450 kHz
NPG	4001.5 kHz	lsb	3800-4000 kHz
U.S. Naval Comm. Station,	4010 kHz	cw	3650-3750 kHz
Stockton, California	6989 kHz	cw	7025-7150 kHz
	7301.5 kHz	lsb	7250-7300 kHz
	7365 kHz	cw	7025-7150 kHz
	13,927.5 kHz	RTTY	14,080-14,100 kHz
	14,470 kHz	usb	14,200-14,350 kHz
	20,983 kHz	cw	21,000-21,200 kHz
	20,998.5 kHz	usb	21,360-21,450 kHz
NPL	7347.5 kHz	RTTY	7090-7100 kHz
U.S. Naval Comm. Station	14,385 kHz	SSTV	14,225-14,250 kHz
San Diego, California			
NZJ	7375 kHz	RTTY	7090-7100 kHz
Marine Corps Air Station	14,400 kHz	usb	14,275-14,350 kHz
El Toro, California			
AIR	4025 kHz	lsb	3800-4000 kHz
2045th Comm. Group,	7305 kHz	lsb	7225-7300 kHz
Andrews Air Force Base	7315 kHz	cw	7025-7150 kHz
Washington, DC	13,997.5 kHz	cw	14,025-14,075 kHz
	14,397 kHz	usb	14,275-14,350 kHz
WAR	4001.5 kHz	cw	3525-3750 kHz
HQ. U.S. Army	4020 kHz	lsb	3800-4000 kHz
Washington, DC	4030 kHz	RTTY	3610-3630 kHz
	6997.5 kHz	cw	7025-7150 kHz
	14,405 kHz	cw	14,025-14,075 kHz
	20,994 kHz	usb	21,270-21,450 kHz

Note 1: SSTV from NAV will run from 1300-2100 UTC May 17, 1980.
Note 2: SSTV from NPL will run from 1600-2400 UTC May 17, 1980.

Stations Broadcasting the Message of the Secretary of Defense

Transmitting Station	*Frequency (kHz)*
NAM — U.S. Navy Communications Area Master Station, Norfolk, Virginia	4005, 7380, 14,400
NPG — U.S. Navy Communications Station, Stockton, California	4010, 7365, 13,927.5
NAV — HQ Navy-Marine Corps MARS Station, Cheltenham, Maryland	7385, 13,975
WAR — HQ U.S. Army, Washington, DC	4030, 6997.5, 14,405
AIR — 2045th Communications Group, DONJM Andrews AFB, Washington, DC	4025, 7315, 13,997.5

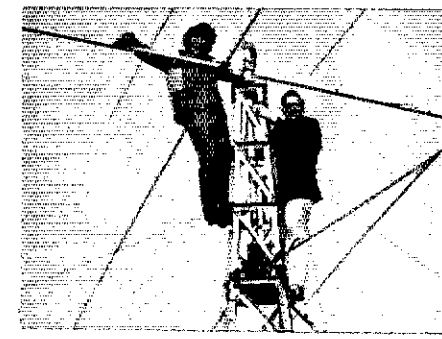
Strays

TRI-STATE QSO PARTY

The Tri-State (West Virginia) ARA is instituting a new award to establish an awareness of Amateur Radio in the tri-state area. To kick off this award the Tri-State ARA is sponsoring a Tri-State QSO party from 0001 UTC on Saturday, May 17, until 2400 UTC on Sunday, May 18. Look for Tri-State activity on the following frequencies: cw — 3.550, 7.050, 14.050, 21.050 and 28.050 MHz; phone — 3.935, 7.235, 14.280, 21.380 and 28.575 MHz. Complete details are available from TARA, P. O. Box 1295, Huntington, WV 25175.

AMATEUR RADIO CLUB IN KOREA

A group of U.S. personnel in Korea have formed an Amateur Radio club for American hams in metropolitan Seoul and nearby areas. This group has taken over operation of the HL9 QSL bureau, which provides incoming and outgoing service for all amateur stations licensed under U.S. Forces Korea. HL9 QSLs should be addressed to: President, American Amateur Radio Club of Korea, Dependent Mail Section, APO San Francisco, CA 96301. — *Thomas Nickle, HL9TN, APO San Francisco*



Thomas Nickle, HL9TN (right), gets a close view of HM2JN's antenna system in Inchon, Republic of Korea. Tom is president of the American Amateur Radio Club of Korea *(HL9TN photo)*

Results, 46th Annual ARRL November Sweepstakes

How Sweep It Is!

By Tom Frenaye,* K1KI and Bill Jennings,** K1WJ

The peak of sunspot cycle apparently coincided with Sweepstakes in 1979. The solar flux ranged from 210 during the cw weekend to 230 during the phone weekend, with mufs reaching above 50 MHz. As a result, those aiming for section or national titles found things a bit more complicated. Activity seemed to grow on 10 meters and wither away on 80 meters.

The statistics say that the number of entries was down by 18%, perhaps indicating that some people found the delights of DXing a bit more to their liking. Logs totalled 2451 (1203 cw and 1248 phone) and were received from all sections except Yukon-NWT. We may have missed a clean sweep, but the logs indicated that it must have been everyone else's year for the "sweep." The deletion of the Canal Zone as a section may have helped make the way easier, on cw anyway, but in all, 478 clean sweeps were recorded. Sweeps are easy enough to spot in the score listings; thus you'll only find a sweep box for those call signs that made it on *both* modes. Makes you begin to wonder if a clean sweep is valued more than the section or division leader spot!

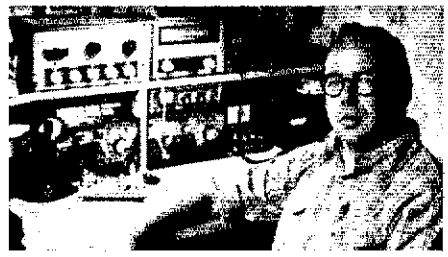
Despite the high levels of solar activity, it doesn't appear that the composition of the top-10 scorers varied much from previous years. Phone scores were dominated by West Coast and Mountain State entries, with a token East Coast entry, while cw scores nearly split evenly between the East and West. Scores were down very slightly among the top 10, though K2TR, operating from KP4Q, garnered the record high phone score. Operating from KP2A during the cw weekend, K2TR nearly broke the cw record despite his claims about not being a cw operator. When was the last time one operator claimed both titles?

Division records didn't fall as easily as they did last year (do they ever?) but there are 27 new division records on file now. The Atlantic, Pacific and Southwestern Division records were broken on both modes in the high-power category, while the Midwest, New England and Northwestern Division records fell in the low-power category on both modes.

The number of clubs submitting scores dropped to 85 this year, and, in general, so did most club scores themselves. The Northern California Contest Club was again the winner in the unlimited category, nearly matching their record total from last year and more than doubling their closest competition's score. The biggest gain in score goes to the Ill-Wind Contesters, with double the entries and nearly triple the score of last year. The Yankee Clipper Contest Club moved into the medium-class category this year with a substantial drop in points and entries, but edging Murphy's Marauders for the top spot. The local club competition proved to be the closest race. The South Jersey Contest Coalition edged out strong competition from the Machine Contest Club and Willamette Valley DX Club for the honors.

The new call sign-vs.-dupe sheet problem seems to have reached the saturation point. Where do you put the AIs on the sheet? How about the KA? With the SS package of forms, we offer a pretty fair dupe sheet that is quite usable up to (if you can print in characters less than 1 inch in height) and well over 500 QSOs per sheet. We'll take almost any form of dupe sheet as long as it is in some alphanumeric order. Those of you with home computers at your disposal have it made. Those of us without those sophisticated electronic toys have a slightly tougher row to hoe, but a little thought and some quick work with a pen and paper should solve your own dupe-sheet dilemma. End of problem.

One of the hardest things to do after a contest is to sit down and figure out just what you should have been able to do better and how you might improve your station. Notes taken right

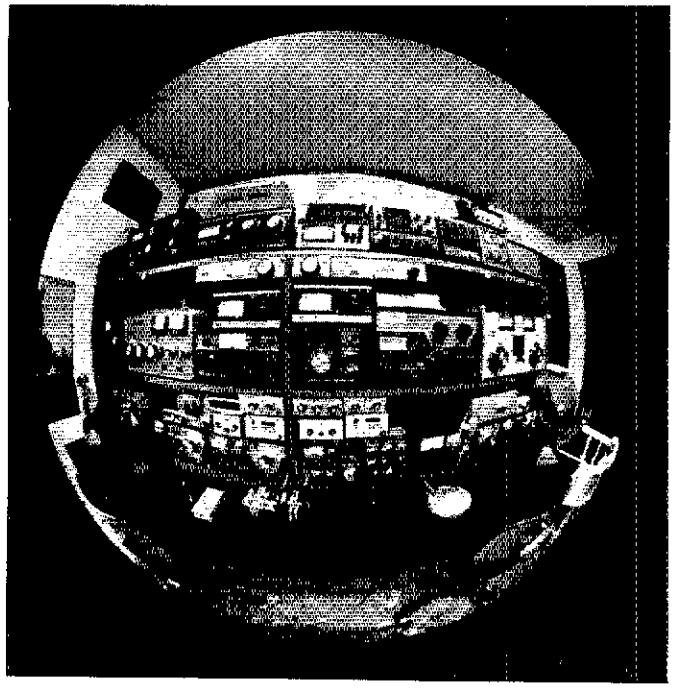


WBØSXH, phoneman, Minnesota.

W5YZ, top low-power cw score from New Mexico.

KA5CHW operated station K5RC to the top of the cw heap in Southern Texas.

*Assistant Communications Manager, ARRL
**Communications Assistant, ARRL



K3LR, seated on the left, WB3EVB, and AF3P, standing — three-fifths of the *number one*, phone, multioperator crew in the 1979 Sweepstakes. K3LR, in a single-op. effort, turned in the number-four cw score, also.

after the contest, while it is still fresh in your mind, are probably the best way to start. You might not want to look at them for a few weeks or months but when you gear up for next year's contest, you'll find the notes useful in planning. A second useful tool is the score listings themselves. Compare your score with those who you know to have similar stations. Make up a sheet showing your QSO rates per hour and band changes during the contest and trade it with someone in your area who had a bigger total (there is always someone with a bigger score, it seems). From that you can perhaps discover where you've fallen short.

There are a lot of things to consider: What band do you start on? How many QSOs can you make in the first hour? When do you change bands? When do you sleep? Should you just take short timeoffs? Call CQ or hunt and peck? Those questions have very different answers depending upon your station, your operating abilities and your QTH. The graph and chart shown on the next page may give you some ideas in planning for next year. The chart showing first-hour QSOs compared with total QSOs was made from logs received for the cw weekend. If you had 1000 QSOs, you should have worked about 65 during the first hour. If you had fewer, maybe you need some extra warmup next time. If you had more, maybe you scheduled your timeouts poorly or your endurance isn't what it used to be. The chart shows some additional comparisons. Big differences can be seen in the strategy involved. Some people find it necessary to make very few band changes, while others seem to do it several times per hour. On cw, East Coast stations made several band changes in order to keep up the high rates. The last hour of the contest was generally spent on 40 and 80 in the East and 20 and 40 in the West. On phone, 10 meters was the place to be if you were in the West, though QSO rates seemed to drop the farther north you went. Perhaps the biggest difference in strategy can be seen in the graph showing the top East and West Coast scores broken down into QSOs per band (Caribbean scores weren't included for obvious reasons). Forty meters was the big producer in the east, while in the West 10 meters was by far the best on phone. And 20 and 15 seemed best on cw.

It might be worth a few minutes of your time to compare your strategy against the number three low-power phone and cw entries of KØEU and N2IC, respectively. To maximize usefulness of these types of comparisons, you might want to get your local contest club together and have each operator do one for his/her SS efforts to be made available to all club members, with an eye toward improving the club aggregate in SS in 1981.

Anyway you look at it, there are many ways to compare and many more factors involved in the equation that produces your final score. Do you have any preferences for how you'd like to see SS scores (or any others) compared in future articles, within the limits of the space available? Drop us a line and let us know.

Division Leaders — Phone

Division	*High Power*	*Low Power*	*Multioperator*
Atlantic	K3UA*	N2ALK	AF3P
Central	W9RE*	K9ZO	W9TM
Dakota	KØKX	KØFRP*	WØSA
Delta	W5WMU*	N4NT	W5XZ
Great Lakes	K8LX	W8JWN	WB8JBM
Hudson	W2PV*	W2XL	WA2JAS
Midwest	K5JZN/Ø*	WBØISW*	ABØS
New England	K1VTM*	N1YY*	W1LJ
Northwestern	K7RI	W7XN*	W7ZR
Pacific	WA7NIN*	WB6SHD	K6OYE
Roanoke	K3NA/4	WA4YUY	AD8J
Rocky Mountain	KØRF*	KØEU	KB7EC
Southeastern	KP4Q*	KB4I*	K4HYE
Southwestern	N6TR*	N7US*	W6TAG
West Gulf	K5GA	K5SR	K5RX
Canadian	VE5DX*	VE5ACS	— —

*new record

CW

Division	*High Power*	*Low Power*	*Single Operator*
Atlantic	K3LR*	K3TM	K3KU
Central	W9NA	K9ZO	N9TG
Dakota	WØZZ	NØNO	KØTK
Delta	K5GO	N5XR	AD5M
Great Lakes	W8UA	K8EKG	K8ND
Hudson	W2YV	N2IC*	KA2ACM
Midwest	WAØVKF	KØLUZ*	KØWA
New England	K1PR	W1ZT*	W1LJ
Northwestern	W7NI	K7UR*	K7QA
Pacific	WA7NIN*	AD7K*	K6RLY
Roanoke	K4VX	WB8AKQ	K4AF
Rocky Mountain	WØCP	N7DF*	WDØEGE
Southeastern	KP2A	K4VFY/4	N4UF
Southwestern	K7KW*	K6WI	WA6SFM
West Gulf	K5RC	WB5WFB	WB5TGK
Canadian	VE7CC	VE4VV*	VE3ART/3

Top Ten — Single Operator

Cw	
KP2A	187,960-1282-74
W7KW	182,464-1233-74
WA7NIN	181,892-1229-74
K3LR	178,192-1204-74
K6LL/7	174,196-1177-74
N6TR	173,752-1174-74
K3UA	170,792-1154-74
W2YV	170,792-1154-74
W3LPL	170,200-1150-74
K5GO	169,016-1142-74
Phone	
KP4Q	351,796-2377-74
WA7NIN	318,792-2154-74
VE5DX	288,896-1952-74
KØRF	288,304-1948-74
K7SS/KH6	283,716-1917-74
K7RI	282,236-1907-74
VE7CC	278,832-1884-74
W7RM	267,288-1806-74
W2PV	259,148-1751-74
W6XR	257,224-1738-74

Low-Power Champs

Cw	
VE4VV	155,198-1063-73
N7DF	150,234-1029-73
N2IC	139,416-942-74
W2CS	138,380-935-74
N5XR	134,532-909-74
NØNO	131,254-899-73
KØEU	130,752-908-72
KØLUZ	130,378-893-73
K4XU	127,458-873-73
AD7K	127,312-872-73
Phone	
W7XN	180,264-1218-74
N7US	170,644-1153-74
KØEU	163,984-1108-74
W7UV	161,912-1094-74
WØUA	157,572-1064-74
N1YY	157,028-1061-74
NØCP	155,844-1053-74
AA5B	154,216-1042-74
KØFRP	153,476-1037-74
N4NT	152,144-1028-74

Top Five — Multioperator

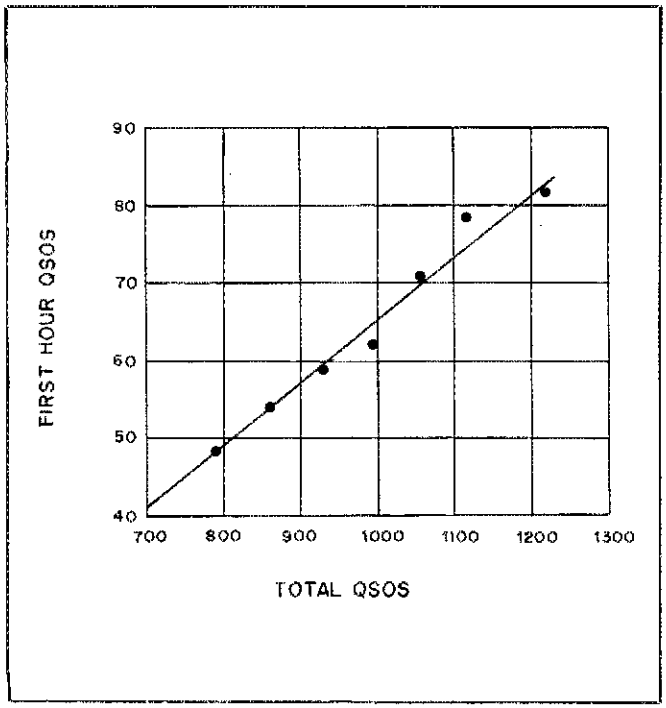
Cw	
K6RLY	146,292-1002-73
KØWA	144,394-989-73
K8ND	142,080-960-74
AA6G	136,802-937-73
K3KU	134,088-906-74
Phone	
AF3P	233,692-1579-74
K6OYE	230,732-1559-74
W7ZR	230,732-1559-74
ABØS	224,960-1520-74
AA6G	216,376-1462-74

Clean Sweep — Both Modes

K1PR K1XA W1WEF N1JW W1LJ K1VR K1MEM K1RX K1UM N1YY W2PV K2AU N2IC N2CQ WA2ECA W3LPL K3SA K3RA K2PLF/3 K3UA K4HAV K4FU N4AA N4SA K4PJ W4MYA N5JB N6RO K6XO N6KB N6VV N6NE K6PJY K6OYE WA6SFM N6TR N6GJ N6BT N6XI N6MG K6RU K6BR N6BV K7SV/6 W6BIP K6SG W7KW K6LL/7 W7JYW WA7NIN W7NI N7ZZ N7AM W8UM K8ND WB8JBM K9RS K9BGL K9ZO KØDEQ VE7CC

SOAPBOX

Low power and bad antenna systems are not conducive to high score. Thanks for allowing us to enter for the umpteenth year in a row and, as always, dead last in Oklahoma and West Gulf (KN5TTN/K5QNM). It would be interesting to see what would happen if stations were to be worked once *per band*! (WB8DQP). Wyoming is an elusive multiplier when you live right next to it here in Montana. Finally snagged it towards the end of the contest on, of all bands, 10 meters — backscatter! (W7JYW). I was beginning to think that Hawaii had sunk into the Pacific Ocean. You'll notice that Pac was my last multiplier and I snagged it about one hour before the end of the contest. I had reached the 73 multiplier stage about half way through the contest (WBØMWJ). I must be doing something right. My score is much higher than last year's despite a few problems and reduced operating time (KB8EJ). A self-addressed, stamped envelope is almost a requirement when sending for a QSL from that "rare" State, which you worked in the SS (K3JF/3-Del.). My first phone SS after eight years in the cw portion (AA6EE). I broke a lot of personal records in this SS; 1st clean sweep, 1st score over 100k, 1st time in three years my tower didn't come down in a storm. . . . But wasn't in North Dakota this year . . . even got a few QSLs for North Dakota. . . . Don't rely on your *Callbook* to fill in the exchanges; get it right during your contest QSO (KØFRP). ALL I want for Christmas is a VE8 for the clean sweep (N4QB). 79% of my phone QSOs were on 10 meters. The band was wide open all weekend (W7CRD). Finally found a Delaware station after trying since 1967 from places all over the world. I was beginning to think that I was a banned country for Delaware. . . . Now if I can only find Maine! (WB7TJI). Just put up a temporary vertical on Saturday afternoon, turned on the rig and much to my surprise, there was SS. What is a fellow to do but jump in and rip off a few? (AB6R). Waited my turn to work a VE8 on 10 who was working by call areas. Missed both times. Went to the lower end of 10 and found a VY1 who was calling "CQ" and getting no answers. My first sweep in 10 years (K8GSR). Yes, Vermont really does exist! (WB1HCT). *Warning!* Vanity calls (N, AT, AI, etc.) are hazardous to your cross check sheets (WØPPJ). I took your advice from last year and gave WD9GUR hell! *And I beat* him! It sure helps to have someone with whom you can compete. During the contest I heard WD9GUR 20 or so QSOs ahead of me and that woke me up enough to keep going (WDØFGY). Yes, sports fans, NØCP *and* WØCP are both in Denver, Colorado. This was my first try at SS and it was a pleasure to use a contest exchange that meant something instead of the usual RST and state. I would like to see this type of exchange, especially the serial numbers, used in other contests (NØCP). Interesting to see if my comments make the soapbox this year! (WB2KHE). [Sure did — Ed.] If your records go back to 1948, '49, or '50, you'll find that I was the top scorer on phone for one of those years, with 804 contacts in the then 73 sections, I believe. Ssb and better operating procedures have resulted in double the contacts in much less time. That's progress! (W6QEU). [In the 1949 phone portion of SS, W6QEU was one of only three stations to break the 100-k point barrier. This was the first time in SS history that it had been done. Pete had 805 QSOs and 72 sections. — Ed.] This started out as a way to get the last few states for my WAS, but that only took



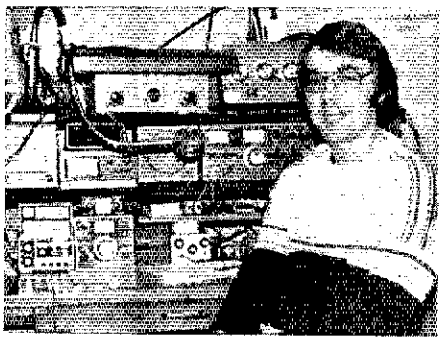
1979 Sweepstakes, cw: first-hour QSOs vs. total QSOs.

Top Ten Scores Compared

	First hour		Last hour		Band
Cw	*QSOs*	*Band*	*QSOs*	*Band*	*Changes*
KP2A	67	10 meters	46	20	15
W7KW	84	10	39	20/40	36
WA7NIN	83	10	39	20/40	34
K3LR	83	10/15/20/40	39	40/80	81
K6LL/7	76	15	43	20/40	14
N6TR	87	10	29	20/40	53
K3UA	90	10/15/20/40	35	40/80	71
W2YV	89	10/15/20/40	31	20/40/80	138
W3LPL	76	10/15	35	40/80	34
K5GO	73	20	42	40	21
Phone					
KP4Q	150	10	41	20/40/80	10
WA7NIN	134	10	84	20	20
VE5DX	116	10	75	15/20	29
KØRF	154	10	66	20	37
K7SS/KH6	71	10	111	10	24
K7RI	123	10	68	10/15	33
VE7CC	127	10	71	10	17
W7RM	114	10/15	67	15/20	43
W2PV	134	15	65	20/40	38
W6XR	133	10	52	15/40	41

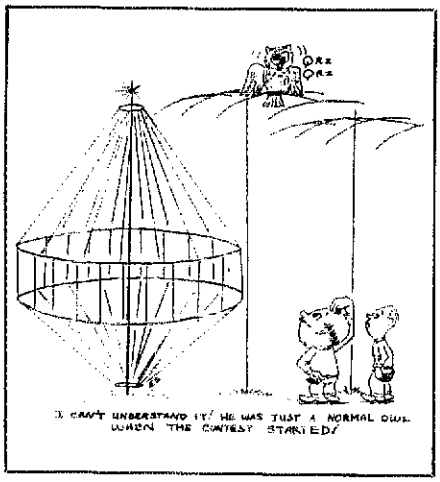
QSOs Per Band — East vs. West

		80	*40*	*20*	*15*	*10*
Phone	WA7NIN	78	176	383	495	1039
	W2PV	128	899	135	382	207
Cw	W7KW	141	166	334	326	266
	K3LR	252	550	254	92	55



KØSCM — 213 k points and first place on phone from Nebraska.

an hour. What the heck, why not try for WAS all over again. That was easy too. It took a total of about 70 contacts to get all 50 states. Well, I couldn't stop there so I went for all sections. Didn't make it, but I blame it on the fact that I didn't know that I was going to want NLI, VE8 and SV. This was my first SS in 22 years of this hobby (W4WWQ). Some negative reactions from the "usual stuffy" crowd on 75 and 40 meters to the contest. However, it did provide them with a *fresh* subject! (WB6NFO). Not a clean sweep, but did manage to raise a little dust (WB9BIO). I managed to work two Qs on 40 meters before I discovered the vertical had fallen down (N6ST). What a time to catch mono! . . . Here's hoping I'm in better health next year. I'm too old for these teenage social diseases! (N9CR). This contest is four hours too long . . . time to switch to the new CD Party format for SS next year (KA1EJ). There ought to be a multiplier for operating from a car. This entry represents 10 hours of operating parked in front of my house (antenna restrictions) with the engine running — hi! (K3ZNV). Just completed my *46th* ARRL SS (W6BIP). I worked K3YL then got K3OM (N4AWZ). Very disappointed. Some of the high-speed cw operators need to QRS when asked to do so (WB8WEZ). The thrill of the contact, the agony of the repeat (W3CEI). If more recognition was given to low-power participants, it might encourage more operators to go the low-power route and conserve energy. There is no reason why anyone should have to use more than 200 watts in a stateside contest (W8LXQ). One horrible change in the SS since the early days, to my mind, was the rudeness shown by some of the "hot shot" operators. If a station asked them for a second fill, they would ignore the request and resume calling "CQ SS," but I'd bet money that they counted that QSO as two points. I thought the idea behind this thing was to teach operation, cooperation and sportsmanship (W7FJZ). I note that although the average licensing period of the participants is 16 years, there are still a few OTs active in the 40-year-plus bracket (VO1AW).



N7DF had an owl roosting on the 20-meter beam most of Saturday night. Sez the owl quickly changed his tune. Who gives a hoot?

Affiliated-Club Competition

Club	Score	Entries	Phone Winner	Cw Winner
Unlimited Class				
Northern California Contest Club	14,475,152	138	WA7NIN	WA7NIN
Potomac Valley RC	7,085,020	83	K3NA/4	W3LPL
Ill Wind Contesters	4,911,914	57	W9RE	W9RW
Medium Class				
Yankee Clipper Contest Club	3,835,138	38	W2PV	W2YV
Murphy's Marauders	3,320,874	35	K1VTM	K1PR
Mad River Radio Club	2,943,262	28	K8LX	K3LR
North Texas Contest Club	2,637,786	31	W5MYA	N5CR
Texas DX Society	2,472,841	34	K5GA	K5RC
Western Washington DX Club	2,136,950	32	K7RI	W7WA
Frankford Radio Club	1,808,795	27	W3MA	W2GD
Wireless Inst. of the Northeast	1,604,254	19	W2RQ	W2RQ/1
Kansas City DX Club	1,365,064	14	WBØTCQ	ABØI
Point Radio Operators Society	1,273,320	20	K3UA	K3UA
South Jersey Radio Assn.	1,029,978	30	K2YY	W2PAU
Central Michigan ARC	1,006,980	28	W8LAQ	W8VPC
Fresno ARC	788,524	12	W6DPD	N6JV
Murgas ARC	778,102	18	WB3FAA	WB3JUK
Kettle Moraine Radio Assn.	677,272	24	N9KS	W9HE
Mid-Missouri ARC	616,092	12	NØSS	NØSS
Saginaw Valley ARA	575,950	17	K8OT	K8OT
Canton ARC	514,852	11	K8FU	K8FU
Motor City RC	494,650	11	K8SIA	K8SIA
Rockford ARA	469,072	20	WD9FVE	WD9DBC
L'anse Creuse ARC	441,678	11	K8DD	K8DD
West Allis RAC	429,048	14	N9AU	K9WTF
Ozarks ARS	406,471	15	AGØQ	WBØOMC
Orange County ARC	374,394	15	WA6LFF	W6LEN
Ramapo Mountain ARC	370,962	13	WB2ARS	WB2ARS
Northern Ohio ARS	345,560	14	N8BKX	K8US
Local Class				
South Jersey Contest Coalition	1,125,636	9	W2KI	N2CQ
Machine Contest Club	1,112,006	10	K8MJZ	AC8Y
Willamette Valley DX Club	1,063,364	7	W7NI	W7NI
Buffalo Area DX Club	898,642	8	WA2ECA	WA2ECA
Colorado Contest Conspiracy	791,580	5	WØCP	—
Radio Club of Tacoma	655,236	8	W7BUN	—
Central Florida DX Assn.	630,368	5	—	N4SA
Overlook Mountain ARC	630,036	9	W2XL	—
Mississippi Valley DX & CC	570,740	4	—	—

Phone

No. 3 Low Power — KØEU — Colorado
Transceiver: TS-520S
Antennas: TA-33 Tribander up 40 feet
40- and 80-Meter Inverted Vees

Hour (Z)	No. of QSOs	Multiplier Total	Band Changes	Time off (minutes)
21	87	23	10	—
22	83	29	10	—
23	79	31	10	—
00	61	43	10-15	—
01	68	46	15	—
02	45	55	15-20	—
03	30	60	20-15-20-40-20	—
04	26	64	20-40	15
05	30	66	40-80	10
06	27	69	80	15
07	41	71	80-20	—
08	15	72	80-40-80	30
09	—	—	—	60
10	—	—	—	60
11	—	—	—	60
12	—	—	—	60
13	12	—	20-15	30
14	31	—	15	—
15	30	—	15-10	—
16	58	73	10	—
17	31	—	10	20
18	49	—	10-15-10	—
19	37	—	10-15-10	—
20	44	—	15	—
21	35	—	15-10-15	—
22	51	—	15-10	—
23	42	74	10-15	—
00	34	—	10-15	—
01	27	—	10-20-15	—
02	26	—	15-20-15	—
	1108 QSOs	74 multipliers	31 band changes	6:00 off time

Central Arizona DX Club	559,498	6	N7US	W7KW
Ft. Wayne RC	535,626	8	K9FW	W9LT
Twin City DX Assn.	512,094	3	—	—
Connecticut Wireless Assn.	495,612	6	W1WEF	W1WEF
Bluegrass ARC	491,932	5	—	WB4PRU
Southern California DX Club	485,750	3	—	—
Poughkeepsie ARC	474,408	7	W2HBY	W2CS
Ohio Valley ARA	443,858	6	—	W8RSW
Foothills ARS	434,124	7	N6ST	N6ST
Penn Wireless Assn.	414,434	8	WB3DJF	K3YL
Wisconsin Valley RA	404,616	6	WB9VOZ	—
IBM Owego ARC	397,218	7	—	N2NW
West Park Radiops	379,819	10	W8IDM	K8AAZ
John Brown University ARC	374,884	3	—	—
Sevier County ARC	368,200	7	KF4H	K4XU
Delmont RC	346,148	6	W3LR	W3LR
Western ARA	334,576	6	WB6SKE	—
Central Illinois DX & CC	320,572	3	—	—
Land of Lakes ARC	310,493	7	WA8OWG	W8UMP
North Florida ARS	308,468	9	WD4ETG	W4PTT
Gloucester County ARC	306,434	9	W2YC	K2HPV
Flyweight DX Group	306,364	4	—	—
Northrop RC	276,564	8	W6CN	K6HRT
Ventura County ARC	247,876	6	WA6DJS	—
Reading RC	217,104	4	—	—
Mitre-Bedford ARC	195,224	6	W1FM	W1FM
Great South Bay ARC	193,132	5	—	WB2RNT
Aviation RC of Rockwell Int'l.	185,124	3	—	—
Providence RA — W1OP	182,496	3	WA1TAQ	—
Central Wisconsin RA	180,456	4	—	—
Eastern Iowa DXA	173,230	3	—	—
Coconino County ARC	142,356	3	—	W7YS
Neenah-Menasha ARC	129,134	3	—	—
Blossomland ARA	126,762	4	—	WAØTAQ
Skylands ARC	126,120	3	—	WA2DFC
OH-KY-IN VHF ARS	119,644	4	WA6EZV/8	—
Muskegon Area ARC	118,042	5	K8BP	—
Larkfield ARC	117,852	5	WA2JCX	—
Ithaca ARC	109,660	5	K2SOT	—
Rio Honda ARC	99,426	3	—	—
Rip Van Winkle ARS	97,828	4	—	—
Duluth Guns RC	96,624	3	—	—
Chicago Radio Traffic Assn.	95,798	5	—	W9HPG
Lynchburg ARC	95,508	7	WB4ZPF	N4CD
Miami County ARC	60,544	3	K9SBW	—
Tahoe ARA	53,194	3	WA6SUV	—
Cuyahoga Falls ARC	49,768	3	—	—

AD8J and friends went portable from a mountain top in West Virginia on phone to the tune of over 1100 QSOs. For their efforts, they expect to spend a fair amount of time filling out QSLs for those needing the confirmation from West Virginia. Left to right — WB8PHU, AD8J and KB3HQ.

Cw

No. 3 Low Power — N2IC — Northern New Jersey
Transceiver: TS-820S
Antennas: System 3 Tribander 40- and 80-meter dipoles

Hour (Z)	No. of QSOs	Multiplier Total	Band changes	Time off (minutes)
21	67	37	10-40	—
22	66	51	40-20-15	—
23	57	55	20-15-40-20	—
00	56	57	40-20	—
01	47	61	20-15-40-80-40	—
02	35	—	80-40	15
03	37	—	80-40	—
04	44	63	80-40	—
05	45	65	40-80	—
06	38	—	40-80	—
07	21	—	80-40-80	21
08	28	—	40-20	21
09	—	—	—	60
10	—	—	—	60
11	—	—	—	60
12	6	—	40	48
13	35	67	40-20	—
14	31	68	20-15-40	—
15	33	70	20-15	18
16	38	71	10-15	—
17	23	—	40-20-10	18
18	30	—	10-15-20	—
19	26	74	20-40-10	15
20	33	—	15-20-10	—
21	33	—	10-15-20-40	—
22	20	—	40-10-15	23
23	23	—	40-80-40-80	—
00	27	—	15-20-80	—
01	17	—	40	21
02	22	—	80-40-80	7
	945 QSOs	74 multipliers	61 band changes	6:28 time off

We all owe the United States Senate a vote of thanks for solving the perennial Canal Zone multiplier problem! (K1MC). . . . where would all the big guns be without us little guys? (WA3UNX). Full break-in was an absolute must (WD5HSN). Ever wonder what it would be like to give a party and have no one show up? The 80-meter Novice band was that way (KA5FAS). Well, I finally did it; worked all sections in the SS after 45 years in Amateur Radio . . . this year I did it without too much trouble (W3EYF). My first SS. I'd rather run in the Boston Marathon — at least I'd have a little elbow room. (KA8DRS). My best friend, W4ZM, passed away on Nov. 1 . . . Who can ever forget W4ZM ck 15? (W4YE). Hecklers were found on 75-meter phone. Sounded like 11 meters out there! (WA1PDG). Count this as another complaint against *keeping logs* during SS . . . I missed most of the contest while hauling firewood on Sunday (KA1FJ). My first SS. Worked 205 QSOs as a Novice (KA1CEI). I just discovered a new game — playing "Blackout Bingo" with your dupe sheet. Obviously some spaces like WD7 or VE9 aren't possible (WA7KPK). After working three QSOs in the first two minutes of the contest (my first contest) I thought that it would be pretty easy keeping the rate up and at the above ratio, I would have 2160 Qs in the alloted 24 hours. This was not to be, as I was to learn after the first full hour of operation (KA6DHM). In 1954, as recounted in the face article of the SS report in *QST*, my 704 QSOs on 40 cw was what appears to be the best single-band 40-meter (only) entry ever submitted. Since the contest has been shortened to 24 hours from 40 hours, a direct comparison is no longer possible, but 24/40ths as many QSOs, more than 422 QSOs, on 40-meter cw would effectively top that mark. As a silver anniversary in Amateur Radio for me, 25 years later, I submit to you 624 QSOs in 24 hours on 40 cw for the SS. As the sunspot cycle closes down 10, 15 and 20 meters and forces more folks to 40, I'm going to try to give you more than 704 QSOs on 40 cw in 24 hours (W5WQN). [Good luck — Ed.] My strategy in previous years was to work the last 24 hours of the contest. I changed that this year in order to take advantage of the activity on the higher bands and to allow more off time. As I get older, I find it tougher to go all night — and I'm only 28. What will I do when I'm 40? . . . SS is the biggest event on my Amateur Radio calendar. My friends all look at me as if I were crazy when I tell them about it and my wife leaves for the weekend. I don't make her go — she prefers not to be here! Fortunately, so far, she's always come back. Maybe I am crazy, but I love it (WA8MAM). *Never again!!* (until next year) (K6IGZ).

FEEDBACK

The following corrections and additions prevented us from having a "clean sweep." Please refer to pages 83 to 93 of April 1979 *QST*, for corrections for 1978 SS.

WAØVKF's score was erroneously listed under the Colorado Section rather than in Iowa where it belonged. Jim's 188,100 points, high power, phone not only should have been the highest listed in Iowa, but also the Midwest Division leader.

K7UR, listed number three in Washington on cw, was running "A" Power, not "B" as reported. He therefore should have been indicated as the new low-power all-time division leader in the Northwestern Division.

On phone, WA6FFI should be moved from the SCV Section listings to the Sacramento Valley Section where he belongs.

Washington, phone, W7BUN's score should be adjusted upward to 84,000 points and 75 sections for the clean sweep.

In the Local Club listings, the Brightleaf ARC aggregate score should have been 82,696 points rather than the 71,796 listed in the SS results. This adjustment raises the Brightleaf ARC one place in the standings.

The club aggregate score listing for the Northwest ARC, Local Club Category, should read 229,718 points, with the phone winner being WD9ADH, not WD9ADM as reported.

K7AWB is the phone certificate winner for the Spokane Radio Amateurs in the Local Club Category.

Add K9HDE to the Illinois phone listings. Joe's line score should read 47,700-318-75-24-A.

From the "this one ain't our fault" department: K6IM mailed his 1978 cw SS log from Garden Grove, California, on December 8, 1978 and *it was not received at Hq. until September 26, 1979.* K6IM is from the Orange Section with the following linescore: 61,320-438-70-17-B.

The scores are listed by call area, ARRL section and in order from highest to lowest score. The single operators are listed first, and the multioperator scores are listed at the end of the section listings. The linescore reads: call score — number of QSOs — number of multipliers — number of hours of operation — power indicator. A power indicates 200 watts or less (dc) used at all times, and B power means that a dc input of greater than 200 watts was used. Example: N6TR 173,752-1174-74-24-B means N6TR had 173,752 points, 1174 valid QSOs, a clean sweep of all 74 possible ARRL sections in 24 hours of operation, and used a dc input of over 200 watts.

CW Scores

U.S.A.

1

Connecticut

K1PR 166,796-1127-74-24-B
K1TO 163,244-1103-74-24-B
W1ZM(K1ZM,opr) 160,162-1097-73-24-B
K1VTM 154,030-1055-73-24-B
K1KI 146,292-1002-73-21-B
K1XA 143,560- 970-74-23-B
W1WEF 118,696- 803-74-24-A
KA1GO 112,076- 779-72-24-B
W1ECH 110,260- 745-74-24-A
K1WA 105,968- 716-74-21-B
WA1CCR 104,098- 713-73-18-B
W1BIH 88,622- 607-73-16-A
N1JW 81,252- 549-74-22-A
K1CBR 78,588- 531-74-22-A
W1XX 61,100- 470-65-10-B
WB1ACZ 58,890- 453-65-13-A
WB1ADR 58,660- 419-70-21-A
WA1YEC 55,488- 408-68-22-A
AA1K 55,440- 385-72-18-A
K1NYK 47,450- 365-65-24-A
KA1BDI 45,968- 338-68-13-A
K1MUJ(WA1DWE,opr) 39,040- 320-61-13-B
K1OD 38,940- 295-66-12-A
W1VV 27,720- 231-60- 5-B
K1DW 24,822- 197-63-24-A
K1IHP 21,056- 188-56- 5-B
K1CE 20,844- 193-54-10-B
K1WB 20,700- 150-69- 7-A
K1CC 19,890- 221-45- 5-B
W1GNC 18,304- 176-52- 5-B
W1VH 17,238- 169-51- 9-B
K1YRP 14,700- 147-50- 6-A
WA1YCO 13,056- 128-51- 9-A
WB1FKU 10,980- 122-45- 7-A
K1TN 10,120- 155-44- 3-B
KA1BXX/1 7722- 99-39-14-A
WB1HLU 4968- 69-36-13-B
N1CC 1188- 33-18- 1-A
W1LJ(+W1OD) 124,616- 842-74-22-B

Eastern Massachusetts

N1EE 139,712- 944-74-24-B
K1VR 138,232- 934-74-24-B
W1LK 132,860- 910-73-24-B
N1HR 118,260- 810-73-24-A
WB1ANT 108,478- 743-73-24-B
W1WAI 92,400- 700-66-17-B
K1VUT 73,414- 517-71-17-A
WA1ZRH 60,568- 452-67-24-A
W1RND 53,584- 394-68-12-A
K1MEM 53,260- 360-74- 9-B
W1FM 52,992- 384-69-17-A
WA1UZH 48,640- 380-64-13-B
WA1OSJ 48,048- 364-66-17-A
W1VL 44,100- 350-63-18-A
W1PL 41,808- 312-67-11-B
WA1UJU 39,000- 300-65-20-A
AD1C 34,398- 273-63-11-A
WB1CNM 31,152- 264-59-17-A
W1AX 30,816- 214-72- 5-B
K1ED 30,680- 260-59-17-A
K1CUD 29,402- 241-61-22-A
KA1CC 22,048- 212-52- 9-B
KA1CEI 20,500- 205-50-21-A
WA1GTQ 19,264- 172-56- 6-A
N1OC 17,864- 154-58-13-A
N1AU 16,416- 152-54-13-A
W4HMV/1 11,322- 111-51- 9-A
W1SR 9600- 120-40- 3-A
K1MC 9506- 97-49-10-A
KA1CLV 7920- 90-44-23-A
AD1Z 7216- 88-41-17-A
K1UCA 3596- 62-29- 7-B

Maine

N1SW 147,822-1041-71-24-B
K1PV 83,580- 597-70-22-A
N1RC 35,910- 285-63-14-A
WB1GLH 24,800- 200-62-13-A
K1SA 16,000- 160-50- 2-B
WB1DHF 15,606- 153-51-21-A
W1GX 7400- 100-37- 3-A
KA1BNE 200- 10-10- 6-A

New Hampshire

K1RX 130,240- 880-74-22-B
K1HI 114,192- 793-72-24-B
W1PH 109,520- 740-74-22-A
WA1QCQ 84,774- 597-71-24-A
K1GQ 82,344- 564-73- 9-B
W1HCS 81,072- 563-72-24-A
AB1Y 79,920- 540-74-23-A
W1UN 30,756- 233-66- 7-B
KA1EP 22,554- 179-63-14-A
KA1DUJ(+AG2X) 40,194- 319-63-17-A

Rhode Island

K1UM 99,456- 672-74-22-B
K1KX 90,576- 629-72-24-A
WA1CVF 51,972- 366-71-18-A
W1RFQ 2940- 49-30- 4-A

Vermont

W2RQ/1 148,774-1019-73-24-B
KA1FJ 72,312- 524-69-19-A
WA1GUV 69,440- 496-70-19-A
WB1GQR 12,314- 131-47- 3-A
KA1BXW 11,760- 120-49-12-A

Western Massachusetts

W1YK(K1TK,opr) 127,540- 911-70-24-B
W1ZT 126,096- 852-74-24-A
N1YY 105,820- 715-74-20-B
WB1AUV 51,840- 405-64-24-A
K1FIR 31,372- 253-62-11-B
WB1HIH 21,816- 202-54-18-A
WA1YXL 10,300- 103-50-17-A
K1IJU 8820- 98-45- 4-A

2

Eastern New York

W2YV(N2NT,opr) 170,792-1154-74-24-B
W2PV(K1AR,opr) 160,876-1087-74-24-B
W2CS 138,380- 935-74-24-A
W2AZO 120,700- 850-71-24-B
K2GBH 97,674- 669-73-24-A
W2XL 86,762- 611-71-24-A
WA2STM 85,968- 597-72-23-A
WB2EYB 31,980- 246-65-11-A
WA2TJE 30,276- 261-58-19-A
AA2Y 27,816- 228-61-12-A
W2DW 27,600- 230-60- 7-B
KB2JQ 21,838- 358-61-24-A
K2GSF 18,360- 170-54-13-B
W2NRD 15,006- 123-61-18-A
WA2SFS 9450- 105-45- 9-A
W2ARQ 7268- 79-46-18-A
WB2QOH 3192- 57-28-10-A
WA2ILG 1280- 32-20- 5-A
WA2KLV 1160- 29-20-11-B
WA2RNX 912- 24-19- 4-A
WB2ABJ(KA2s DOK EPK FQJ, WA2s GFW GFX GGM, WB2s JDH OEL,opr) 11,938- 127-47-21-B

New York City - L.I.

K2PE 147,852- 999-74-24-B
K2SX 127,576- 862-74-21-B
K2AU 103,600- 700-74-19-B
W2DKM 77,248- 544-71-22-A
N2GC 66,220- 473-70-13-A
WB2JAY 63,382- 473-67-22-A
WB2RNT 56,994- 413-69-14-A
W2LPA 55,250- 425-65-23-A
KA2AEV 50,592- 372-68-18-A
K2HVN 37,772- 266-71-10-B
K2CMV 29,618- 251-59-17-A
KA2CIW 18,000- 180-50-19-A
KA2BDL 10,080- 105-48-12-A
KA2DFO 6888- 84-41-12-A
W2HBO 396- 18-11- 4-A

Northern New Jersey

W2GD 165,168-1116-74-24-B
N2IC 139,416- 942-74-24-A
W2SQ 106,950- 775-69-17-B
WA2VZW 90,104- 653-69-24-A
AC2U 89,568- 622-72-22-A
WB2POG 72,216- 531-68-18-A
WA2DFC 61,920- 430-72-18-A
WB2NGT 55,380- 390-71-19-A
AF2L 53,734- 401-67-12-B
WB2FGZ 53,298- 423-63-20-A
W2HCA 43,960- 314-70-19-A
W2IFK 38,610- 351-55-10-B
W1GD/2 30,740- 265-58-12-B
K2TWK 29,840- 240-58-13-A
AE2A 26,596- 218-61- 5-B
WB2ARS 26,334- 231-57-20-B
W2KWW 25,728- 201-64-15-A
KA2EAO 25,460- 190-67-11-A
K9CW/2 25,422- 223-57- 9-A
WA2JAX 24,544- 208-59-18-A
WA2OVE 21,924- 189-58- 4-B
W2LVT 21,414- 249-43-23-A
WB2IKL 16,952- 163-52- 8-A
W2HR 9900- 150-33- 8-A
K2BJG 9546- 111-43-19-A
K2RK 8820- 98-45- 5-A
KA2FGD 3780- 70-27-13-A
W2NPT 3388- 77-22-24-B
K2VX 1886- 41-23- 2-A
KA2EKX 1100- 25-22- 6-A
KA2ACM(+WB2KYE) 70,992- 493-72-24-B
K2GQ(N2BQ, WA2s MYZ NXW, WB2s CKB KGN RLB,opr) 54,264- 399-68-24-A
WA2DTJ(+WA2UPK) 24,832- 194-64-21-B

Southern New Jersey

N2CQ 148,148-1001-74-24-B
W2KI 131,692- 902-73-24-B
W2SUA 129,944- 878-74-24-B
AB2E 87,408- 607-72-15-B
WA2MNO 77,112- 567-68-24-A
W2PAU 69,438- 489-71-18-B
WB2BYU 67,248- 467-72-20-A
K2HPV 50,592- 408-62-21-A
WA2KOK 41,600- 320-65-19-A
WB2UVB 34,526- 283-61-18-A
WA2NPD 27,140- 230-59-12-A
K2OSV 25,422- 223-57-12-B
N2UU 18,522- 189-49- 6-A
K2JF 17,700- 150-59-15-A
WA2CUW 13,338- 117-57-11-A
W2BLV 12,100- 110-55-12-A
KA2BEW 11,562- 123-47-18-A
WA2VYA 11,180- 130-43- 3-B
WB2SJA 9944- 113-44-13-A
WB2PHD 8064- 112-36- 6-A
K2TD 7600- 100-38- 3-B
N2AWH 5112- 71-36- 6-A
W2OGZ 3008- 47-32- 5-A
KA2FFS 2494- 43-29-21-A
WA2WJL 1850- 37-25- 6-A
W2PAZ 840- 28-15- 4-A
WB2YOF(+N2ATX) 60,434- 451-67-24-B
W2YC(+WA2LGT, WA3KRL) 50,820- 363-70-11-B
N2BCF(+K2NH) 37,830- 291-65-23-A

Western New York

WA2ECA(N2CU,opr) 144,744- 978-74-24-B
K2ZL 139,860- 945-74-24-B
K2IGW(WA2LCC,opr) 129,056- 872-74-24-B
W2TZ 108,080- 772-70-16-B
K2FU 103,892- 702-74-24-B
WB2ABD 96,798- 663-73-24-A
N2ALK 96,276- 678-71-20-A
N2NW 85,260- 609-70-24-A
N2DE 70,432- 496-71-24-A
WA2EYA 67,248- 467-72-24-B
K2MQY 62,480- 440-71-19-A
W2EZ 59,764- 446-67-24-A
K2ET 58,968- 468-63-20-A
W2QJ 48,990- 355-69-14-A
WB2EXL 41,580- 315-66-16-A
N3GO/2 37,440- 312-60-19-A
K2HA 36,400- 280-65-18-A
N2APB 31,000- 250-62-17-A
N2GU 27,342- 217-63-12-A
K2RN 25,992- 228-57-14-A
K2GWN 24,592- 212-58- 8-A
WB2KLA 22,572- 198-57-11-A
K2XU 20,520- 171-60-11-A
W2UP 18,294- 166-57- 3-A
W2IMO 17,680- 170-52-11-A
KA2DFM 11,520- 160-36-17-A
K2UAN 9282- 119-39- 9-A
N2ALB 8800- 110-40-10-A
KA2CGV 6381- 76-42-13-A
WA2IMG 4864- 64-38- 8-A
KA2AKG 3520- 55-32-11-A
KA2BSC 1026- 27-19- 3-A
WA2YVG 960- 30-16- 8-A
WB2PSI(K2OS,W2AV,WA2ZKD, WB2KAO,N9TE,oprs) 118,696- 802-74-24-B
K2ADQ(+WB2JVM) 53,198- 397-67-24-A

3

Delaware

K4CHE/3 67,480- 482-70-24-A
K3HBP 38,016- 264-72-10-A
N4AIG/3 10,710- 119-45- 8-A

Eastern Pennsylvania

N3RD(W3XU,opr) 149,332-1009-74-24-B
K3YL 137,310- 995-69-24-B
WB3JUK 111,000- 750-74-24-B
W3MM 108,484- 733-74-21-B
N2MM/3 100,886- 691-73-18-B
N3ATQ 89,176- 628-71-20-B
K3ONW 85,100- 575-74-21-B
W3LR 83,214- 621-67-20-B
W3MA 81,312- 616-66-15-B
AJ3G 79,240- 566-70-15-B
WB3CAI 71,820- 513-70-24-A
K3TEJ 67,200- 480-70-18-B
W3CNS 62,016- 456-68-14-A
WA3YRM 48,960- 408-60-13-B
W3FV 48,360- 372-65- 9-B
K3VW 39,186- 311-63- 6-A
W3EFY 38,592- 288-67-15-A
WA3MVP 37,944- 306-62-14-B
W3LCX 35,216- 284-62-18-B
K3DTD 32,184- 298-54-13-A
AA3B 28,090- 265-53- 7-B
N2EY/3 27,206- 223-61-11-A
WB3DCT 20,196- 187-54- 8-B
W3CEI 17,400- 174-50-15-A
WB3AKI 14,484- 142-51-12-A
KB3GL 13,716- 127-54-12-A
W3KV 13,176- 122-54- 6-A
KA3AHX 10,998- 117-47-10-A
N3AO 7128- 99-36- 7-A
N3KR 5402- 73-37- 3-A
W3HMR 3420- 57-30- 5-B
WB3FAA 3264- 51-32- 6-A
KA3CAS 3132- 54-29- 3-A
KA3CAN 2550- 51-25- 5-A
K3UC 2500- 50-25- 2-A
WB3BBW 1444- 38-19-10-A
WB3FYT 1296- 27-24- 5-A
K4DHB/3 1120- 35-16- 4-A
KA3BTG 540- 18-15- 3-B
WB3EPW 100- 10- 5- 6-A
W3GM(+K3RL) 105,558- 723-73-22-B
WB3DJF(+AG3R,KA3BER) 52,608- 411-64-18-B
W3ADE(+WD9EMA) 50,048- 368-68-19-A

Maryland - D.C.

W3LPL 170,200-1150-74-24-B
N3AM 144,892- 979-74-24-B
K3SA 144,004- 973-74-24-B
N3TR 136,308- 921-74-24-B
K3IM 121,064- 818-74-24-A
K3ZZ 113,800- 780-73-24-B
K3IU 108,576- 754-72-20-B
N3GB 106,848- 742-72-21-B
K2PLF/3 104,782- 706-74-24-A
K3RA 103,156- 697-74-17-B
W3MR 100,678- 709-71-20-B
K3AO 96,652- 662-73-16-B
W3UJ 95,472- 662-72-21-B
W3FA(WA3ZAS,opr) 82,500- 625-66-18-B
W3GN 81,792- 576-71-23-A
WA3KCY 78,952- 556-71-20-B
N3II 58,930- 415-71-14-B
WA3EOQ 58,098- 421-69-18-B
WA3UPH 57,330- 455-63-12-B
W3ZZ 55,380- 390-71-11-B
N3RL 52,480- 410-64-17-B
N3AVA 47,250- 375-63-12-A
K3CU 41,808- 312-67-11-A
W3GRF 41,044- 331-62- 6-B
W3HVM 33,232- 248-67-10-B
WA3WTQ 30,744- 252-60-18-A
N8AMZ/3 25,194- 221-57-17-A
W3EE 24,428- 197-62-13-A
AG3S 19,536- 148-66-18-A
W3IDT 15,732- 171-46-13-A
N3AXA 8586- 159-27-22-A
K3AA 8400- 100-42- 6-A
N8RC/3 2400- 50-24- 1-B
KA3DAG 336- 14-12- 4-A
W3FQE 162- 9- 9- 2-A
WB3LNO 126- 9- 7- 8-A
K3KU(multiop) 134,088- 906-74-24-B

Western Pennsylvania

K3LR 178,392-1204-74-24-B
K3UA 170,792-1154-74-24-B
K3OTY(W3AS,opr) 134,532- 909-74-24-B
W3YQ 114,256- 772-74-17-B
K3VK 107,424- 741-72-24-A
K3KO 104,244- 714-73-20-A
K3WT 100,536- 708-71-22-A
K3VX 97,920- 680-72-23-A
WB3AXN 93,536- 632-74-22-A
WA3FYJ 83,070- 585-71-20-A
W3HDH 75,480- 510-74-13-B
AF3B 70,372- 482-73-14-A
AD8J/3 69,690- 505-69-20-A
W3GNR 60,060- 429-70-18-A
WB3KAF 50,662- 347-73-13-A
N2GL/3 47,766- 419-57-19-A
WA3MOY 42,532- 343-62-19-A
K3IC 40,068- 318-63-13-B
K3RN 38,272- 299-64-11-B
WA3NOM 32,256- 288-56-10-A
K3FR 31,584- 282-56-12-A
AG3H 26,680- 230-58-16-A
WA3UNX 24,156- 198-61-11-B
N3ASB 14,310- 135-53- 6-A
KB3DS 11,900- 119-50-11-A
N3SD 8488- 101-42- 8-B
KA3BMU 6408- 89-36-17-A
K3TP 6192- 86-36- 9-B
W3IW 2500- 50-25- 1-B

4

Alabama

N4KG(WN4KKN,opr) 156,436-1057-74-24-B
N4QB 88,560- 615-72-23-A
K4ZGB 65,792- 514-64-22-A
AC4X 49,280- 352-70-11-B
K4GSK 39,780- 306-65-18-A
K4JXS 33,920- 265-64-23-A
WD4PZN 19,952- 172-58-18-A
W4PVK 16,352- 146-56-12-A

Georgia

K4BAI 143,560- 970-74-24-B
K4VFY/4 115,344- 801-72-16-A
K4BAM 83,520- 580-72-22-A
AA4U 78,402- 537-73-16-A
N4TZ 75,402- 531-71-20-A
KA5APB/4 37,654- 281-67-18-A
K4HAV 34,040- 230-74-14-B
WD4SEU 31,464- 276-57-15-B
KI4Y 19,840- 155-64- 9-A
N4AWZ 13,172- 263-62-23-A
KB4AJ 13,144- 248-53-12-A

Kentucky

N4XM 117,364- 793-74-24-B
K4FU 110,704- 748-74-22-B
WB4PRU 109,354- 749-73-22-B
WB4FOT 95,616- 664-72-22-A
WA4LSD 61,472- 452-68-18-A
WA4GHO 38,610- 297-65-13-A
WD4LWH 30,208- 256-59-18-A
KA4IDW 22,040- 190-58-21-A
K4AVX 11,750- 125-47- 6-A
KA4ORT 5254- 71-37-11-A

North Carolina

N4AA 148,000-1000-74-23-B
AA4NC 112,712- 772-73-20-B
KE4I 86,432- 584-71-19-A
W6NWS/4 51,198- 371-69-19-A
KB4C 19,908- 158-63-10-A
WA4FFW 19,140- 174-55- 7-A
KE4U 8640- 96-45-13-A
W4DGJ 5180- 74-35- 9-A
N4BTO 3570- 55-32- 9-A

Northern Florida

N4SA 144,448- 976-74-22-B
W4PTT(WD4ITK,opr) 133,776- 929-72-24-B
N4WW(WB4YFF,opr) 125,440- 896-70-24-B
W4WKQ 46,720- 365-64-13-B
KA4FJY 9976- 116-43- 8-A
WD4ETG 3290- 47-35- 7-A
K4IEX 3240- 60-27- 3-A
WB4DTS 2862- 53-27- 2-A
W2KGI/4 616- 22-14-24-A
KA4EDX 126- 9- 7-24-A
N4UF(+WB4YEY) 123,284- 833-74-24-B

South Carolina

AE4Y 83,220- 570-73-22-A
W4LS 53,060- 379-70-20-A
N4ZG 44,380- 317-70-22-A
WA1LJP/4 28,652- 247-58-21-A
KA4FOJ 17,500- 125-50-11-A
N4EF 11,644- 142-41-10-B
WA4TNI 4352- 64-34- 9-A

Southern Florida

N4BP 158,200-1130-70-24-B
KR4H 68,508- 519-66-23-A
K4XB 63,050- 485-65-23-B
W4WBC 50,680- 362-70-12-B
N4XR 39,960- 270-74-16-A
KI2X/4 37,536- 272-69-16-A
WB4BBH 34,500- 250-69-19-A
WD4AHZ 27,104- 242-56-16-A
W2HAL/4 12,936- 132-49- 8-A
WD4NRF 9750- 125-39-13-A
N4AJD 1040- 126-20- 2-A

Tennessee

N4ZZ 164,724-1113-74-24-B
K4XU 127,458- 873-73-24-A
WB4FEC 106,412- 719-74-17-B
K4PJ 81,992- 554-74-13-B
KF4H 71,426- 503-71-23-A
WB4HMA 51,830- 355-73-16-B
WA4EVB 49,776- 366-68-18-A
WA4SCL 41,322- 291-71-19-A
N4AVF 28,140- 210-67-13-A
KE4F 18,774- 149-63-19-A

Virginia

K4VX(WB4SGV,opr) 165,168-1116-74-24-B
N4RV(K3EST,opr) 164,280-1110-74-24-B
K4PQL 147,704- 998-74-24-B
K4FJ 132,860- 910-73-23-B
K4OAQ 122,544- 888-69-24-B
W4YE 117,384- 804-73-19-B
W4EI 102,240- 720-71-19-B
N4ZR 102,060- 729-70-21-B
K4YF 73,728- 512-72-13-B
N4XD 71,936- 562-64-24-B
K5OGU/4 71,284- 502-71-20-A
W4MYA 68,968- 474-74-13-B
K4KDN 61,904- 424-73-23-A
W4XD 58,752- 408-72-17-A
N4DW 58,616- 431-68-10-A
K4TM 53,406- 387-69-12-A
WA4EAZ 50,260- 359-70-17-A
W4NH 48,824- 359-58-10-A
N4APK 44,588- 314-71-13-A
K2EKM/4 43,194- 313-69-13-A
K4JST 42,976- 316-68-18-A
K4GKD 40,690- 313-65-10-B
N4CD 40,446- 321-63-11-B
WB4FLT 39,520- 304-65-13-A
WD4JHY 35,588- 287-67-12-A
KA4BFU 20,900- 190-55-12-A
K4GEL 14,734- 139-53- 6-A
W4RX 9180- 102-45- 1-B
K4FNE 8273- 94-44- 8-A
N4CMJ 7800- 100-39- 9-B
AA4FF 6900- 75-46- 2-A
W4KMS 6248- 71-44-12-A
W4EZ 5520- 69-40- 4-A
N4NK 4700- 75-32- 3-A
WB9NZY/4 600- 20-15- 3-A
N4MM 468- 18-13- 1-A
WD4GCE 468- 12- 9- 1-A
W4DM 2- 1- 1- 1-B
K4AF(WD3DNL,N8II,oprs) 121,472- 832-73-22-B
W4POX(AA4AT,AG4D,KA4s BFT INK,WA4TDS,WB4BAB,oprs) 82,008- 612-67-24-B
WB4WDM(+WA4ZNY) 20,304- 188-54-24-B

West Indies

KP2A(K2TR,opr) 187,960-1282-74-24-B

5

Arkansas

K5GO 169,016-1142-74-24-B
N5XR(K8CC,opr) 134,532- 909-74-24-A
W4OGG/5 19,552- 188-52- 9-A
AD5M(+K5SVS,WA5VUT,WB5s LRP WNG,WD5BIV) 47,760- 398-60-24-A

Louisiana

K5KU 151,256-1022-74-24-B
K3JT/5 83,580- 597-70-24-A
W5WG 52,780- 377-70-20-A

KB5M 23,072- 206-56-13-A
WD5EAE 20,570- 187-55-19-A
WA5JWU 16,240- 145-56-10-A
WD5EAF(+WD5EAE) 1206- 28-21- 2-A

Mississippi

W5VSZ 54,648- 414-66- 9-H
WD5KEM 2842- 49-29- 8-A

New Mexico

WA5YTX 120,742- 827-73-20-B
W5YZ 111,328- 781-71-24-A
WD5JYU 62,310- 465-67-24-A
WD5IOM 30,916- 524-59-18-A
N5MF 27,694- 227-61- 8-A
WD5JMA 11,616- 132-44-15-A
W5JOV 3200- 50-32- 2-A

Northern Texas

N5CR 152,278-1043-73-24-B
N5JB 144,300- 975-74-24-B
W5MYA 142,568-1004-71-24-A
N5AU 106,680- 762-70-15-B
W9PL/5 85,680- 612-70-24-A
K5OJI(W5ONL,opr) 83,160- 584-70-24-B
K5ME 61,460- 439-70-21-A
K5SOR 51,348- 389-66-14-A
WD5GNY 43,940- 338-65-22-A
N5BT 39,680- 320-62-15-A
KA5FAS 36,666- 291-63-23-A
WB5TYQ 34,770- 285-61-24-A
K5JA(N5AU,opr) 33,712- 301-56- 5-B
K5FUV 27,494- 233-59-15-A
K5MR 25,630- 233-55- 5-B
WD5IYT 21,344- 232-46-13-A
KA5W 18,354- 161-57- 7-A
W5QF 17,670- 155-57-10-A
KB5AH 12,200- 122-60-20-A
K2SCU/5 11,368- 116-49- 6-B
K5RQ 10,332- 123-42- 6-A
AG5B 5112- 71-36- 4-A
WB5BKL 3894- 59-33- 8-A
WB5TGK(+K9LA) 64,736- 476-68-21-A
KA5C(+AA5D,N5AUU) 8820- 105-42-19-A

Oklahoma

WB5RXZ 99,400- 710-70-21-B
WB5WFB 93,380- 667-70-22-A
AE5Y 56,950- 425-67-20-A
W5HFN/5 9576- 152-63- -B
W9XW/5 9384- 102-46- 8-A
WB5OSM 6552- 84-39-11-B

Southern Texas

K5RC(KA5CHW,opr) 161,616-1092-74-24-B
K1EA/5 160,876-1087-74-24-B
K5TM(K5ZD,opr) 155,206-1093-71-24-B
W5AC(K5GN,opr) 148,444-1003-74-24-B
N5DU 129,648- 888-73-24-B
K5MA 125,852- 862-73-21-B
K5NU 111,888- 777-72-17-B
WA3UVC/5 109,728- 762-72-23-B
K5LZO 107,740- 740-73-18-B
K5FP 90,000- 625-72-16-B
W5WQN 86,112- 624-69-24-B
K5WA 84,280- 602-70-13-B
K3ZMI/5 79,774- 540-73-24-A
K5GB 65,240- 460-72-16-A
K5CKD 59,202- 429-69-21-A
AG5K 58,788- 426-69-20-A
K5KG 57,352- 428-67-11-B
WA5WFP 51,612- 391-66-21-A
N5JJ 47,760- 352-65- 7-B
W5RRR(W5LSZ,opr) 45,648- 317-72-21-B
W5UNY 42,900- 330-65-18-A
K8DMU/5 38,016- 297-64- 9-A
K5JS 33,930- 261-65-10-B
K5TSQ 33,792- 264-64- 6-B
K5TU 33,550- 275-61- 7-A
K5NA 31,552- 272-58- 5-B
WD5BCK 25,312- 226-56-18-A
KA5I 23,312- 188-62-12-A
W5NR 18,328- 158-58- 7-B
WA5MUF 18,260- 166-55-16-A
KO5O 12,936- 132-49- 6-B
WD8DKJ/5 11,440- 104-55-19-A
WB5GMB 10,028- 109-46-12-A
K5LWL(K5RC,opr) 9720- 108-45- 2-B
WD5BTU 9652- 127-38- 8-A
N5RF 7772- 101-36-10-A
WD5HSN 6308- 83-38- 4-A
N5DB 3894- 59-33- 6-A
K5DX 3660- 61-30- 4-A
KA5CDX(+KA5GIF) 1334- 29-23- 6-A

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East Bay

N6RO 164,328-1111-74-24-B
AA6UO 149,480-1010-74-24-B
K6XO 140,748- 951-74-24-B
N6KB 136,604- 923-74-24-B
N6OP 135,216- 939-72-24-B
N6VV 129,056- 872-74-23-B
N6NE 126,688- 856-74-24-B
K6PJY 109,372- 739-74-24-A
K6HIH 102,492- 702-73-22-B
K6XV 89,976- 652-69-16-A
KA2M 70,720- 520-68-22-B
WB6GPT 65,258- 468-67-24-A
K6ATV 60,918- 429-71-17-A
WB6ZEP 52,500- 375-70-21-A
WA6GJH(K6CSL,opr) 41,788- 337-62-23-A
WA6DIL 28,652- 247-58- 5-A
K6OYE(+KA6BPN,KB6F,W6EEN WA6s AVS NTG) 119,140- 805-74-24-B
WA6JCZ(+WB6SHD) 116,362- 797-73-23-B

Los Angeles

W6AM(N6TJ,opr) 158,264-1084-73-23-B
K6MP 131,472- 913-72-21-B
N6HC 98,842- 677-73-22-A
KA6CPL 56,994- 413-69-22-A
N6GL 43,810- 337-65-19-A
W6NNV 42,778- 293-73-22-A
K4JSI/6 24,120- 201-60-17-B
W6SVO 15,232- 136-56-10-A
W6CBA 9202- 107-43-16-A
WA6HQS 5616- 72-39-10-A
AA6PY 3192- 57-28- 5-B
WA6SFM(WA6s FSF PZL,WB6s CIA JJE,oprs) 100,048- 676-74-24-A
N6ME(+WA6DMX,WB6BIM, WA8FTA) 33,524- 289-58-18-B

KA6EZX(multiop) 3468- 51-34-15-A

Orange

WA6JAH 117,504- 816-72-21-B
K6WI 115,772- 789-74-22-A
W6LEN 52,930- 395-67-18-A
WA6LFF 46,280- 362-65-20-A
N6PE 42,700- 305-70- 6-A
K6WS 29,484- 234-63- 9-A
N6CCE 26,784- 248-54-17-A
K6HRT 26,164- 422-62-10-A
WB6GCF 25,074- 199-63-16-A
WA6TMY 14,586- 143-51-10-A
KA6IDE 6240- 78-40-16-A
WD6FLV 5900- 118-50-12-A
WB6AJV 5016- 66-38- 4-A
N6BJW 4352- 64-34-10-A
WB6NHV(+WB6SHL) 26,786- 227-59-17-A

Santa Barbara

N6TR 173,752-1174-74-24-B
W6KPJ 83,664- 581-72-24-A
K6IGZ 48,106- 359-67-22-A
W6OUL 41,610- 285-73-11-A
WA6VNN 34,224- 276-62-22-A
W6TKF 30,840- 257-60-12-A
W6UA 17,316- 117-74- 9-A
N6JQ 840- 35-12- 5-A

Santa Clara Valley

N6GJ(N6IG,opr) 153,920-1040-74-24-B
N6BT(WA6VEF,opr) 153,328-1036-74-24-B
N6TV 151,056-1049-72-24-B
N6XI 130,092- 879-74-24-B
W6MSF(WA6HCI,opr) 128,792- 882-73-24-B
W6XX 127,800- 900-71-22-B
N6MG 126,540- 855-74-24-B
N6TU 122,832- 853-72-20-B
N6TA 120,768- 816-74-24-B
K6RU 120,176- 812-74-22-B
K6XM 116,920- 790-74-24-A
N6NF 112,560- 804-70-23-B
AJ6V 102,492- 702-73-24-B
KC6D 102,200- 700-73-24-A
N6KT 94,080- 672-70-23-A
WB6DSV 93,092- 629-74-14-B
N6ZB 91,392- 672-68-22-B
K6PU 89,392- 604-74-12-B
K6OQ(W6OKK,opr) 88,914- 609-73-17-B
K6BR 87,912- 594-74-17-B
W6OWQ(AA6KB,opr) 79,596- 594-67-18-B
W6ISQ 72,416- 496-73-13-B
N6ST 63,648- 468-68-20-A
N6RZ 58,400- 400-73-18-A
W6KZJ 50,592- 372-68-21-B
K6OMB 50,232- 364-69-21-A
WD6EPV 47,196- 414-57-12-B
K6RM 37,820- 305-62-15-A
N6OM 34,816- 272-64-14-B
K6SEM 33,792- 264-64-21-A
WD6ERA 27,648- 216-64-10-A
N6AUV 26,680- 230-58-14-B
N6QW 24,318- 193-63- 8-A
WA6BZT 23,040- 192-60-12-B
N6YV 23,010- 195-59- 7-B
AA6PZ 20,460- 186-55-10-B
W6SZN 10,710- 119-45- 4-A
W6IO 10,658- 73-73-17-A
K6SMH 8800- 100-44- 5-A
W6XB 4422- 67-33- 3-B
K6MA 1836- 34-27- 1-B
WA6HAO 1518- 33-23- 9-A
KA6EVN 836- 22-19-13-A
KF6X 126- 9- 7-13-A
AA6G(+W1ARR) 136,802- 937-73-24-B
W6YX(K1JH,WA6ITV,N7MH, W8ZI,oprs) 97,776- 679-72-23-B
K6YA/6(AG6D,W6ASH,oprs) 89,760- 660-68-23-B

San Diego

N6ND 130,176- 904-72-24-B
W6RTH(W7KHN,opr) 111,488- 832-67-24-B
AA6EE 42,228- 306-69-14-A
N6KW 31,552- 232-68- 9-A
K6ZH 24,000- 200-60- 5-A

San Francisco

N6BV 150,664-1018-74-24-B
K7SV/6 129,056- 872-74-23-B
W6WB 48,160- 344-70-17-B
WD6DPL 46,376- 374-62-14-A
K6CRN 35,880- 260-69- 6-A
W6BIP(+WA6DJI) 103,748- 701-74-20-B

San Joaquin Valley

WB6ION 132,912- 922-72-24-B
W6MYP 73,872- 513-72-20-A
N6GG 68,172- 494-69-12-B
K6AO 36,938- 253-73-11-A
N6PR 18,126- 171-53-15-A
W6YKM 16,254- 258-63- 4-B
WB6KHR 12,096- 112-54- 9-A
K6TG 6084- 78-39- 6-A
W7HSS/6 2700- 50-27- 7-A
WA6YAB 690- 23-15- 3-A

Sacramento Valley

AA6OX 146,146-1001-73-24-B
N6JV 117,216- 792-74-20-B
W6TPH 103,896- 702-74-24-A
W6NKR 83,496- 588-71-21-B
W6EGX 38,640- 280-69-15-A
W6SX 9506- 97-49- 2-B
WA6BRV 4514- 61-37- 4-A
N6JM 476- 17-14- 1-B
K6RLY(+K6ZBV) 146,292-1002-73-24-B
K6SG(+W8KZH) 111,592- 754-74-23-B
KA6HWH(+W6NJU) 16,080- 134-60-18-A

Pacific

AH6BL 68,408- 503-68-19-A

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Arizona

W7KW(K7GM,opr) 182,464-1233-74-24-B
K6LL/7 174,196-1177-74-24-B
W7ZMD 87,892- 602-73-23-B
W7YS 73,852- 499-74-22-A
K1TU/7 72,720- 505-72-19-A
WB7PXS 54,020- 370-73-17-A
WA7NXL 47,600- 340-70-15-B
WB7PNZ 20,904- 201-52-23-B
K7JVR 18,600- 155-60- 6-A
KA7FRS 16,632- 154-54-24-A
K8TE/7 8486- 101-42- 4-A

Idaho

W7IO 144,124-1001-72-23-B
K7QD 124,684- 854-73-24-A
K9SB/7 57,472- 449-64-18-B
K7JV 42,640- 328-65-16-A
WB7TJI 26,520- 204-65-14-B
WB7VID 9360- 120-39-12-A
K7MM(+N7AWE) 109,668- 741-74-24-B

Montana

W7JYW 121,508- 821-74-24-B
KØPP/7 88,652- 599-74-23-A
K7CPC 85,768- 608-71-24-A
N7AMZ 70,858- 499-71-18-A
WB7OXF 38,220- 294-65-19-A
KL7FDQ/7 25,620- 210-61-19-A
KA1EA/7 12,648- 124-51- 7-A
K7QA(+W9NFW) 127,374- 897-71-19-B

Nevada

WA7NIN(N6SF,opr) 181,892-1229-74-24-B
K7CA 164,736-1144-72-24-B
AD7K 127,312- 872-73-24-A
WA7YHP 85,692- 579-74-24-A
AJ7S 73,168- 538-68-18-A
AE7K 60,620- 433-70-20-A

Oregon

W7NI 161,764-1093-74-24-B
W7ZR 121,764- 834-73-23-B
W7WHO 100,188- 726-69-22-A
AF7S 96,624- 671-72-20-B
W7KMB 91,584- 636-72-24-A
W7YAQ 60,680- 410-74-16-A
K7KJM 60,320- 464-65-22-A
W7JZV 23,714- 167-71-12-B
WB7UFJ 19,292- 182-53-19-A
WB7RKT 15,392- 148-52-16-A
W7LT 15,290- 139-55-16-A
K7EAU 12,690- 135-47-22-A
KA7EXM 7470- 83-45-11-A
K7WPC(+WB7PQU) 83,080- 620-67-22-B

Utah

N7DF 160,234-1029-73-24-A
K7EA 45,540- 330-69-18-A
K6EIL/7 32,982- 239-69-14-A
N7SM 7448- 98-38- 7-A
WB7VMQ 2100- 42-25- 7-A

Washington

W7WA 149,332-1009-74-23-B
N7ZZ 145,336- 982-74-24-B
WA7RKJ 132,608- 896-74-24-B
K7UR 126,984- 858-74-24-A
W7BUN 94,202- 703-67-21-B
WB7PSP 90,132- 609-74-20-A
K7HBN 87,840- 610-72-20-A
W7LKG 87,308- 598-73-24-B
K7LXC(K7WA,opr) 78,884- 533-74-19-A
WB7FFF 75,762- 549-69-19-B
N7AM 69,856- 472-74-19-B
WB3HNF/7 44,744- 329-68-24-A
K7FR 41,720- 298-70-19-A
W6VNJ/7 32,706- 237-69-11-A
W7BYK 29,480- 220-67-13-A
WB7AYB 29,436- 223-66-14-A
W7LRD 23,184- 207-56-12-A
W2JWF 23,128- 196-59-22-A
W7FJZ 20,448- 144-71-16-A
W7ERH 19,140- 174-55-11-A
WB7RMQ 16,956- 157-54-13-A
W7KJ 15,582- 147-53-10-A
N7DX 9000- 100-45- 3-A
N7CT 6240- 80-39- 6-B
W7LUR 6230- 89-35-16-A
K7NF 3500- 50-35- 2-B
WB7BNP 2970- 45-33-24-A
K7BFL 680- 20-17- 1-A
K7RS 84- 7- 6- 2-B
KA7BAY 50- 5- 5- 3-A
N7RV(+K7YST) 15,794- 149-53- 8-B

Wyoming

N7BDH 55,460- 470-59-17-A
K9DR/7 28,820- 262-55- 6-B
W7HRM 23,184- 207-56-11-B
WB7PLU 12,864- 134-48-22-A

Alaska

KL7HR 103,784- 704-73-19-B
KL7IVX 59,228- 442-67-18-A

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Michigan

W8UA(WA8ZDT,opr) 147,852- 999-74-24-B
K8LX 146,438-1003-73-24-B
K8DD 115,340- 790-73-24-B
WA8MAM 101,616- 696-73-24-A
AC8Y 100,988- 743-68-24-B
K8KA 97,820- 670-73-24-A
N8EA 97,674- 669-73-22-A
W8LXQ 97,632- 679-72-21-A
W8MNL 93,984- 712-66-24-B
WA8RRR 92,598- 671-69-14-B
AI8D 86,768- 638-68-21-B
WD8DMX 80,868- 586-69-23-A
WB8MTD 79,992- 606-66-22-A
K8SIA 74,620- 533-70-18-B
WD9HFW/8 74,096- 576-73-21-A
W8VPC 72,144- 501-72-19-A
AI8F 68,508- 519-66-23-A
WA8QAF 68,160- 480-71-17-A
W8UMP 64,184- 452-71-23-A
KA8CMO 62,992- 508-62-22-A
WAØTAQ/8 61,380- 465-66-18-A
W8JKU 59,792- 404-74-23-B
WB8YRY 57,800- 425-68-20-A
N8AW 49,368- 374-66-13-A
K8YRO 48,800- 400-61-24-A
WB8AAX 48,444- 367-66-17-B
WA5VUF/8 48,300- 350-69-16-A
K8OT 47,168- 352-67-22-A
K8RDJ 45,696- 336-68-22-A
W8TJQ 44,640- 310-72-15-A
WA8OWG 42,880- 335-64-19-A
W8IZS 42,746- 319-67-19-A
K8SS 32,562- 243-67- 8-A
K8GK 32,488- 262-62-15-A
WB8RUQ 31,744- 248-64- 9-A
N8LA 30,600- 262-60-16-A
WD8KXV 29,304- 222-66-12-A
WA8VEB 26,680- 230-58-11-A
K8KQJ 26,680- 230-58-11-A
W8MSK 25,088- 196-64-11-A
W8EGI 24,000- 200-60- 7-A
W8YO 21,230- 193-55-16-A
W8IJS 19,706- 167-59-24-A
W8PVI 16,680- 139-60-10-A
KA8EHM 16,512- 172-48-24-A
W8LAQ 16,320- 160-51- 5-A
W8OM 15,606- 153-51- 6-A
WB8SYA 15,426- 137-49-13-A
W8GBR 12,696- 138-46-11-A
WD8BHE 12,420- 135-46-10-A
WA8ZTQ 12,084- 106-57-10-A
K8MVZ 10,080- 90-56- 7-A
N8AOE 9200- 100-46- 8-A
KA8DWP 5976- 83-36-13-A
W8JUP 3500- 50-35- 4-A
W8LCU 1768- 52-34- 3-A
WD8JRU 1240- 31-20- 4-A
K8KM 630- 21-15- 3-B
KA8EHR 570- 19-15-12-A
W3GQJ/8 546- 21-13- 3-A
WB2LZN/8 140- 10- 7- 1-A
KA8HDV 50- 5- 5- 1-A
W8UM(K8LF,KB8EQ,WB8YVI, oprs) 105,376- 712-74-23-B
WB8YDR(+WD8CJJ) 81,030- 555-73-24-A
AJ8C(+AI8U,AJ8Z,WD8JSQ) 64,872- 477-68-24-B
W8TQE(K8s AQM KIC, KA8s ALG ALH,WB8ZFB,WD8s AUS KLP,oprs) 63,788- 431-74-24-A
WD8CSA/8(+W8MPD,WA8FRE) 63,630- 505-63-24-B
WD8ECT(+WD8ECU) 34,650- 275-63-17-A
WB8LZA(+WB8LYY) 28,182- 231-61-11-A
WB8UHS(+WB8WIM) 8170- 95-43-18-A
KB8LP(+WD8PGQ) 1702- 37-23-15-A
KA8BWL(+KA8HAH) 870- 29-15-10-A

Ohio

K8FU 126,576- 879-72-24-B
W8LT(WB8YSD,opr) 122,256- 849-72-24-B
K8EKG 116,800- 800-73-22-A
W8RSW 116,064- 806-72-22-B
AC8E(WD8ALG,opr) 111,106- 761-73-24-B
W8FN 103,320- 738-70-19-B
W8KRR 102,346- 701-73-22-A
K8CL 98,696- 676-73-24-A
W8UPH 86,478- 609-71-24-B
K8BL 79,920- 555-72-18-A
W8ETU 74,460- 510-73-19-A
K8MN 74,340- 531-70-16-B
N8LM 70,620- 535-66-19-A
K8US 62,176- 474-67-16-B
K8AAZ 61,758- 423-73-17-A
N8BJQ 56,000- 400-70-23-A
WB8LCF 55,624- 409-68-19-A
K8JK 54,740- 391-70-15-B
WB8RTJ 54,538- 407-67- -A
AA8S 51,830- 355-73-22-A
AC8X 51,520- 368-70-17-A
W8IDM 51,060- 345-74-17-B
W8VQI 50,508- 366-69-18-B
W8GOC 47,880- 342-70-14-A
W8IM 46,200- 350-66-14-A
K6SLM/8 46,150- 355-65-22-A
AA8Z 41,262- 299-69-16-B
WD8MBK 31,598- 259-61-22-A
K8MR 31,320- 270-58- 4-B
WB8NBA 31,008- 304-51-11-A
WD8DTG 29,184- 256-57- 8-A
K8SWE 28,512- 216-66-11-A
W8BMG(K8EM,opr) 23,160- 386-60-20-A
KA8CQI 23,028- 202-57-24-A
W8KHP 22,680- 189-60-13-A
N8AFE 19,140- 174-55-10-A
W8CAR 17,930- 163-55- 9-B
WA8ADA 17,492- 156-56-20-B
N2MA/8 14,522- 137-53- 4-A
AF8C 13,700- 137-50-19-A
AD8P 12,972- 138-47- 3-A
W8AJW 12,878- 137-47- 5-A
WB8NBY 11,232- 117-48- 8-A
W8DWP 9768- 74-66-15-A
W8DXT 6080- 80-38-17-B
K8HLJ 3538- 61-30- 5-A
KA8CTC 3300- 55-30- 9-A
N8VT 3120- 60-26- 3-A
KA8D 1512- 36-21- 3-A
N8BKX 1276- 29-22- 4-A
WD8RPI 1020- 30-17-17-A
W8XT 640- 20-16- 1-A
WD8MIF 600- 20-15-13-A
KA8HAX 360- 15-12- 6-A
KA8DRS 280- 14-10- 7-A
WB8VPB 264- 12-11- 4-A
KA8DVI 180- 10- 9- 3-A
WB7VCT/8 96- 8- 6- 4-A
K8ND(+N2MA,AD8I,K8NU) 142,080- 960-74-24-B
WB8JBM(WB8s DQP LSN,oprs) 130,240- 880-74-24-B
KA8Y(+AI8V,WD8MHJ) 26,160- 218-60-19-A
W8FW(AA8R,KA8s DQC EYM, N8BCM,WD8AMV,oprs) 4088- 73-28-11-A

West Virginia

AC8L(N8RR,opr) 138,380- 935-74-24-B
K8KT(WA8WPW,opr) 125,560- 860-73-24-B
K8JQ 113,184- 786-72-21-B
WB8AKQ 95,992- 676-71-22-A
W4NW/8 71,686- 491-73-13-A
W8UT 57,270- 415-69-17-A
WA8DGE 41,676- 302-69-16-A
W8JWX 12,096- 112-54- 7-A
WB8AHH 4896- 72-34- 4-A
KA8CVI 2784- 48-29-11-A
K8UQ 144- 9- 8- 4-A
WB8WEZ 96- 8- 6- 2-A

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Illinois

W9RW 146,146-1001-73-23-B
K9RF(K9UIY,opr) 141,858- 999-71-24-B
K9GL 141,328- 968-73-24-B
K9RS 139,712- 944-74-24-B
K9KM 138,116- 946-73-24-B
K9NO 137,520- 955-72-24-B
W9YH(K9VV,opr) 128,760- 870-74-24-B
K9BG 124,172- 839-74-24-B
K9GS 122,692- 829-74-24-B
K9BGL 122,100- 825-74-24-B
WD9DCL 116,362- 797-73-24-B
K9ZO 114,996- 777-74-24-A
K9WA 110,230- 755-73-24-A
K9RU 109,372- 739-74-23-B
N9BT 107,856- 749-72-24-A
W9TM 104,688- 727-72-24-B
WB9TIY 100,886- 691-73-21-B
AG9A 100,380- 717-70-24-A
N9AQT 85,544- 578-74-22-A
K9JU 85,264- 584-73-22-A
N9GB 76,432- 562-68-23-B
K9LUW 71,712- 498-72-24-A
N9AG 64,600- 475-68-17-A
N9AX 57,620- 430-67-19-A
WB9JSR 55,074- 411-67-15-A
WAØAXH/9 49,664- 388-64-22-A
AF9C 49,104- 372-66-20-B
KB9EW 48,508- 362-67-23-A
WD9DBC 47,488- 371-64-17-A
N9AUZ 45,952- 359-64-21-A
N9NA 45,440- 320-71-13-A
K9CC 41,520- 346-60-14-B
K9AR 34,560- 270-64- 9-B
WD9IIX 30,134- 247-61-17-A
W9HPG 25,870- 199-65-13-A
N9UN 23,984- 169-68-10-A
W9REC 23,760- 180-66-15-A
W9LNQ 22,896- 159-73-12-A
WD9IFD 21,546- 189-57-15-A
W9WR 21,492- 199-54- 8-B
WB9SMU 20,862- 171-61-11-A
WD9FSE 20,160- 180-56-18-A
K9HDE 15,844- 143-54-16-B
K9KNV 11,968- 136-44-16-A
W8XU/9 9588- 102-47- 5-A
WB9VLM 8928- 124-36- 6-A
KA9ACS 8820- 90-49-11-A
K8KIX/9 7138- 83-43-12-A
W9ZEN 5472- 72-38- 6-A
W9AGM 3600- 50-36- 2-A
K9MK 1672- 36-22- 2-A
K9MBX 1554- 37-21- 8-A
WD9CMB 990- 33-15- 4-A
WA9ZZG 550- 25-11- 5-A
KB9IL 520- 26-10- -A
KA9BOD 60- 6- 5-12-A
N9TG(+K9s SA UQN,W9JXT, WB9s TNK UJB) 87,630- 635-69-24-B
W9PK(+AI9F,WD9JBK) 82,740- 591-70-24-A
N9JF(+WB9s UTY UTZ) 81,696- 552-74-24-A
WD9EVV(+WD4FFW,KA9DTE) 15,322- 163-47-15-A
KA9ECE(+KA9s DMT OMW) 13,160- 140-47-20-A
WD9GGY(+WD9BHK) 11,430- 127-45-24-A
KA9DIL(+WA9TKK) 10,672- 116-46-15-A
KA9DAG(+KA9s DWB ERW) 9328- 106-44-17-A

Indiana

W9RE 143,810- 985-73-24-B
W9LT 121,804- 823-74-24-B
N9NO 116,216- 796-73-24-B
N9NS(W9OBF,opr) 112,332- 796-71-24-B
K9FW 97,240- 715-68-23-B
WB9VJE 92,856- 636-73-23-B
W9FC 87,454- 599-73-23-A
W9JOO 85,272- 627-68-24-A
W9XL 72,288- 502-72-14-A
K9WWT 69,690- 505-69-21-B
WA9TBW 44,040- 367-60-17-B
W9QLW 26,040- 217-60-22-B
N9ACD 20,020- 182-55- 8-A
K9KB 18,468- 162-57-14-B
K1TH/9 17,346- 147-59-13-A
KA9FKU 12,900- 129-50-15-A
N9RC 9348- 123-38- 7-B
WA9PKL 7200- 90-40- 8-A
N9CR 1840- 46-20- 2-A
WD9FEP 198- 11- 9- 4-A
W9LJ/9(K9s DGV KIQ,KA9DGX, KB9BU,N9AJT,W9s AYH JEX, WB9s EWH EWO JKO QMQ,WD9s ETM EZB FMV FOT HLS HXN WAN,oprs) 25,190- 229-55-24-A

Wisconsin

W9NA 147,024-1021-72-23-B
W9YT(WB9PYE,opr) 119,952- 882-68-24-B
K9BN 107,448- 726-74-23-B
N9AW 104,796- 738-71-24-B
N9NE 102,960- 715-72-24-A
W9GHY 96,832- 712-68-24-B
K9EYA 91,000- 650-70-20-B
N9AU 89,060- 610-73-22-B
W2WOE/9 87,720- 645-68-22-B
WB9FRF(W9XT,opr) 86,380- 617-70-24-A
W9HE 71,940- 545-66-18-A
WD9GUR 69,496- 511-68-24-A
W9HI 67,620- 483-70-15-A
WB9EJE 61,200- 425-72-20-A
N9EZ 58,362- 411-71-19-A
N9KS 50,652- 378-67-17-B
K9WTF 45,890- 353-65-18-B
N9TD 43,520- 340-64-17-A
W9FBC 40,252- 347-58-13-B
K9KR 25,404- 219-58-19-B
WB9BSO 24,522- 201-61-18-A
AG9V 23,296- 208-56- 9-A
K9GDF 23,084- 199-58- 3-A
WD9BCM 21,460- 185-58-11-A
W9GIL 16,128- 144-56-24-A
N9HR 15,000- 150-50- 9-A
WA9POV 13,462- 127-53- 9-A
KA9CHP 12,420- 115-54-18-A
KA9AKH 11,938- 127-47-10-A
WB9GZP 11,500- 115-50-11-A
KA9CHM 10,672- 116-46- 8-A
W9FPA 10,584- 126-42- 8-A
WD9IKO 8400- 100-42- 6-A
WB9YCS 8346- 107-39-18-A
N9AGE 3120- 52-30-10-A
AJ9K 1950- 39-25- 3-A
WD9EFJ 672- 21-16- 2-A
WD9ESX 2- 1- 1- 1-A
WD9AYE(+WB9s SVN SVO, WD9HJV) 37,120- 290-64-20-A
KA9ACC(+KA9s AGI AJB) 32,574- 267-61-24-A
WB9BWP(+KA9DNL) 3060- 45-34-15-A

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Colorado

WØCP 150,526-1031-73-24-B
KØEU 130,752- 908-72-24-A
WØYK 129,024- 896-72-22-B
NØDV 114,026- 781-73-24-A
ACØS 109,060- 779-70-22-B
N3SL/Ø 107,152- 724-74-20-A
NØCP 99,718- 683-73-23-A
AGØL 76,680- 540-71-21-A
WØRSR 55,614- 403-69-17-A
WØGO 22,742- 181-63-10-A
ACØY 22,660- 206-55-10-A

KAØAIA 6142- 83-37-14-A
ABØG 2484- 46-27- 2-A
WDØEGE(+WB3AMM,KAØBMU)
85,698- 621-69-23-B
KAØCPM(+KAØs DGT DGU DGV)
5928- 76-39-18-A

Iowa

WAØVKF 134,900- 950-71-24-B
KØLUZ 130,378- 893-73-24-A
WBØPYD 103,514- 709-73-23-A
KØIS 101,616- 696-73-24-A
WDØFGY 80,040- 580-69-24-A
WBØVDE 46,992- 356-66-17-A
NØBB 44,968- 308-73-18-A
AIØZ 34,684- 299-58-14-A
AKØM 33,792- 264-64- 9-A
WBØUCP 27,840- 240-58- 9-A
WØJTC 22,736- 203-56-14-B
WØLR 22,680- 360-63-10-A
WAØTVV 20,130- 153-55- 9-B
WDØGVY 20,036- 189-53-20-A
WØNMU 10,812- 102-53-12-A
NØADI 8960- 70-64-22-A
NØAYM 7800- 100-39- 7-A

Kansas

WAØTKJ 118,844- 803-74-24-A
KØVBU 109,500- 750-73-24-A
WDØFBP 70,380- 510-69-23-A
WBØVKC(WB5WOQ,opr)
36,934- 313-59-22-B
WBØDDX 23,484- 206-57-10-A
KAØBCW 21,460- 185-58-14-B
NØIN 13,818- 141-49- 2-B
KAØBUT 11,000- 110-50-11-A
K5JZN/Ø 9000- 100-45- 2-A
KAØCRT 5070- 65-39-12-A
NØARB 4484- 59-38- 4-A

WBØTOM 4000- 100-40- 7-A
KØSBV 2700- 50-27- 2-B
WDØBRX 532- 19-14- 7-A
KØWA(+ABØS)
144,394- 989-73-24-B
KAØBMX(+WBØZEP)
14,200- 142-50-18-B

Minnesota

WØZZ 158,192-1069-74-24-B
WØSA 143,920-1021-70-24-B
NØNO 131,254- 899-73-24-A
WØUC 114,452- 806-71-24-A
WØYCR 110,740- 791-70-22-B
KØMPH 110,180- 787-70-24-A
WØWDW 108,204- 762-71-23-A
WØHW 104,488- 706-74-18-B
KØFRP 97,016- 724-67-20-A
KØFZG 88,458- 641-69-24-A
WØROE 70,148- 494-71-22-A
AA4MD/Ø 67,584- 512-66-18-B
KAØC 43,112- 317-68-15-A
WØRSB 40,800- 300-68-13-A
KØBR 40,430- 311-65-11-A
KAØASU 37,520- 280-67-21-A
WØPPJ 34,320- 312-55-14-A
WBØUKI 31,232- 256-61-14-A
NØAGW 19,320- 210-46-18-A
NØBAP 14,190- 165-43- 8-A
WAØWWW 6804- 81-42-13-A
WA2HFI/Ø 6150- 123-50-13-A
KØII 4690- 67-35- 1-A
NØADJ 3720- 62-30- 4-A
WØMN 3300- 55-30- 4-A
KØIJL 2352- 49-24- 1-A
KØTK(+KØFVF,NØBG,WBØGDB)
133,792- 904-74-24-B
KØTG(+NØBG,WAØRBW)
115,360- 824-70-24-B

KØLTC(KØGRA,KAØDJJ,NØBCH,
WØUBT,WBØs HRX SNH SNP,WDØs
BQP BQR FVH,oprs)
51,786- 411-63-24-B
WB1DQN(+NØAOI)
30,250- 275-55-13-A

Missouri

KØDEQ 120,472- 814-74-22-B
ABØI(KØXR,opr)
118,368- 822-72-24-A
KØVUW(KØFU,opr)
117,860- 830-71-24-B
NØDX 117,718- 829-71-24-B
NØTT 107,068- 754-71-24-A
KØRWL 105,790- 745-71-24-B
WØQWS 95,922- 657-73-20-A
WBØLFY 90,114- 653-69-24-A
NØSS 82,960- 610-68-12-B
WØRNG 79,624- 538-74-19-A
WØVE 78,402- 537-73-23-A
WAØFBQ 74,392- 547-68-17-A
AGØA 35,376- 264-67-13-A
WBØVHN 28,036- 238-61-12-A
WBØOMC 15,700- 157-50-10-A
WØOQ 11,900- 119-50- 7-A
WDØARX 11,466- 117-49-18-A
WDØCHZ 6384- 84-38-20-A
WØBV 6148- 106-29- 5-A
WDØBBN 4736- 74-32-10-B
WBØTPK 2666- 43-31-12-A
WBØZSS 2400- 40-30- 6-A
WBØOQV 1900- 50-19- 5-A
WØEEE(NØs ARN AX,WBØs LTD
UGX ZLB,oprs)
111,252- 762-73-24-B
WBØTPP(+AGØC,WBØUFJ)
56,810- 437-65-23-B

WAØQWW(WB5VMZ,WBØSPT,oprs)
20,460- 372-55-22-A

Nebraska

KØDI(+KØNB)
117,852- 854-67-24-B

North Dakota

WDØECS 41,772- 354-59-19-A
WØLHS 30,720- 256-60-17-A
W9IX/Ø 22,288- 199-56-10-A
KAØDNN 12,300- 123-50-10-A
WA5TFU/Ø 11,186- 119-47-15-A
WDØATI(+WØRIB)
30,508- 263-58-12-A
WØHSC(NØs BHR OL,WBØs OAJ
YVX,WDØs AJS HTX,oprs)
13,632- 142-48-16-A

South Dakota

WDØBWH 28,548- 234-61-21-A
NØACL(+WBØPJB)
91,494- 663-69-24-A
WDØEMB(+WDØCXU)
81,900- 630-65-17-A

VE

Maritime - Newfoundland

VE1OXA(VE1BXC,opr)
135,124- 913-74-24-B
VE1BGD 50,700- 390-65-22-A
VE1WF 42,140- 301-70-14-B
VO1AW 39,520- 304-65-17-B

Quebec

VE2HY 60,060- 462-65-23-A
VE2WA 16,724- 113-74- 8-A
VE2AQP 2900- 50-29- 2-B

Ontario

VE3OT 100,536- 708-71-22-B
VE3JTP 75,740- 541-70-22-A
VE3GCE 75,024- 521-72-16-A
VX3XJ 50,516- 346-73-19-A
VE3DOP 43,648- 352-62-17-B
VE3KYP 30,150- 225-67-24-A
VE3KLW 10,952- 74-74-10-A
VE3LJJ 10,700- 107-50-18-A
VE3LDT 5978- 92-65-10-A
VE3KQD 4200- 60-35-24-A
VE3JTQ 3960- 66-30- 4-A
VE3ART/3(VE3s ATD DAO GAS
LNS,oprs) 107,210- 755-71-21-A
VE3BX([+VE3s HGE KMF
JG1LEB) 52,428- 392-67-24-A

Manitoba

VE4VV 155,198-1063-73-22-A

Saskatchewan

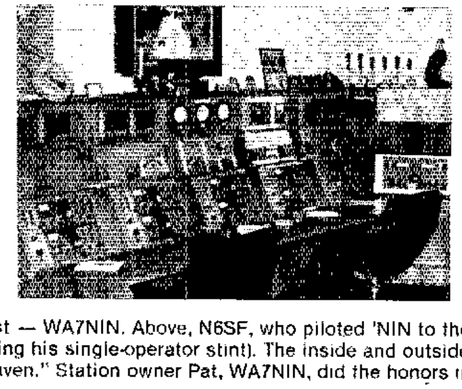
VE5ACS 10,246- 109-47-19-A
VE5BBQ(+VE5ZU)
16,932- 166-51- 7-A

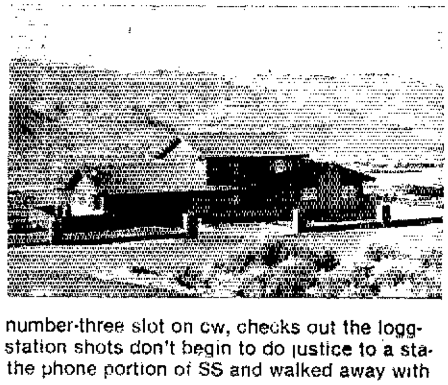
Alberta

VE6CGY 1440- 30-24- 4-A

British Columbia

VE7CC 167,240-1130-74-24-B
VE7CRU 72,450- 525-69-23-A
VE7CGN 51,750- 375-69-20-A





The source of the BIG signal from the West Coast — WA7NIN. Above, N6SF, who piloted 'NIN to the number-three slot on cw, checks out the logging accommodations (unfortunately not used during his single-operator stint). The inside and outside station shots don't begin to do justice to a station that truly deserves the title "Contester's Heaven." Station owner Pat, WA7NIN, did the honors in the phone portion of SS and walked away with second-place overall.

Phone Scores

U.S.A.

1

Connecticut

K1VTM 244,496-1652-74-24-B
K1PR 237,688-1616-74-24-B
W1AW(W3AZD,opr)
174,672-1213-72-18-B
K1RT 145,416- 996-73-15-B
KA1GD 142,820- 965-74-22-B
W1WEF 138,824- 938-74-20-B
K1XM 110,376- 756-73-17-B
WA1ZDW 109,816- 742-74-19-A
K1TO 105,558- 723-73-12-B
WB1ACZ 98,716- 667-74-16-A
N1JW 98,716- 667-74-14-B
K1WB 88,900- 635-70-20-A
K1THP 78,292- 529-74-13-B
W1VV 65,712- 444-74- 8-B
K1KI 63,504- 441-72- 6-B
W1ZM(K1ZM,opr)
52,930- 395-67- 5-B
WA1YEC 50,694- 357-71-24-A
N1ADE 50,688- 352-72-18-B
K1TN 48,034- 329-73- 5-B
K1WA 45,140- 370-61- 6-B
WB1EYI 38,780- 277-70-13-A
K1BV 37,260- 345-54- 7-B
K1OD 33,184- 272-61-12-A
N1CC 27,450- 225-61- 7-A
W1ECH 23,370- 205-57- 5-A
K1DII 22,458- 197-57-24-A
K1DW 16,300- 163-50- 8-A
W1BIH 15,840- 110-72-24-B
WB1FKU 15,180- 138-55- 4-A
WA1YCO 11,834- 117-51-11-A
WA1UUA 4402- 71-31- 1-A
K1YRP 4012- 59-34- 2-A
WA1STO 3996- 54-37- 2-A
WB1HLU 3116- 82-19- 3-A
W1LJ(+K1s CC NFE, W1s BL OD,
WA1PAT) 204,092-1379-74-24-B
K1XA(+K1WJ,W1OD)
157,472-1064-74-21-B
K1MUJ(WA1s DWF GBA HYN,oprs)
144,432-1003-72-23-B
WB1ADR(+KA1s ARB DBK)
100,110- 705-71-24-A
KA1BB(+N1AMR)
17,914- 169-53-12-A

Eastern Massachusetts

W1CF(WA1LKX,opr)
277,180-1535-74-24-B
AB1A 210,900-1425-74-24-B
WA1UZH 145,632- 984-74-24-A
N1AU 137,270- 928-74-24-B
K1GSK 112,036- 757-74-14-B
K1VR 108,780- 735-74-17-B
KA1AQ 90,288- 627-72-24-A
N1RC 77,108- 521-74-17-A
N1HR 76,812- 519-74-14-A
W1FM 72,144- 501-72-17-A
KA1CC 71,136- 494-72-17-B
WA1FRC 38,216- 281-68-19-B
AD1Z 33,528- 254-66-15-B
WA1YVT 16,440- 137-60-13-A
K1MEM 14,800- 100-74- 7-B

WA1UJU 14,000- 140-50- 7-A
WB1ANT 5472- 72-38- 1-B
K1VUT 4940- 65-38- 3-B
W1PLJ 4650- 75-31- 7-B
K1RB 4560- 60-38- 6-A
WB1DFV 4392- 61-36- 4-A
K1CHY 3540- 59-30- 4-A
WA1PHY(K1EO,opr)
1470- 35-21- 2-A
W1TKZ(K1s TK UR,WA1s YOJ
ZLQ,oprs) 85,248- 576-74-22-B
K1PDX(+WB1FCO)
45,678- 331-69-16-A

Maine

WA1PDG 73,584- 511-72-18-A
WA1YOC 60,520- 445-68-15-B
KA1CVM 20,650- 175-59-16-A
K1SA 10,988- 134-41- 2-B
W1GX 7000- 100-35- 3-A
N1SO(+K1IZX)
146,584-1004-73-24-B
KM6FC/1(+KM6FD)
64,042- 451-71-11-B
WA1ZBH(WB1DED et al,oprs)
51,262- 361-71-24-A

New Hampshire

K1RX 198,912-1344-74-24-B
K1GQ 159,988-1081-74-14-B
K1HI(N1EE,opr)
140,748- 951-74-18-B
KA1EP 66,220- 473-70-17-A
WA1YIV 33,634- 251-67-14-A
N1OM 18,126- 159-57- 7-A
W1ICU 16,578- 147-57-11-A
AC1J 8930- 95-47- 4-A
W1UN 3740- 55-34- 2-B
K1XR(+KA1DOK,WA1s RLO UNN
WJE,WA2VSN)
200,836-1357-74-24-B

Rhode Island

WA1TAQ 111,296- 752-74-16-A
WA1CVF 55,728- 387-72-15-B
N1AGU 36,300- 275-66-15-A
W1RFQ 33,810- 245-69-12-A
K1VSJ 30,940- 238-65- 9-A
K1UM 22,940- 155-74-11-A
N1ARP 6912- 96-36- 6-A
WA1RKL 784- 28-14- 1-A
W1OP(K1s DT PLX,oprs)
70,416- 489-72-23-A
WA4MMP/1(+KB5MY)
1232- 28-22- 2-A

Vermont

WB1GQR(WB2JSJ,opr)
217,264-1468-74-24-B
K1IK 184,354-1245-74-20-B
WB1HCT 64,186- 479-67-15-B
KA1FJ 24,800- 200-62- 6-A
WA1WLM(K1s LJL VT,WA1ZLD,
WB1BWV,oprs)
60,354- 479-63-12-B

Western Massachusetts

N1YY 157,028-1061-74-24-A
K1NWE 150,072-1014-74-20-A
AG1C 84,804- 573-74-23-A
K1FIR 42,880- 320-67-11-B
N1ADX 11,742- 103-57-16-B
N1ACJ(+KA1BBD)
89,8.6- 607-74-24-B

2

Eastern New York

W2PV(K1AR,opr)
259,148-1751-74-24-B
K2AE(WB2CFP,opr)
124,818- 879-71-20-B
W2XL 104,682- 717-73-24-A
W2AZO 103,600- 700-74-14-B
KC2L 101,232- 684-74-24-A
WA2STM 91,008- 632-72-24-A
WB2EYB 46,472- 314-74- 8-A
WB2NFG 44,940- 321-70-19-A
WA2ARQ 42,632- 292-73-23-A
WA2KLV 41,814- 303-69-15-A
N2BHP 40,870- 335-61-17-A
W2HBY 36,582- 273-67-12-A
WA2MJX 32,760- 260-63-16-B
WB2ENA 32,240- 248-65-16-A
K2GSF 29,358- 233-63-11-B
AA2Y 28,520- 230-62- 9-B
WA2TJE 27,852- 211-66-15-A
WB2OFV 27,216- 216-63-11-B
N2FS 24,696- 196-63-13-A
WB2KHE 24,304- 196-62-15-A
W2DW 13,886- 131-53- 3-B
WA2RNX 9936- 108-46- 4-A
WA2ILG 2500- 50-25- 4-A
WA2WSX(+WB2KMY)
140,452- 949-74-24-B
N2CF(+WB2RRH)
31,980- 246-65-12-A
WB2OEL(+WA2JDM,KA2s DOK
EPK FQJ,oprs)
30,910- 281-55-24-A

New York City - L.I.

K2HVN 117,612- 794-74-20-B
W2DKM 84,508- 571-74-21-A
WB2RNT 83,232- 578-72-23-A
WB2TCQ 70,420- 502-70-16-A
K2AU 46,620- 315-74-10-B
N2ALD 45,936- 348-66-16-B
K2SX 41,160- 294-70- 6-B
WB2PXA 28,016- 206-68-12-B
WA2ICX 27,084- 222-61-13-A
N2GC 25,800- 215-60-10-A
K2PE 21,616- 193-56- 3-A
N2NT 10,952- 74-74- 5-A
WA2TSF 3000- 50-30- 4-A
K2CMV 2900- 50-29- 3-A
KA2BDL 1280- 32-20- 4-A
KB2DN 12- 3- 2- 1-A
WA2JAS(KA2s CLQ ELB FXU
GJE,KB2J,WA2s JBY SEL,WN2VVR
WB2QEU,oprs)
150,380-1030-73-24-B
KA2AEV(+KA2GWJ,WA2YEI,
WB3LHK) 77,000- 550-70-24-A

Northern New Jersey

W2RQ 183,376-1256-73-23-B
WA2OVE 114,256- 772-74-16-B
W2SQ 95,850- 675-71- 9-B
KB2AH 77,328- 537-72-18-B
N2IC 76,664- 518-74- 6-B
WB2ARS 55,584- 386-72-17-B
N2AAZ 53,108- 374-71-21-B
WB2POG 50,694- 357-71-10-A
WB2QLO 46,410- 357-65-21-A
AE2A 33,040- 295-56- 5-B
WB2QEA 29,172- 221-66-13-A
WA2UPK 28,980- 210-69-12-B
K2BJG 27,160- 194-70-14-B

WA2DTJ 24,192- 189-64-14-B
W2GNW 23,552- 184-64-12-A
WB2IKL 22,538- 191-59- 7-A
W2IFK 19,264- 172-56- 5-B
AD2K 16,640- 130-64-15-A
WA2UDT 16,200- 150-54- 5-A
W3EVQ/2 7830- 87-45-18-A
W2CC 4760- 68-35- 3-B
WA2VZW(+KA2BNF,WB2s WAB
YAW) 128,940- 921-70-24-A
K2GQ(N2BQ,WA2s KYG MYZ
NXW,WB2s KGN RLB,oprs)
91,980- 630-73-24-A
AG2N(+KB2EW,WA2WFF)
61,548- 446-69-14-B
WB2WEX(+KA2COQ)
9020- 82-55- 8-B

Southern New Jersey

W2KI 172,869-1168-74-24-B
AB2E 135,568- 916-74-20-B
K2YY 131,424- 888-74-17-B
AA2Z 123,136- 832-74-18-B
N2CQ 122,396- 827-74-16-B
WB2VFT 102,120- 690-74-23-A
WA2WJL 80,154- 549-73-19-A
W2PAU 79,570- 545-73-18-B
W2FGY 78,440- 530-74-24-B
WA2NPD 74,480- 532-70-14-B
WB2YOF 68,870- 485-71-20-A
WB2GTW 67,876- 478-71-16-A
WA2NBM 61,658- 425-73-21-B
WA2KOK 57,820- 413-70-20-A
W2EA 49,680- 360-69-20-A
W2YC 47,286- 333-71-13-B
WB2UVB 46,150- 325-71-18-A
N2BCF 29,358- 233-63-20-A
N2AWH 28,680- 239-60-11-A
K2JF 26,800- 200-67-13-A
W2BLV 23,146- 163-71-13-A
WB2PHD 21,504- 192-56-15-A
K2HPV 18,908- 163-58- 8-B
W2OGZ 13,640- 124-55- 7-B
WA2DUE 12,650- 115-55- 9-A
WA2AWS 8880- 120-37- 4-A
W2PJC 6478- 79-41-13-A
N2BBU 2800- 50-28- 4-A
WB2ERI 2538- 47-27- 6-A
W2ZQ(KA2BKF,N2BBU,WA2s HPY
SQD,WB2s IQJ IQV,K3CPF,oprs)
50,784- 368-69-16-B
K2OSV(+WB2SJA)
46,512- 342-68-14-B

Western New York

WA2ECA(WA2LCC,opr)
206,756-1397-74-24-B
N2ALK 122,100- 825-74-24-A
W2RR(WA2AOG,opr)
106,560- 720-74-16-B
N2NW 106,264- 718-74-24-A
K2OVI(WA2FQE,opr)
94,462- 674-73-24-B
WA2AWX 67,784- 458-74-12-A
KB2DE 63,640- 430-74-22-A
WB2ABD 62,196- 426-73-17-A
K2SOT 50,172- 339-74-17-B
K2SQX 40,180- 287-70-19-A
W2VDX 36,852- 249-71-14-B
K2XU 29,104- 214-69-11-A
WB2ODH 28,200- 235-60-12-A
WB2QDN 27,950- 215-65-13-A
KB2DF 19,716- 159-62- 9-A
WA2PHA 16,524- 162-51- 9-B
KA2DFM 15,048- 114-66-24-A

N2CU 12,672- 198-32- 3-A
N2ARD 12,190- 115-53-10-A
KA2CZO 11,808- 123-48- 7-A
W2UP 9000- 100-45- 1-A
N2ARG 8568- 84-51- 5-A
W2GJ 6068- 82-37- 5-A
WA2IMG 5000- 50-50- 6-A
WB2PSI(W2AV,WA2s VCM ZKD,
N9TE,oprs) 156,868-1060-74-24-B
W2OW(K2OC,N2HR,W2IE,WA2RBJ
WB2s DDE GGH PGU RFI SGS,oprs)
121,508- 821-74-24-B

3

Delaware

K3JFZ/3 124,830- 855-73-14-B
AC3T 52,256- 368-71-13-A
K3HBP 48,360- 372-65- 7-B
WB3GDB 14,364- 133-54- 8-A
K6SMH/3 12,212- 142-43- 6-A
WA3TVS(+N2RF)
97,966- 671-73-23-B

Eastern Pennsylvania

W3MA 193,288-1306-74-24-B
K3ZA 182,632-1234-74-23-B
WB3FAA 118,696- 802-74-23-B
W3LR 114,912- 798-72-16-B
W3IQS 113,442- 777-73-19-B
WB3EMG 100,394- 707-71-24-B
KA3AQF 81,224- 572-71-19-B
K3ZFG 71,248- 488-73-16-B
WB3DJF 69,264- 468-74-17-B
WB3CIW 66,528- 462-72-22-B
WB3GZV 64,800- 450-72-20-A
WA3NRU 63,216- 439-72-16-A
WA3VGT 61,600- 440-70-18-B
WB3DYQ 61,488- 427-72-24-A
WB3AAK 59,920- 428-70-24-A
KA3ARQ 57,800- 425-68-22-B
W3ARK 56,648- 388-73-14-A
W3FRY(K3WJV,opr)
54,312- 438-62-16-B
WB3CAI 50,410- 355-71-22-A
WA3YON 45,072- 313-72-18-A
WB3FYT 43,746- 317-69-17-A
WB3BBW 36,018- 261-69-16-B
WB3AZE 34,020- 243-70-15-A
WB3IOV 33,264- 264-63-13-A
K3KHL 30,530- 215-71-10-A
KA3AHX 29,832- 226-66-14-A
WB3AKI 28,854- 229-63-14-A
W3DHM 26,532- 201-66- 8-B
WA3YTI 26,040- 210-62-13-A
WA3NHO 24,396- 214-57- 5-A
W3RJ 21,600- 200-54- 2-B
WB3KIL 20,440- 146-70-11-A
W3DZH 19,272- 146-66- 6-A
WB3BGA 15,120- 135-56-18-A
WB3DCT 13,442- 143-47- 3-B
W3ETB 11,730- 115-51- 8-B
W3KOK 10,920- 105-52-15-A
WB3JUK 9078- 89-61- 5-B
AG3R 3886- 67-29- 4-A
WB3FKQ 2464- 56-22- 2-B
WA3LGG 588- 21-14- 9-A
K3CSG(AC3O,AG3M,WB3s HRU
KFJ KFK,oprs)
56,280- 402-70-19-A
WA3RCA(KA3s AAE BFQ,K3DLS,
WA3OVH,WB3s CTP DQD HNW,
oprs) 37,820- 305-62-10-B

K6HRT and N6BLH (multiop on phone from the Orange Section) before, during and after — the changing faces of the phone SS.

Maryland - D.C.

W3LPL(N8RC,opr) 180,264-1218-74-24-B
WA3KCY 166,648-1126-74-23-B
K2PLF/3 164-016-1139-72-24-B
K3TA(N3TR,opr) 162,936-1116-73-24-B
WA3VUQ 152,588-1031-74-22-B
W1FLM/3 136,456- 922-74-17-B
K3ZZ 133,344- 926-72-24-B
N3RL 124,616- 842-74-19-B
W3MR 119,732- 809-74-17-B
N3GB 118,400- 800-74-18-B
WA3UPH 103,968- 722-72-13-B
K3SA 103,600- 700-74-15-B
KB3EI 102,712- 694-74-24-B
W3UJ 84,388- 578-73-12-B
N3AVA 54,528- 384-71-19-A
N3II 52,966- 373-71- 8-A
G3ZCZ/W3 48,988- 331-74-20-B
N3AGH 42,884- 302-71-21-B
W3IDT 42,612- 318-67-11-A
K3ZJ 41,888- 308-68- 5-B
W3GNQ 41,752- 307-68- 8-B
KD5M/3 39,054- 283-69-17-A
K3ZNV 34,860- 249-70-10-A
W3HVM 25,200- 200-63- 7-B
AG3S 15,180- 115-58- 9-A
K3VY 11,250- 125-45-24-B
W3GRF 11,250- 125-45-24-B
KA3DAG 11,070- 123-45- 8-A
W3GG 10,368- 72-72- 5-B
WA3WTQ 8800- 100-44- 7-A
K3IU 6708- 78-43- 3-B
W3FQE 5244- 69-38- 5-A
WA3YKR 3840- 60-32- 8-A
W3GN 1800- 50-18- 2-A
K3RA(+N4NW) 178,636-1207-74-24-B
N3MG(+WB3FOG) 174,344-1178-74-24-B
W3FA(+WA3ZAS) 79,424- 544-73-16-B
W3ADO(WA3VHS,WB4s PNG ZSO,WB5WZA,KH6JAV,N6CY, WA6VZN,N7AYG,oprs) 60,634- 427-71-22-B

Western Pennsylvania

K3UA 233,692-1579-74-24-B
W3KWH(WA3FYJ,opr) 187,516-1267-74-22-B
AG3H 70,704- 491-72-18-A
K3VX 60,882- 417-73-12-A
KA3DJM 45,370- 349-65-19-A
K3RN 44,540- 348-64- 8-B
N2SL/3 41,676- 302-69-10-B
WB3AKK 35,152- 259-64-24-A
K3WT 31,878- 253-63- 6-A
WA3MDY 27,720- 252-55-13-A
K3CR(W3AS,opr) 21,586- 251-43- 5-B
K3FR 17,596- 166-53- 5-A
W3IW 17,400- 150-58- 4-B
W3YQ 11,136- 116-48- 2-A
KB3BV 9570- 87-55 4-A
WA3ESH 8978- 67-67-14-B
N2GL/3 7566- 97-39- 4-B
K3RYA 4288- 67-32- 4-A
AF3B 3306- 57-29- 1-A
WA3PCX 2- 1- 1- 1-A
AF3P(+K3s LA LR,WA3YTA, WB3EUB) 233,692-1579-74-24-B
N3SD(+WA3YVI) 48,326- 331-73-14-A
WB3KAF(+N3ASB) 31,780- 227-70-13-B

4

Alabama

AC4X 113,220- 765-74-14-B
KO4O 107,602- 737-73-18-B
N4KG(WN4KKN,opr) 92,564- 634-73- 8-B
N4QB 71,686- 491-73-20-A
AA4TG 49,700- 350-71-20-B
WB4YSJ 35,856- 249-72-17-A
KA4EWD 29,900- 230-65-10-A
WA4MGJ 4806- 89-27- 9-A

Georgia

KB4I(K2PO,opr) 149,332-1009-74-24-A
K4BAI 100,678- 709-71-15-B
K4VFY/4 88,800- 600-74-11-A
KA4EPX 87,252- 661-66-23-B
KB4MC 82,320- 588-70-20-B
K4HAV 78,292- 529-74-23-A
WD4MYD 31,104- 243-64-12-A
KI4Y 19,698- 147-67- 8-A
WB5OJW/4 16,356- 141-58-15-A
K4KKJ 16,128- 144-56- 4-A
K4BAM 11,872- 112-53- 4-A
W4LAQ 180- 10- 9- 5-A
N4AJL(+WB4VSP) 75,460- 539-70-16-B

Kentucky

WB4OSS 195,212-1319-74-24-B
WB4PRU 118,548- 801-74-18-B
K4FU 96,940- 655-74-18-B
WB4FOT 83,664- 581-72-13-B
WA4NNG 20,090- 205-49-13-A
KA4DRT 10,856- 92-59-10-A
N4CCJ 6398- 57-57-14-A
AB4Y(+KA4CLL,KB4s PI YI, N4AOC,WA4IGS,WD4s DQF MDY) 57,960- 420-69-20-B

North Carolina

N4AA 149,332-1009-74-18-B
N4QY 130,176- 904-72-23-B
AA4NC 112,964- 763-74-13-B
WA4FFW 95,756- 647-74-15-B
WA4ZXA 63,280- 452-70- 9-B
KE4I 52,540- 355-74-11-A
N4BMG 17,360- 155-56-13-A
N4UH 12,600- 100-63- 3-B
N4BJI 9906- 127-37- 7-A
WA4HWT(+WA4APL,WB4OTP) 59,214- 417-71-19-A

Northern Florida

N4WW 188,404-1273-74-24-B
N4SA 163,836-1107-74-19-B
WB4QBB 146,520- 990-74-24-A
W3TOO/4 70,700- 505-70-11-B
W4WKQ 31,222- 233-67- 5-B
WD4ETG 26,780- 206-65- 8-A
N4MS 22,218- 161-69-10-B
KA4FYC 11,752- 113-52- 8-B
KA4HHM 9752- 106-46-13-A
WA4TUB 5644- 83-34- 5-A
K4MZK 3200- 64-25- 3-A
WD4IIO(WA3YMV,WB3FUJ, W4ILE,WB4JJH,WD4s EGR,FNX, N8AWM,oprs) 38,624- 284-68-22-A

South Carolina

WA4YUY(KØEJ,opr) 104,244- 714-73-21-A
N4DT 104,192- 704-74-18-B
WA1LJP/4 83,664- 581-72-23-A
AE4Y 76,752- 533-72-20-A
K4ADP 39,566- 271-73-16-A
WD4NNP 37,062- 261-71-16-A
KA4FOJ 14,006- 149-47-10-A

Southern Florida

N4BP 108,632- 734-74-11-B
W4OST 78,242- 551-71-16-B
WA4FIB 54,880- 392-70-22-A
W2HAE/4 23,256- 171-68- 8-A
W4MNZ 5850- 75-39- 3-B
N4AJD 5304- 68-39- 5-A
K4HYE(KA4JEF,WD4JNS'OA4CS, oprs) 87,264- 606-72-21-A

Tennessee

N4NT(WA4BTK,opr) 152,144-1028-74-24-A
K4PJ 63,492- 429-74- 6-B
KF4H 59,792- 404-74-18-A
W4EAL(WA4ZZU,opr) 43,956- 333-66-11-B
N4AVF 43,000- 300-72-13-A
WD4PEQ 29,648- 218-68-13-A
WB4WHE 27,984- 212-66- 6-A
W4OGG 14,800- 148-50- 6-A
N4BCS 10,400- 100-52- 6-A
WB1DJN/4 10,100- 101-50- 6-B
K4PR 9328- 106-44- 6-A
KA4FLP 4284- 63-34- 5-A
KE4F(+KA4LJM) 43,928- 323-68-14-A

Virginia

K3NA/4 204,980-1385-74-24-B
K4AF(WB3DNL,opr) 197,728-1336-74-24-B
W4MYA 158,360-1070-74-20-B
WA4NTP 103,600- 700-74-20-B
N4XD 95,484- 654-73-23-B
KA4EKO 79,772- 539-74-13-B
K4OD 72,224- 488-74-17-B
KB4NI 64,678- 443-73-18-A
K4PQL 56,668- 457-62-24-B
K5OGU/4 50,730- 345-73-10-B
W4YE 47,886- 347-69- 6-B
W4EI 41,076- 326-63- 7-B
W4NH 37,100- 265-70-10-A
K4PNE 35,912- 268-67-12-A
N4RV 34,320- 264-65- 4-B
WB4ZPF 22,044- 167-66-17-A
W4NW 20,640- 172-60- 5-B
K4TSU 17,892- 126-71-15-B
WD4JHY 17,604- 163-54- 7-A
AA4I 17,110- 145-59-12-A
W4WWQ 14,058- 99-71-10-A
N4CD 10,658- 73-73-13-B
W4DM 9900- 99-50- 2-B
N4AXA 6720- 84-40- 7-A
K4OAQ 5472- 76-36- 3-B
WB9NZY/4 2520- 45-28- 3-A
WD4GCE 286- 13-11- 1-A
N4DW(+WA4s OHG SCE,WB4PAT) 119,732- 809-74-22-B
WA4ZNY(+WB4WDM) 96,496- 654-74-24-B
W4UVA(K3ZM,AD4J,KQ4Y, WA4FKX,WB4DBK,WD4EIS,oprs) 74,888- 506-74-16-B

West Indies

KP4Q(K2TR,opr) 351,796-2377-74-24-B

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Arkansas

N5DX(WB9RKS,opr) 128,368- 904-71-23-A
WA5YJV(K8CC,opr) 71,336- 482-74- 6-B
WD5DJW 22,936- 188-61-13-A
AD5M(KA5FPS,N5BPT,WA5VUT, WB5s GFA RP NXK,WD5BIV,oprs) 60,624- 421-72-24-A

Louisiana

W5WMU 244,496-1652-74-24-B
W5WG 49,202- 337-73-22-A
WA4UIH/5 29,484- 234-63-11-B
N5AMA 20,400- 170-60-13-A
N5BMD 13,688- 118-58- 9-A
KB5M 11,760- 120-49- 6-A
W5XZ(+K3JT) 180,856-1222-74-23-B

Mississippi

W5VSZ 230,880-1560-74-24-B
AE5H 59,496- 402-74-13-A
WD5BOL(+KA5DTD,WBØHOZ) 54,180- 387-70-24-A

New Mexico

K5TA 241,536-1632-74-22-B
K5QQ 229,804-1574-73-24-B
W5JW 202,612-1369-74-24-B
AA5B 154,216-1042-74-21-A
WB5TXJ 39,456- 274-72-21-A
K8TE/5 7280- 91-40- 1-B
W5JOV 1134- 27-21- 2-A

Northern Texas

W5MYA 219,336-1482-74-24-B
K5QY(N5EG,opr) 201,280-1360-74-24-B
K5JA 150,234-1029-73-15-B
K5NW 149,628-1011-74-16-B
K5SR 137,240- 940-73-23-A
N5JB 130,832- 884-74-20-B
KA5Q 113,516- 767-74-15-B
N5AU 106,856- 722-74-15-B
W5LKP 86,762- 611-71-23-B
WB5MJK 77,562- 524-74-22-B
N5BET 73,982- 521-71-17-A
W9PL/5 68,018- 479-71-17-A
K5MR 64,728- 558-58- 7-B
K2SCD/5 60,384- 408-74-16-B
WB5HPG 54,432- 432-63-18-B
N5BCE 48,162- 349-69-17-A
WA5GYX 47,428- 334-71-18-A
KB5AH 43,344- 301-72-21-A
K5FUV 25,326- 201-63- 8-B
K5RQ 23,826- 209-57- 6-A
W5FO(N5JB,opr) 22,656- 192-59- 20B
N5BT 12,250- 125-49- 6-A
K5EQ 5092- 67-38- 7-A
WD5BCI 1628- 37-22- 4-A
K5RX(+K5XR,WA5RRL) 200,244-1353-74-24-B
K5OJI(+W5ONL) 123,608- 857-72-24-B
K9LA/5(+WB5TGK,WA9POT) 98,420- 665-74-24-A
K5JEF(WB3BEL,KQ4B,WD5ISA, WB6IUZ,N9BAH,WBØOLA,OPRs) 92,300- 650-71-24-B
WB5OFB(+AG5B) 87,016- 596-73-23-A
WD5BCF(+WD5BCH) 46,872- 372-63-20-B
KB5AD(+KA5CUO,KB5BD) 13,054- 107-61-18-A

Oklahoma

AD1S/5 152,144-1028-74-21-B
N5ND 112,464- 781-72-23-B
AE5Y 102,638- 703-73-19-B
KA5ALN 52,864- 448-59-10-B
WB5OSM 15,196- 181-58-14-A
WD5HBX(+WD5FRQ) 94,572- 666-71-24-A

Southern Texas

K5GA(K5ZD,opr) 235,320-1590-74-24-B
N5DU 208,236-1407-74-22-B
WB5FND(WA3OVC,opr) 173,356-1172-74-24-B
K5DX 91,316- 617-74-15-B
N5JJ 72,064- 563-64- 9-B
K5GB 66,740- 470-71-12-B
K5LZO 64,380- 448-74- 9-A
K5NU 53,724- 363-74-14-A
N5ATC 50,310- 387-65-22-A
W5RRR(W5LSZ,opr) 49,876- 337-74-19-B
AE5E 49,120- 353-70-18-A
W5YG(KB5MU,opr) 44,676- 306-73-22-A
KA5T 44,208- 307-72-21-A
WA5ABR 42,000- 300-70-14-A
W5JWM 38,036- 257-74-24-B
K5WA 37,070- 337-55- 5-B
K5FP(N5ZR,opr) 33,976- 274-62-10-B
K5LWL(K5WA,opr) 28,556- 242-59-24-B
N5BPB 24,012- 207-58-19-B
K5NA 15,912- 153-52- 3-B
K5RC 12,600- 140-45- 2-B
KA5N 12,600- 126-50-12-A
WB5QGK 9216- 96-48-11-A
N5BSW 7448- 98-38- 6-A
KD5O 7376- 89-42- 4-B
WD8DKJ/5 5120- 64-40-17-A
N5DB 4756- 66-36- 4-A
K5TU 1892- 43-22- 1-A
K3ZMI/5 144- 9- 8- 1-A
K5IY(+KA5CHW,WD5GKI) 195,360-1320-74-24-B
KB5FU(+AA5E,N5AF,KA5BUW, WD5FJL) 68,766- 471-73-23-A
WB5SZH(+WD5DXR) 26,474- 217-61-10-A
KA5CDX(+KA5GIF) 25,326- 201-63-15-A

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East Bay

N6RO 235,468-1591-74-24-B
N6KB 196,692-1342-74-23-B
K6ZM(WA6OIL,opr) 179,820-1214-74-19-B
N6NE 172,124-1163-74-24-B
K6PJY 128,316- 867-74-22-B
K6XO 125,060- 845-74-20-B
WA6BOB 108,000- 750-72-16-B
N6VV 106,708- 721-74-24-B
K6HIH 97,680- 660-74-14-B
WA6KEQ 92,204- 623-74-19-A
WB6LRV 69,580- 497-70-23-A
W6OT(K6CSL,opr) 67,536- 469-72-23-B
WB6ZEP 60,590- 415-73-21-A
WB6GPT 55,860- 399-70-24-A
N6DA 43,260- 309-70- 9-A
K5GOE/6 22,100- 170-65- 9-A
WA6JCZ 16,116- 158-51- 9-B
K6OYE(+KA6BPN,W6EEN,WA6s AVS NTG) 230,732-1559-74-24-B
W6BB(AA6UO,N6s CEI KL,oprs) 68,586- 483-71-15-B

Los Angeles

N6HC 125,122- 857-73-21-B
W6CN 96,792- 654-74-22-B
WB6RXW 54,760- 370-74-23-A
AB6J 46,512- 342-68-19-A
WA6NPA 43,188- 355-61-16-B
W6CBA 35,464- 286-62-15-A
AA6PY 24,000- 200-60- 7-B
WB6NFO 20,944- 159-68-20-A
N6BCY 16,280- 297-55-10-A
WB6WWU 12,544- 128-49- 9-A
KE6A 11,554- 109-53- 7-A
N6GL 9024- 96-47- 6-A
W6PFE 8280- 92-45- 6-A
W6NXB 8148- 97-42-17-A
WD6DMV 3306- 57-29- 5-A
WA6HQS 850- 25-17- 5-A
WA6SFM(+WA6s FSF PZL,WB6s CIA JJE) 93,388- 631-74-24-A
W6YRA(N6BGM,WB6LHO, WBØAXD,oprs) 54,400- 400-68-22-A
KA6EZX(Multiop) 29,500- 250-59-21-A

Orange

K6RR(N6IN,opr) 243,756-1647-74-24-B
KB6SD 63,000- 450-70-23-A
WD6BNG 62,480- 440-71-23-A
WA6LFF 49,984- 354-71-10-A
WD6GKS 46,224- 321-72-12-A
WD6FLV 45,258- 337-67-18-A
KA6DHM 39,360- 328-60-20-A
WA6TMY 37,520- 280-67-11-A
KB6MT 32,604- 494-66-15-A
WB6SKE 28,500- 250-57- 6-B
W6HHC 26,162- 233-57- 8-A
WA6FOW 25,488- 236-54-16-A
N6PE 18,974- 123-69- 6-A
K6WI 16,226- 133-61- 5-A
KA6CEK 13,668- 134-51-17-A
W6LEN 13,152- 137-48- 6-A
WB6IHZ 6970- 85-41- 4-B
WB6AJV 6630- 85-39- 5-A
AB6R 5776- 83-36- 4-A
W6TAG(+AJ6Q,N6BUW) 133,348- 901-74-23-B
WB6NHV(+KA6FBI,N6BFQ, WB6SHL) 104,636- 707-74-20-B
K6HRT(+N6BLH) 101,376- 704-72-21-B
WA6JBT(+KA6s DVW DVX, WA6JBR,WB6s BZM,JCC) 97,160- 694-70-24-B
WA6PMX(+W4DCO,WA6s PMY WWT,WD6YYL) 43,960- 314-70-24-A

Santa Barbara

N6TR 255,004-1723-74-24-B
WA6DJS 62,829- 437-72-16-B
WA6VNN 59,432- 437-68-20-A
WA6IJZ 56,388- 381-74-15-A
W6KPJ 22,320- 186-60- 5-A
WA6IGU 21,204- 186-57- 7-A
W6UA 16,872- 114-74-10-A
K6VMN 16,800- 150-56- 9-A
WD5JMC/6 12,838- 131-49-10-A

Santa Clara Valley

W6XR 257,224-1738-74-24-B
K6MYC(N6IG,opr) 251,748-1701-74-24-B
N6BT(WA6VEF,opr) 248,048-1681-74-24-B
K6OQ(WB6DSV,opr) 243,312-1644-74-23-B
W6XX 243,164-1643-74-24-B
N6KT 224,516-1517-74-23-B
K6HNZ 193,140-1305-74-24-B
N6MG(WA6PGB,opr) 192,696-1302-74-24-B
N6XI 186,184-1258-74-24-B
K6DC(K6KLY,opr) 167,684-1133-74-21-B
N6GJ(WA6HCI,opr) 164,576-1112-74-24-B
WB6SHD 136,656- 936-73-20-A
K6BR 135,716- 917-74-21-B
W6OWQ 127,724- 863-74-24-B
N6QW 114,552- 774-74-24-A
WA6ITV 112,184- 758-74-24-B
W6NLG 109,500- 750-73-20-B
AJ6V 108,916- 746-73-23-B
N6ST 103,896- 702-74-18-B
K6SEM 82,928- 568-73-22-A
K6OMB 78,100- 550-71-23-A
N6NF 75,168- 522-72-10-A
K6WJ 74,148- 501-74-17-B
N6AUV 67,160- 460-73-13-B
W6SXD 63,140- 451-70-18-B
K6RM 57,670- 395-73-16-A
W6OKK 52,414- 359-73-10-B
W6ISQ 44,100- 315-70- 8-B
WA6SVW 42,700- 305-70-14-B
K6VGW 42,032- 284-72-24-A
WB6DFX 39,812- 269-74-12-A
W6XB 38,726- 289-67-24-B
W6WZF 36,790- 283-65-18-A
WB6RIU 26,496- 192-69- 7-B
N6ZB 25,976- 191-68-10-A
K6PU 22,800- 190-60- 4-B
WD6EPV 21,500- 215-50- 8-B
N6TA 21,278- 479-61- 6-B
N6RY 20,400- 200-51- 5-B
WD6CHF 15,620- 142-55- 8-A
WA6BZT 14,248- 137-52- 4-A
K6ITL 11,738- 127-47- 4-B
WB6OML 10,816- 104-52- 9-A
N6TU 9240- 110-42- 4-A
K6XM 9180- 102-45- 2-B
W6IO 4312- 49-44-10-A
WB6AMN 3100- 100-31- 4-A
AA6G(+N6TV) 216,376-1462-74-24-B
N6RZ(+WA6OCV) 211,344-1428-74-22-B
W6YX(K1JH,N7MH,W8ZI, WAØJRB,oprs) 202,908-1371-74-24-B
K6RU(+W1ARR) 179,228-1235-74-24-B
K6YA(AA6PZ,AG6D,K6MA, WA6LIJ,W8RPA,oprs) 143,708- 971-74-22-B
KA6R(+KA6AFK) 18,590- 169-55-13-A

San Diego

N6ND 216,124-1462-74-24-B
N6CDA 132,312- 894-74-17-B
W7KHN/6 121,212- 819-74-24-A
K2UVG/6 94,572- 639-74-19-A
K6GC 55,152- 383-72-12-B
WA6UFY 16,800- 150-56- 8-B
AA6EE 7832- 89-44- 5-A
W6KBD 1800- 36-25- 5-A

San Francisco

N6BV 236,800-1600-74-24-B
K7SV/6 136,160- 920-74-23-B
N6QC 45,220- 323-70-15-A
WB6FCR 25,172- 217-58- 8-B
K6LRN 23,270- 179-65- 6-A
N6KL 16,302- 143-57- 7-A
WA8LLY/6 3120- 52-30- 9-A
W6BIP(+AA6GM,WA6PYN) 128,020- 865-74-21-B
N6IP(+WA6RNF,WB6NBR) 93,440- 640-73-21-B

San Joaquin Valley

WB6ION 219,632-1484-74-24-B
AI6V 216,820-1465-74-22-B
N6PR 53,108- 374-71-18-A
K6AO 45,140- 305-74-15-B

W6DPD 37,520- 268-70-11-B
WB6KHR 21,504- 168-64-14-A
K6TG 15,048- 132-57-10-A
WA6YAB 7600- 100-38- 7-A

Sacramento Valley

AA6DX 229,844-1552-74-24-B
K6RLY 176,416-1192-74-22-B
K6SG 114,996- 777-74-21-B
WB6RDA 80,068- 541-74-15-A
WA6FYP 37,488- 284-66-20-A
N6JM 18,910- 155-61- 6-B
WA6BRV 13,176- 122-54- 4-A
W6QEU 10,952- 74-74-16-B
KB6JM 8424- 78-54- 8-A
WA6SIM 16- 4- 4- 7-A
WA6SUV 12- 4- 3- 2-A
WB6ULK 6- 3- 2- 2-A
WB6NQJ(WA1VGK,KA6s FNX FTY,KB6NF,WA6s ASI SIM SUV, WB6s VLK VVM WBN YOG, WD6s GHG GHI,AD7M,AF7I, W7KJU,oprs)
53,176- 391-68-24-A
W6NJU(+KA6HWH)
32,154- 233-69-14-A

Pacific

K7SS/KH6 285,048-1917-74-24-B
WH6ACQ 10,848- 113-48-12-B

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Arizona

K6LL/7 227,032-1534-74-24-B
W7KW(W6TPH,opr)
217,856-1472-74-24-B
N7US 170,644-1153-74-24-A
W7UV 161,912-1094-74-24-A
W7ZMD 78,894- 539-73-17-B
K7JVR 21,204- 171-62- 6-A
W7GZY 15,680- 140-56-14-A
K1TU 14,700- 150-49- 6-A
K7HP 7696- 104-74-18-A
K7RUF(KA7s BFZ FJS,WB7PRG, oprs) 34,800- 300-58-24-B

Idaho

K7LR 247,456-1672-74-20-B
WB7CY 101,178- 693-73-20-A
K9SB/7 81,501- 566-72-22-B
N7AOS 77,928- 573-68-19-A
K7JV 44,928- 312-72-12-A
WB7TJI 21,476- 182-59-12-B
W7KXA 1840- 40-23- 2-A
W7LQT(+WB7WBZ)
158,508-1071-74-24-B

Montana

W7JYW 191,364-1293-74-23-B
K7PGL 189,072-1313-72-21-B
W7TYN 185,592-1254-74-24-B
WA7KPK 61,260- 414-74-21-A
KA1EA/7 4420- 65-34- 3-A
W7FO(K7s JM KCR RRS,N7s AFS AFT,W7ROE,EA7s FBN LSF MUU PZO YSH,WB7s PUE PKY UKK, oprs) 126,688- 856-74-24-B

Nevada

WA7NIN 318,792-2154,74-24-B
W7DIA 80,512- 544-74-20-A
W7YKN 37,380- 267-70-11-B
W7VVH 33,120- 240-69-17-B

Oregon

W7NI 237,984-1608-74-24-B
AG7M 223,184-1508-74-24-B
W7XN 180,264-1218-74-19-A
W7JZV 114,700- 775-74-21-B
W7YAQ 74,460- 510-73-18-A
WB6ERG/7 66,220- 473-70-18-A
WB7MLJ 51,830- 365-71-21-A
K7EAU 44,472- 327-68-21-A
K7GDN 42,612- 318-67-13-A
W7TWL 42,210- 315-67-17-A
WB7RKT 41,208- 303-68-20-A
W7GUR 33,232- 254-67- 9-B
K7WT 10,200- 100-51- 7-B
W7LT 9598- 102-47- 9-A
WB7UFJ 144- 9- 8- 1-A
W7ZR(+N4BQS)
230,732-1559-74-24-B

Utah

N7DF 234,136-1582-74-24-B
KB7EB 173,308-1171-74-20-B
W7GXC 66,138- 453-73-14-A
N7SM 38,316- 309-62-10-A
KB7EC(+KB7JI,WB7VCI)
128,918- 883-73-22-B

Washington

K7RI 282,236-1907-74-24-B
W7RM(W7WA,opr)
267,288-1806-74-24-B
N7ZZ 243,162-1643-74-24-B
W7BUN 222,296-1502-74-24-B
WA7PVE 108,186- 741-73-22-A
W7LRD 105,266- 721-73-21-A
AJ7V 103,748- 701-74-21-B
N7ACL 73,556- 518-71-16-A
N7AM 66,748- 451-74-20-B
WA7OII 44,640- 360-62-12-B
WB7BNP 28,560- 210-68-24-A
N7DX 23,760- 198-60- 6-A
W7LKG 20,880- 180-58-10-B
WB7OXA 16,830- 153-55-10-A
N7ABA 11,176- 127-44- 8-A
KA7BAY 9800- 100-49- 9-A
W7ERH 8600- 100-43- 6-A
W7HX 7560- 84-45- 2-B
K7RS 6106- 71-43- 5-B
W7DOQ 2600- 50-26- 6-A
WB7PSP 2- 1- 1- 1-A
K7IR(+KA7s DFQ EJK EXC)
WB7SDP) 148,608-1032-72-24-A
WA7IUL(+WA7s GWX LNH)
136,072- 932-73-23-A
K7FR(+K7LXC)
122,396- 827-74-24-A
K7IM(+K7WA)
103,368- 708-73-18-A
WA7RWK(+K7XK,WA7IVO)
75,332- 509-74-17-A
N7RV(+WA7LVN)
62,300- 445-70-13-B
WD5CPK/7(+WB7VNJ)
49,714- 371-67-19-A

Wyoming

K9DR/7 149,332-1009-74-17-B
N7BDH 91,524- 789-58-20-A
WA0LJN/7 45,260- 310-73-24-A

Alaska

AL7AF 158,264-1084-73-23-B

KL7D 142,376- 962-74-19-B
KL7IVX 142,376- 962-74-22-A
KL7JFY 53,130- 385-69-10-B
KL7CQ 40,698- 323-63-13-B
KL7IYN 8184- 93-44- 7-A

8

Michigan

K8LX(WA8ZDT,opr)
212,528-1436-74-24-B
WB9DZS/8 173,012-1169-74-24-B
K8MJZ 169,756-1147-74-24-B
K8SMC 165,612-1119-74-24-B
AI8D 164,012-1123-73-23-B
AC8Y 153,180-1035-74-24-B
W8MNL 126,864- 881-72-23-B
K8DD 105,968- 716-74-20-B
W8JWN 104,932- 709-74-24-A
WA8OWG 101,972- 689-74-20-B
WD8MGQ 101,324- 694-73-24-A
K8SIA 95,338- 653-73-19-B
K8OT 89,984- 608-74-23-B
W8LAQ 89,886- 633-71-15-A
N8AGY 81,844- 553-74-23-A
WD8BWN 81,548- 551-74-19-B
K8SS 74,888- 506-74-11-B
K8GSR 71,928- 486-74-21-B
N8AW 60,776- 428-71- 9-B
W8AP 60,236- 407-74-19-B
K8BP 58,032- 403-72-19-A
AK8B 56,012- 418-67- 9-B
K8YRO 54,432- 378-72-24-A
N8LA 53,392- 381-71-21-A
N8BCD 52,272- 363-72-19-A
WA8MJY 50,954- 349-73-16-A
W8VPC 46,632- 348-67-13-B
AF8D 44,446- 313-71-13-B
WD8JFE 43,884- 318-69-10-B
KB8HP 43,508- 298-73-13-A
W8JKU 39,220- 265-74-19-B
W3GQJ/8 38,640- 276-70-14-A
WB8UKR 37,240- 266-70-13-A
WB8PLO 36,040- 265-68-13-A
WA8ZTQ 33,740- 241-70-13-B
WB8AAX 33,048- 243-68-12-A
W8TJQ 32,620- 233-70-12-A
WB8NQE 32,060- 229-70-15-B
WD8PRM 31,590- 243-65-21-A
WB8UKU 30,856- 266-58-14-A
K8KM 30,736- 226-68-11-B
WB8SBI 30,000- 250-60-10-B
K8BIO 28,684- 202-71-15-A
K8EMQ 27,608- 203-68-14-A
N8AWD 22,440- 204-55-20-B
WA8QAF 22,400- 175-64- 5-A
WD8JEM 21,700- 155-70-11-A
WA8TAQ/8 20,298- 199-51- 6-A
W8ETH 19,372- 167-58-10-B
K8SAK 18,792- 174-54-10-A
WD8KZX 18,422- 151-61- 9-A
WD8DMX 17,516- 151-58- 3-A
W8CNL 17,316- 117-74-12-B
WD8ECT 16,632- 154-54- 6-A
WD8RIN 15,080- 145-52- 7-B
W8MSK 14,896- 133-56- 6-A
N8AOE 14,000- 125-56- 9-A
W8SS 13,750- 125-55- 7-B
K8GK 12,032- 128-47- 4-A
W8EGI 9400- 100-47- 4-A
WB8LWS 4350- 75-29- 5-A
W8JUP 3906- 63-31- 4-A
K8RDJ 3402- 63-27- 3-A
W8TIC 2800- 50-28- 5-A
K8TU 2700- 50-27- 2-B
WB2LZN/8 1038- 23-23- 2-A
W8IZS 840- 30-14- 3-A
W8UM(K8LF,KB8EQ,WB8YVI, AG9V,oprs) 144,448- 976-74-24-B
WA8FRE(+W8MPD,WD8CSA)
125,652- 849-74-23-B
WB8JYX(+WA8QPN,WB8MDG)
111,296- 752-74-24-B
AJ8C(+AI8U,AJ8Z,WD8JSQ)
103,748- 701-74-24-B
WB8NDP(+WB8s POK VYN,WD8s JNQ KBX) 71,780- 485-74-24-B
AI8F(+WD8PIB)
62,050- 425-73-20-A
AA8N(+KB8JN)
61,912- 436-71-20-B
KA8BCL(+N8ALL)
59,080- 422-70-18-B
W8MRM(+WB8RNY)
48,880- 376-65-13-B
W8GBR(+KA8CVE)
43,736- 308-71-20-A
N8BHT(+KA8DGE)
41,538- 301-69-17-A
WB8UHS(+WB8WIM)
34,506- 243-71-21-A
WD8PGQ (+KB8s IS LP)
31,624- 236-67-22-A
WD8JEQ(+KA8s BWL HAH)
24,400- 200-61-15-A
WB8LZA(+WB8LYY)
11,200- 112-50- 4-A
WA8LAY(+WD8NQG)
9120- 144-40- 6-A

Ohio

WB8MZZ 202,464-1368-74-24-B
K8MN 190,300-1285-74-24-B
AC8E 184,260-1245-74-24-B
WD8ALG 129,500- 875-74-22-B
K8MR 121,360- 820-74-13-B
W8UPH 96,944- 653-74-24-B
K8EE 90,132- 609-74-23-A
WB8VPA 84,064- 568-74-22-A
K8FU 81,322- 557-73-12-B
K8BL 77,700- 525-74-18-A
WA6EZV/8 59,422- 407-73-18-A
WA6LOW 54,864- 381-72-19-A
N8AID 54,400- 400-68-13-A
AA8S 53,436- 366-73-17-A
N8FU 52,096- 352-74-10-A
WB8NBY 49,848- 372-67-17-B
KA8CQI 45,014- 317-71-24-A
N8BJQ 44,520- 318-70-17-B
W8IDM 44,100- 315-70-17-B
KA8AAZ 43,594- 307-71-17-A
N8BKX 43,488- 302-72-22-A
WD8OTO 42,180- 285-74-19-A
N8LM 40,044- 282-71-10-B
WA8ADA 39,920- 304-65-20-B
W8VQI 38,284- 282-68-13-A
N8AHK 37,940- 271-70-18-A
WB8LZR 34,220- 290-59-19-A
W8DXT 32,736- 264-62-21-B
WB8HQN 32,480- 232-69-16-B
W8EQG 30,056- 221-68-16-A
WD8AYE 26,928- 198-68-11-B
W8IMF 27,560- 182-60- 9-B
N8BKB 21,888- 171-64-10-A
N8BHB 19,824- 177-56- 9-A
KA8D 19,030- 173-55- 7-A
WB8RTJ 17,920- 140-64-11-A
W8FN 14,946- 141-53- 3-A
WD8QAC 13,254- 141-47-12-A
N8AKF 10,952- 74-74- 6-B
W8TK 8600- 100-43- 2-B
AD8P 6000- 75-40- 2-A
K8US 2444- 47-26- 1-A
K8RSH 1428- 34-21- 3-A

K8HLJ 1080- 30-18- 2-A
W8AEI 374- 17-11- 2-B
K8UFW 330- 15-11- 2-A
W8XT 128- 8- 8- 1-A
WB8JBM(N8CQ,WB8s DQP JMP, L5N YQJ,oprs)
200,096-1352-74-24-B
K8ND(+AD8I,K8s EM NU, WB8VLR) 196,544-1328-74-24-B
WD8OYO(+N8AUH,WD8PMW)
65,386- 455-72-21-B
W8FW(N8s BCM BCX,WD8AMV, oprs) 55,428- 408-68-19-B
W8UPD(AG8N,WD8s DTG QWD, oprs) 45,960- 383-60- 9-B
KA8Y(+WD8MHJ)
35,712- 248-72-15-A
WD8GBL(+K8BST,KA8DRR,WD8s KVX NTB) 26,000- 200-65- 9-B
WD8JAW(+WD8JAM)
6278- 73-43- 8-A

West Virginia

N8II 193,140-1305-74-24-B
K8BS 67,932- 459-74-18-A
KB8FJ 65,992- 452-73-16-A
W8UT 16,530- 145-57- 5-A
WB8WEZ 6006- 79-39- 9-A
WA8DGE 1680- 35-24- 6-A
AD8J(+KB3HQ,WB8PHU)
162,144-1126-72-24-B

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Illinois

K9RK(K9GL,opr)
195,508-1321-74-24-B
K9BGL 174,196-1177-74-24-B
K9RS 148,740-1005-74-20-B
K9HDE 148,296-1002-74-24-B
K4VUD/9 146,292-1002-73-22-B
WD9IIX 138,972- 939-74-24-B
WB9TIY 136,308- 921-74-22-B
K9CC 136,012- 919-74-24-B
K9ZO 126,100- 825-74-24-A
W9UVM 116,946- 801-73-23-B
AG9A 105,968- 716-74-23-A
AJ9B 96,200- 650-74-24-B
N9GB 96,200- 650-74-24-B
K9LLW 91,020- 615-74-24-B
WA9VKN 87,764- 593-74-16-B
N9AGC 79,476- 537-74-16-A
WB9JFO 76,220- 515-74-17-A
K8KIX/9 72,520- 490-74-23-A
K9BG 57,084- 426-67-10-B
W9OFV 56,516- 398-71-12-B
KB9AW 50,764- 343-74-18-A
N9AKE 50,552- 356-71-11-B
WD9FVE 50,400- 350-72-23-A
W9RW 49,136- 332-74- 6-B
WB9SFT 47,570- 335-71-21-A
WD9OCL 45,640- 326-70- 7-B
N9AQT 45,540- 330-69- 9-A
N9UN 44,400- 300-74-11-A
WD9DDW 44,160- 320-69-16-A
WD9JDR 42,192- 293-72-17-B
W9GH 39,984- 294-68-18-B
K9AR 37,674- 273-69-11-B
N9AHY 34,816- 256-68-19-A
WD9GGY 34,706- 259-67-12-A
WD9IQV 34,704- 241-72-14-A
N9LE 30,360- 220-69- 8-A
WD9DBD 29,512- 217-68-10-A
AD9K 27,776- 224-62-17-A
KA9ALR 27,604- 206-67-12-A
K9VV 22,554- 179-63- 6-A
W9USS 22,176- 168-66-17-A
WD9FVP 20,184- 174-58-11-A
WB9VLM 19,980- 185-54- 5-A
WD9FJF 19,520- 160-61-10-A
W9REC 16,900- 130-65-15-A
KA9BRC 13,824- 128-54-14-A
K9JK 10,878- 111-49- 6-A
WD9CMB 10,148- 118-43- 6-A
W9CA 10,074- 73-69- 5-A
WD9DBC 9072- 84-54- 6-A
K9KNV 8064- 96-42- 9-A
W9VTL 7708- 94-41- 9-A
WA9ZZG 4816- 86-28-11-A
W8XU/9 2800- 50-28- 2-A
W9HPG 2500- 50-25- 3-A
WB9BIO 2400- 50-24- 4-B
KB9IW 2300- 50-23- 4-A
WB9LEF 1320- 30-22- 3-A
N9AIB 1008- 24-21- 2-A
W9TM(+K9NO)
169,214-1159-73-24-B
AA9D(+WD9EBQ)
137,824- 944-73-24-B
K9YUG(+KB9A,N9BBU,WB9s UCW WUW,WN9GEV)
120,176- 812-74-23-B
WA0AVL/9(+KA9FUJ,N9APM, WB9AGY 108,632- 734-74-23-B
KA9DAG(+KA9s DWB ERW)
42,600- 300-71-20-A
WD9HBA(+WD9GUF)
20,988- 198-53- 4-A
WD9ISG(multiop)
15,950- 140-57-11-A
KA9DIL(+WA9TKK)
11,872- 112-53- 9-A

Indiana

W9RE 226,884-1533-74-24-B
W9OBF 192,400-1300-74-24-B
N9JG 130,816- 896-73-24-B
K9KLR 120,472- 814-74-22-B
N9QX 113,812- 769-74-24-B
N9RC 105,266- 721-73-14-B
WD9GSO 59,904- 416-73-16-A
N9AFU 55,008- 382-72-21-A
K9IU(W3EP,opr)
54,720- 380-72-12-A
K9FW 52,716- 382-69- 6-B
KA9FUS 49,248- 342-72-16-A
W9HCK 40,256- 272-74-15-B
WD9FMS 38,016- 288-66-24-A
WD9IUZ 35,632- 262-68-20-B
WA9SUS 29,768- 244-61-10-A
KA9FKU 29,358- 233-63-17-A
WB9UKE 20,956- 169-62- 5-A
W9QLW 19,470- 165-59- 9-B
WB9IWN 14,112- 147-48- 4-A
N9CR 13,566- 119-57- 6-A
K9KB 11,960- 115-52- 4-A
W9UFM 7832- 89-44- 3-B
WB9VJE 4260- 71-30- 4-B
K1TH 3128- 68-23- 5-A
K9SBW 3036- 46-33- 5-A
WB9FNR 2080- 40-26- 4-A
WB9QOH/9 1848- 42-22- 4-A
KA9BJT 1518- 33-23- 3-A
W9LJ/9(KA9s DDH DEV,KB9s FU GR,WD9s ETM EZB HXO HXN, EWN EWU HLS FMV FQT, K9KIO,N9AJT,W9s CUR JEX, WB9QMQ,oprs)
68,256- 474-72-24-A

Wisconsin

AC9C 185,296-1252-74-24-B

N9AW 131,572- 889-74-23-B
N9KS 114,480- 775-72-20-B
W9GHY 82,782- 567-73-16-B
N9AU 79,132- 542-73-16-B
K9EYA 78,110- 535-73-16-A
K9WTF 73,408- 496-74-18-B
K9KR 73,112- 494-74-18-B
W9FBC 66,866- 499-67-12-B
WB9VOZ 66,452- 449-74-23-A
K9EE 63,364- 434-73-21-A
W9NA 58,320- 405-72- 8-B
N9NE 51,100- 340-73-11-B
WB9BSO 45,936- 319-72-15-A
W9GKJ 45,360- 324-70-13-A
WB9PCQ 44,100- 350-63- 8-B
K9QET 35,778- 267-67-14-B
WA9BZW 35,510- 265-67-14-B
AB9L 33,265- 252-66-12-A
WB9SVN 32,944- 232-71-17-A
WB9YLR 32,368- 238-68-12-A
KB9DZ 28,810- 215-67-17-A
WA9AKV 27,060- 205-66-12-B
WB9EJE 26,250- 202-65-10-A
W9GDF 25,870- 199-65- 3-B
WB9ECM 23,392- 172-68-15-A
W9HE 22,968- 174-66- 6-A
KB9CT 22,016- 172-64- 7-A
KA9AKH 21,756- 184-58- 9-A
N9HR 20,160- 160-63- 8-A
WB9GZP 19,680- 164-60-10-B
KA9BJO 18,824- 181-52- 8-A
WD9IKO 18,600- 150-62-10-A
N9AGE 18,300- 150-61- 8-A
K9JIG 17,172- 162-53-14-A
W9FPA 15,846- 139-57- 6-A
WD9EFJ 15,496- 149-52-13-A
W9GIL 14,800- 100-74-24-A
WB9SVO 14,364- 133-54- 7-A
W9WH 12,960- 120-54- 6-A
WD9GJY 12,688- 122-52- 7-A
WA9WYF 10,260- 114-45- 5-A
W9FJE 9800- 100-49- 8-A
W9YCV 9200- 100-46- 5-A
WA9POV 6240- 78-40-10-A
WD9ETA 5180- 70-37- 8-A
WD9GJX 4288- 67-32- 3-B
KA9CEK 1840- 40-23- 3-A
WD9ESX 840- 28-15- 4-A
AJ9K 200- 10-10- 1-A
W9CUS/9(+KA9DHM,N9OO, WB9s JTZ PCM PCQ)
47,232- 328-72-24-A
WB9BWP(+KA9DNL)
3828- 58-33- 5-A

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Colorado

KØRF(KØGU,opr)
288,304-1948-74-24-B
KØUK 250,264-1693-74-24-B
WØYK 236,504-1598-74-24-B
WØCP 227,920-1540-74-24-B
KØEU 163,984-1108-74-24-A
WØUA(WBØIWL,opr)
157,472-1064-74-24-A
NØCP 155,844-1053-74-24-A
AI4M/Ø 98,328- 723-68-21-A
ADØQ 90,666- 621-73-24-A
AGØL 83,512- 572-73-17-A
WDØGXR 78,624- 546-72-21-A
ACØS 75,396- 618-61-10-B
WB8DAC/Ø 43,508- 298-73-24-A
NØDV 27,694- 227-61- 6-A
NØAJM 21,344- 184-58-11-A
KØHOA 19,872- 184-54-11-B
NØSLH/Ø 18,260- 166-55- 6-A
WØKFX 11,440- 110-52-10-A
WØDSW 1584- 36-22- 2-A
WØQEY(WB6JHJ,AKØR,WØCDY, WBØZCI,WDØGCK,oprs)
114,048- 792-72-24-B
KAØCPM(+KAØs DGT DGU DGV)
23,760- 198-60-20-B

Iowa

WAØVKF 147,460-1010-73-20-B
KØAL 146,964- 992-74-23-B
KØJGH 98,842- 677-73-23-A
WDØFGY 63,364- 434-73-18-A
WB9MQK/Ø 55,358- 386-73-17-A
WØPPF 44,240- 316-70-21-B
NØAFL 35,052- 254-69-10-A
WØNMU 28,700- 205-70-11-A
WDØCMT 28,600- 220-65-20-B
WBØMLF 21,228- 174-61-11-A
AKØM 18,644- 158-59- 6-A
WBØCSG 16,506- 131-58- 9-A
KAØD 12,500- 125-50-20-A
WØIO(WA1MKE,AJØV,WBØs CHP TJD,WDØFSW,oprs)
74,266- 523-71-24-B
KØPCG(+KAØFRW)
41,208- 303-68-20-A
WBØOKP(+KAØs EGL EGO)
32,768- 256-64-19-B

Kansas

K5JZN/Ø 222,592-1504-74-24-B
WBØISW 134,028- 918-73-24-A
KAØBCW 70,104- 508-69-14-B
WDØHAP 57,352- 428-67-16-B
WBØDOX 57,024- 396-72-18-A
WDØBRX 42,746- 319-67-23-A
NØARB 35,280- 252-70-13-A
KØVBU 28,438- 241-59- 5-A
NØAMB 27,540- 270-51-14-B
WØMYM 9844- 107-46-10-A
KØSBV 9248- 68-68- 5-B
WBØTOM 5180- 74-35- 4-A
KØYBV 600- 20-15- 2-A
ABØS(+KØWA)
224,960-1520-74-24-B

Minnesota

KØKX 243,162-1643-74-23-B
KØJJL 171,088-1156-74-22-B
KØFRP 153,476-1037-74-22-A
WAØLKL 126,874- 869-73-24-A
KØILI 114,318- 783-73-21-B
WØUC 112,332- 759-74-23-A
KØFZG 108,336- 732-74-24-A
ACØN 92,056- 622-74-24-A
KØMPH 63,560- 454-70-11-A
WA2HFI/Ø 60,760- 434-70-18-A
WDØCNQ 60,192- 418-72-18-A
KØBR 51,504- 348-74-16-A
WAØVHX 45,140- 305-74- 9-A
NØADJ 43,032- 326-66-12-A
WBØDHS 41,072- 302-68-11-A
WBØSXH 32,760- 260-63-20-A
WDØBMM 24,000- 200-60-10-B
WAØWWW 20,584- 166-62- 9-A
WAØDCQ 20,448- 144-71-14-B
WØHW 14,416- 136-53- 4-B
NØACN 12,728- 86-74-13-A
WDØEFR 12,446- 127-49-13-A
KØVW 8400- 100-42- 4-A
WØMN 4788- 63-38- 4-A
KAØC 420- 15-14- 1-A
NØBG(+KØTG,WAØRBW)
165,612-1119-74-24-B

KØTK(+KØFVF,WBØGDB)
124,538- 853-73-24-B
KØLTC(WDØMHH,KØGRA,WØUBT WBØs FBN GPR HRX SNG SNH SNP,WDØFVH,oprs)
124,172- 839-74-24-B
WBØYUC(+WDØFOF)
97,344- 676-72-21-B
WAØVQR(+WBØs IHR VPK)
286- 13-11- 1-A

Missouri

WBØTCQ 178,784-1208-74-24-B
KØVUW(KØFU,opr)
156,584-1058-74-24-B
KØRWL 150,888-1028-73-23-B
NØRJ 139,120- 940-74-20-B
NØSS 117,360- 815-72-12-B
KØDEQ 86,580- 585-74-15-B
AGØQ 84,360- 570-74-24-A
WBØOGV 82,584- 558-74-19-A
WBØLFY 80,208- 557-72-19-A
WØVE 78,588- 531-74-20-B
KAØDGC 75,504- 511-72-24-B
WBØVHN 70,848- 492-72-23-A
KØFA 58,646- 413-71- 9-B
WDØCPS 53,280- 360-74-14-A
WBØMYQ 46,494- 347-67-18-A
WBØVPF 33,864- 249-68-22-A
WBØRNG 32,560- 220-74-12-A
WBØTPK 31,416- 231-68-17-A
WDØBBN 27,324- 207-66-11-B
WBØMTU 24,400- 188-65- 9-B
NØAOP 22,620- 174-65-17-A
WBØYFV 17,892- 142-63-13-B
WDØFDK 13,452- 114-59- 9-A
WBØTPP 11,074- 113-49- 8-B
WDØHRB 9400- 100-47- 8-A
WBØATD 9256- 89-52- 4-B
WBØOMC 7050- 75-47- 6-A
WDØDBM 3038- 49-31- 3-A
WAØITU 2400- 50-24- 2-B
WDØCHZ 672- 21-16- 3-B
WØEEE(NØARN,WBØs LTD QLU SND UGX,WDØCNX,oprs)
155,548-1051-74-24-B
WAØQWW(WB5VMZ,WBØSPT, oprs) 55,508- 379-71-22-A
NØALC(+WDØs ATR AUT)
51,198- 371-69-21-B
KØAZV(KAØCDG,WAØOIS WDØFNP,oprs)
40,434- 293-69-17-A

Nebraska

KØSCM 213,416-1441-74-24-B
KØJBL 137,008- 957-72-18-B
WAØJCE 76,680- 540-71-13-B
WBØSYV 47,570- 355-67-15-A
WØKK 22,968- 174-66-14-A
KØDG(KØs PQR TVO NØs AON AZF,WBØAUM,WDØs DLN,GIL, oprs) 173,900-1175-74-24-B
KØNB(+KØDI)
167,024-1144-73-24-B

North Dakota

AEØE 196,248-1326-74-24-B
WDØECS 109,056- 769-71-22-A
WDØDAM 60,384- 408-74-21-A
WØSAI(+KØTS,KAØCRO,NØAVB, WAØs FCX GWY,WBØMBD)
201,280-1360-74-24-B
WDØHFV(+WA6IUZ,WBØs HAH VUJ,WDØHTF)
122,692- 829-74-23-B
WØRIB(+WDØATI)
105,280- 752-70-17-A
WØHSC(NØBHR,WDØs AJS HTX, oprs) 18,810- 165-57- 9-A
WØMXW/Ø(KAØCSE,KØSE,oprs)
15,950- 145-55-15-A

South Dakota

NØSD 141,832- 959-74-21-B
WBØMWJ 110,408- 746-74-18-B
WAØARZ 99,792- 693-72-24-A
WAØARS 96,360- 660-73-15-A
WØWUU 12,096- 108-56- 7-A

VE

Maritime - Newfoundland

VO1AA(K6ZH,opr)
89,838- 651-69-15-A
VO1AW 31,920- 228-70-14-B
VE1AGE 13,520- 130-52-11-B

Ontario

VE3ECP(VE3BXY,opr)
122,100- 825-74-24-B
VE3DOP 98,716- 667-74-21-B
VE3GD 75,638- 511-74-18-A
VE3AOD 71,102- 487-73-24-A
VE3FSV 53,676- 378-71-21-A
VE3JTP 39,618- 279-71-14-A
VE3KYP 23,100- 175-66-20-A
VE3GLD 18,720- 144-59-14-A
VE3KLW 11,100- 75-74- 9-A
VE3ECH 10,368- 108-48- 9-A
VE3JTQ 260- 13-10- 1-A

Manitoba

VE4RM 241,684-1633-74-23-B
VE4VV 117,238- 803-73-10-B

Saskatchewan

VE5DX 288,896-1952-74-24-B
VE5ACS 94,336- 737-64-17-A
VE5BBD 60,060- 429-70-16-A

Alberta

VE6ATT 56,832- 384-74-14-A
VE6CGY 41,602- 341-61- 6-A

British Columbia

VE7CC 278,832-1884-74-24-B
VE7WJ(W7EJ,opr)
229,548-1551-74-22-B
VE7AQF 161,914-1109-73-24-B
VE7AJP 127,280- 860-74-22-B

Check Logs

CW - W1FS,W1PWK,KA2EAY, W3EYF,K3SWZ,K4JEX, WD4LOO,WD4SKH,K7HP, WA7KPK,W8TFZ,K8TI, WB8ZFB,WD9DEU

Phone - WA1DER,W1UI,WB2MCB, N4AIG/3,N4CBR,W4YSJ,W5AC, K6MP,AE7K,K8ZE

Disqualifications: CW- AG7M

Phone - WD4IXD,K4XU,VE7SZ

Public Service

Conducted By Robert J. Halprin,* K1XA

Net Managers — Air Traffic Controllers

A net manager is a net manager is a Net Manager. Whoa, run that one by again. How does a lower-case net manager become an upper-case Net Manager? By the official recognition of the Section Communications Manager, of course.

Accomplishing this sounds relatively simple, and most often it is. But sometimes it is a source of irritation that degenerates into a full-fledged hassle. Let's review the ideal situation with a short history lesson thrown in for free.

There have been net managers ever since there have been nets. This leadership position usually exists in all nets whether they be independent, affiliated with the National Traffic System (NTS), ARES, RACES, or just for tagchewing. The irritation occurs when a net wishes to be an NTS net but fails to fulfill the responsibility that affiliation entails.

Historically, the appointments of Route Manager and Phone Activities Manager were conferred on those who managed the section NTS activities on cw and phone, respectively. In effect they were net managers. This oftentimes resulted in the local 2-meter fm net manager cast in a somewhat inferior status. To alleviate this condition, the appointment structure was significantly modernized in 1978 with the creation of the Net Manager appointment. Note the use of capital NM.

This had the desired affect of properly recognizing *all* the leadership people in the Section who function in a net management role, whether it be 2-meter fm, 75-meter ssb or 80-meter cw. This also erased the distinction between phone and cw. To coordinate the overall section liaison, the post of Section Traffic Manager was also created.

This produced a tidy package with a logical chain of command similar to the emergency branch of the section hierarchy. However, effective results still hinged upon people relationships. The potential vexation occurs in the appointment of Net Manager (caps) by the SCM. The historical role that phone operation has played in the development of NTS is important to an understanding of the grief sometimes experienced in conferring the Net Manager appointment.

In 1949, George Hart, W1NJM, unveiled the National Traffic System before a traffic community experiencing the demise of the then United Trunk Lines. UTL was a cw iron-man approach to traffic handling that had been most effective in its day. It continued on for a few more years after the implementation of the ARRL-sponsored NTS, but the death knell had been sounded. The sequential schedule of NTS nets and schedules at different levels attracted those interested in disciplined traffic handling. It relied upon the masses to function. The "Dr. Glooms" of the late '40s forecast that the many operators to fill all the slots could not be found. But they were. The leaders came from the Trunk Lines, but the day-to-day operators came from the recruits who were lured by this systemized method of traffic handling. The cw-oriented NTS grew and prospered, for it was the only game in town.

Meanwhile, net operations on phone followed diverse avenues. More independent nets sprung up than meadow muffins in a cow field. A few section-level phone nets embraced the NTS concept . . . But then they encouraged out-of-section check-ins, sent their traffic in an undisciplined manner, met infrequently, didn't liaise with the region net, conducted "informals" while legitimate traffic withered on the vine and elected a net manager not sanctioned by the SCM. And when the SCM stepped in with the good book in hand, all Hades would break loose. At the region level, a few feeble efforts were made to conduct phone sessions, but they all ended in failure. No wonder many an NTS operator was heard to proudly proclaim: "And I don't even *own* a microphone!"

After a quarter century of this cw/phone dichotomy, NTS made its official appearance on the daytime scene — primarily on phone. Traffic could now be moved coast-to-coast in the same day. Retired phone operators could be utilized. Housewives and second- and third-shift workers could contribute.

The precepts under which NTS was founded apply equally to the newer daytime cycle — a disciplined sequence of nets and out-of-net schedules managed by those who have the overall foresight to see the objectives of the *entire* system, and who will sacrifice their own personal convenience for the good of the system and the public we serve. The daytime cycle has survived a truly remarkable evolution, from the Continental Traffic Net concept of exchanging all regional traffic on a single net, to the growing mirrorlike image of the evening cycle of today. This maturation has not occurred without growing pains. But each metamorphosis has always produced a heartier stock.

NTS now stands on the brink of implementing a truly unified single system — a system that operates primarily on phone in the daytime, and cw in the evening, with official liaison between the two for effective traffic flow; a unified system of sequential nets that properly dovetail and is easily reproducible every three hours during times of emergency. Thus NTS will answer its critics who have decried its inability to respond adequately during times of dire need.

The key person is still the net manager. The SCM and STM are responsible for the nets within their jurisdiction, following the guidelines of NTS. Short-ranged provincial views cannot prevail. The NTS affiliated net at the section or local level must meet certain criteria to qualify for System status. It must maintain proper liaison, meet at certain times (usually with considerable leeway), conduct disciplined sessions, and generally discourage out-of-section check-ins. And the manager of the net is committed to the program headed up by the elected SCM. There is an inherent allegiance to the Section policies as administered by the elected SCM, upon acceptance of the Net Manager post. That's where some see a thorn.

For instance, the net wants to elect its own manager. Nothing wrong with that. That is often the case. But to be a Net Manager (upper case), the net manager must be on the SCM's ballteam. The Yankees cannot decide to play the Dodgers in the middle of the season because they feel like it, if the Orioles are the scheduled opposition. For the net that operates according to NTS principles this presents no problem. With proper rapport and understanding of the System, conferring the NM appointment normally follows "election" as net manager. It is only when the rules are not clearly understood or personalities collide that tempers flare.

NTS phone operation does not have the long rich NTS history that cw nets have enjoyed. It will take a concerted effort of those committed to the NTS concept to tap properly the great potential that exists with the phone operator. At the base of this pyramid stands the Net Manager and the everyday check-in. If *you* are interested, join in. To learn more of what it's all about, an s.a.s.e. will bring you the *Public Service Communications Manual*. — *John F. Lindholm, W1XX*

PUBLIC SERVICE DIARY

☐ Terceira Is., Azores — January 1. A disastrous earthquake struck and caused a vast amount of damage to the island. K8HGY ran approximately 165 phone patches on the Air Force MARS circuits, shortly after the disaster, furnishing a valuable communications link between the military personnel on the island and the United States. (K8HGY)

☐ Thompson, Connecticut — January 28. K1VSC led a contingent of hams from three states in assisting the state police during the search for a lost three-year-old in the Quaddick State Forest. K1MUJ/RPT provided the means of communications, and the child was located after 19 hours. (K1VSC)

☐ Atlantic Ocean — February 7. Sailing yacht "Rapier" was nearly lost at sea 200 miles northwest of Bermuda. Through the efforts of W1BNW, WB1CMB and the Maritime Mobile Network, however, instructions were passed to the ship and a Coast Guard rescue was coordinated. (WB1CMB)

☐ Oakhurst, New Jersey — February 12. When a trailer full of electronic equipment was stolen from W2ZEE's business, an aerial search was conducted and coordinated by means of the Monmouth County Repeater Association repeater. The trailer was located in less than an hour. (W2ZEE)

*Assistant Communications Manager, ARRL

PUBLIC SERVICE NET
ARRL Net Directory Registration

1. Net Name:

2. Net Abbreviation (if any): | 3. Freq.

4. On what days, based on UTC, does net meet each week?

5. During the winter, net meets at the following time(s) UTC: UTC

6. Purpose: ◯ Traffic ◯ Weather ◯ Emergency ◯ .....(specify)

7. National Traffic System? ☐ YES ☐ NO
If yes, check one: ◯ Local Net ◯ Section Net ◯ Region Net ◯ Area Net

8. Direct Coverage:

9. Liaison(s): | 10. Manager's Call:

11. Date Submitted: 19..... | 12. Sender's Call:

CD-85(1076) ➡ Return to ARRL, 225 Main Street, Newington, CT 06111

June 1 is the deadline for "Net Directory" registrations.

A blast from the past. VE5PQ (left) and VE5XA operate the 1975 Simulated Emergency Test from 'PQ's shack in Moose Jaw, Saskatchewan. *(Harry Blakey photo)*

☐ Grant County, Indiana — February 25. The worst snowstorm of the winter swept through the state, but area hams were alerted and gathered road condition information and provided communications for the Red Cross relief efforts. (WB9EAP)

ARES REPORTS

☐ Bedford County, Virginia — January 1. A massive search was conducted for a lost hunter, and since communications difficulties were anticipated, the county sheriff requested the assistance of hams. More than 20 hams trekked through the forest coordinating the search via their hand-helds. The lost hunter was found three hours later. (W4WWQ, EC Central Virginia)

☐ The Northwest — January 7-12. After a blizzard swept through Oregon and Washington, members of the Clark and Skamania County ARES (Washington) and the Amateur Radio Disaster Service assisted emergency personnel by coordinating the medical, food, shelter and rescue efforts. (WB7TKZ, EC Clark and Skamania Cos., Washington and K7JAD)

☐ Logan, Utah — January 12. When a light plane crashed in rugged mountains, the Salt Lake County ARES was dispatched to track it down in a severe winter storm. The aircraft was emitting a signal via its onboard Emergency Locator Transmitter. (WA7ZBO, EC Salt Lake Co., Utah)

☐ Owensboro, Kentucky — February 20. After five railroad cars, one containing flammable resin, derailed next to an oxygen-storage tank, members of the local ARES coordinated the relief effort using K4HY/RPT and its phone patch extensively. (W4OYI)

COMMUNICATIONS SERVICE OF THE MONTH

Salinas, California — January 13-15. Between 4 and 6 A.M. on the 13th, this area experienced a torrential downpour. When residents in the low-lying areas got out of bed, they found water up to their ankles and rising rapidly. WB6KSD and KA6ADW were among those who were experiencing the flooding. WB6ARF announced their plight over WR6AZO and asked for volunteers to help pack furniture and belongings from the hams' homes. Thirteen hams responded and assisted in the effort.

As hours passed, more reports of severe flood damage were received by the Red Cross and Salinas city officials. EC WD6EKR was contacted by the Red Cross to coordinate two teams of hams trained in damage assessment to make a door-to-door survey of the flooded area. Six hours later the completed reports were turned in and were used to help the unfortunate flood victims get low-interest federal loans for home repair. (WD6EKQ)

This photo of the Georgia section leadership was taken at an ARES meeting in conjunction with the Columbus hamfest. Left to right: STM WA3NAZ/4, SEC K4SWJ, EC WB4HXE, EC WA4PZD and SCM K4JNL.

☐ ARRL Section Emergency Coordinator Reports. For February, 35 SEC reports were received, denoting a total ARES membership of 16,280. This represents a 2.9-% increase in reports received one year ago (34), and a 9.8-% increase in ARES membership (14,827). Sections reporting were Ala, Alta, Ariz, Ark, Conn, Del, EBay, EPa, Ind, Iowa, Kans, Ky, La, Me, Mar/NFld, Mich, Minn, Miss, Mo, Mont, Nev, NFla, NTex, Ohio, Okla, SV, SDgo, SJV, SBar, SCV, SFla, Va, WVa, WPa, Wis.

REPEATER LOG

According to reports received between February 20 and March 20, the following repeaters were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Fire	Miscellaneous	Total
K1MPK			1					1
WR2ACD				2				2
WR2ACN				1				1
WB2NHO			1	8	1		1	11
W2VL				8	1		2	11
WR4ACY		1	3	15	3		3	25
WR5ABA				3				3
WR5ABE				2				2
WR5ABI				1				1
WR5ABY				16				16
WR5APK		1		4				5
WR5APN				2				2
K5HCJ				1				1
WR7ABM				1				1
WR7AHK				1				1
K7CC			1	10			1	12
KB8KG				2				2
W8UPV						1		1
WR9ADQ	1							1
Total	1	2	5	77	6	0	7	99

NATIONAL TRAFFIC SYSTEM

KL7JEB new manager of RN7-D, succeeding WA7IHS. KB4N now assistant manager, 4RN-E.

Certificates: KA6A KB6OT (RN6-D); VE1WF VE3CWA VE3FGU VE3JIR W2EFU WB2TOM WA4LJI WB4WII (EAN-D); W5ENI KL7HSF/5 WA7MEL AG7Q WDØDEX WØNFW (TWN); W7AK N7ANE N7ANT WB7EJS WA6NTI WB7OFI WB7OJV K7RBR K7TQM KN7WLF WA3WPY/7 WA7YCM VE6BBL VE6CEY VE6JB VE7BOT VE7DOI VE7GY (RN7-E); W5SBE WD9CIS K9BVE KØFRE WA4VKD N5BB K5IL W9OBS AFØO WBØPYD (CAN-E).

February Reports

Area Nets

	2	3	4	5	6	7
EAN	87	3936	45.2	1.216	96.4	
CAN	87	1834	21.1	.628	99.6	
PAN	57	1963	34.4	.879	96.6	
Region Nets						
1RN*	96	987	10.3	.573	84.3	97.7
2RN	137	1720	12.6	.671	97.8	97.7
3RN	89	960	10.8	.702	99.2	96.6
4RN	116	2087	18.0	.631	85.6	95.4
RN5	87	1305	15.0	.519	96.3	100.0
RN6	116	1475	12.7	.368	93.5	95.4
RN7	116	1555	13.4	.999	99.4	98.9
8RN	113	865	7.7	.408	88.2	97.7
9RN	145	983	6.8	.324	98.0	100.0
TRN	86	523	6.1	.303	78.2	99.1
ECN	58	462	8.0	.601	88.5	93.1
TWN	87	724	8.3	.346	90.1	98.9
TCC						
TCC Eastern	187[1]	1142				
TCC Central	197[1]	1016				
TCC Pacific	104[1]	873				
Sections[2]	5519	27,175	4.9			
Summary	6996	51,585	7.4			
Record	6414	44,200	24.3			

*incompiete report

[1]TCC functions not counted as net sessions
[2]Section and local nets reporting (194): ATN (AB), AENB AEND AENJ AENM AENS (AL), ARN OZK (AR), ATEN HARC SWN (AZ), NCN NCTN (CA), CN HNN (CO), CN CPN NVTN WESCON (CT), DEPN DTN (DE), AFPN DEN FPON FPTN GN MEN PBTN PEN QFN QFNS SBEN SPARC SWFTN TPTN (FL), AEN CGVN CVEN GERN GSN GSSBN GTFCN GTN MAEN (GA), I75MN IACN TLCN (IA), IMN MTN (ID/MT), ILN ILPN (IL), ICN ITN QIN (IN), KPN KSBN KWN QKS QKS/SS (KS), 4DARES 5DARES 6DARES KNTN KRN KRTN KTN KYN MKPN SEKEN (KY), LAN LRN LSN LTN (LA), EM2MN EMRI EMRIPN HHTN NEEPN WMEN WMN WMPN (MA/RI), MEPN MMN MTN WRIN (MB), MDD MEPN (MDC), AEN SPSN (ME), MACS MNN MTN QMN UPN (MI), MAWXN MSN MSPN MSSN RARES (MN), ACE MEOW MON NEMOE TNT (MO), APN (MR/NF), MTN (MS), CMN NCSSBN (NC), WNN (NE), NSN (NV), GSFM NHN (NH), JSARS MCN NJN NJPN NJSN NJVN OBITN UCETN (NJ), NMRR SWN (NM), BAVHF CNYTN NLI NLIP NLIVHF NYPON NYS OCTEN STAR WDN (NY), CMN NCSSBN (NC), BN BNR BRTN HCCN MASER ONN OSN OSSBN TSRAC (OH), OAN OFON OLZ OPEN OTWN STN (OK), CMN LN ODN OLN OPN OSN (ON), 16/76 AREST BSN PDXAARES (OR), EPA EPAEPTN NWPATMTN PTTN WPA WPAPTN WPATMTN (PA), WQV/UHF (PQ), SCSSBN (SC), NJQ SDEN SDN SDWN (SD), SATN SPN (SK), MCRN METEN MTPSN RCARESN TEPN TN TSN WTVHFN (TN), DFW TEX TSN TTN (TX), BUN UCN (UT), VN VNTN VSBN VSN (VA), WARTSN WSN (WA).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP
7 — % REP. TO AREA NET

Transcontinental Corps

K5AJM and WB5YDD received TCC-C(D) certificates. W2EFU, W2CQB, N3SJ and W4JK received TCC-E(D) certificates.

	2	3	4	5
TCC Eastern	193	96.9	3039	1142
TCC Central	203	97.0	1828	1016
TCC Pacific	116	89.7	1746	873
Summary	512	94.5	6613	3031

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (February): Eastern Area (N2YL/K3KW, Directors) — W1s KX NJM, WA1ZAZ, K1s BA EIR GN SSH XA, W2s CS CQB EFU FR GKZ MTA RQ ZOJ, K2NY, N2YL, WA2s ICB SPL SYR, W3s FAF PQ, WA3WOP, K3s KW NGN, N3SJ, W4s JK MEE SQQ UQ, WA4CCK, WB4PNY, K4s BKX KNP, N4s KB NK, KB4N, KB6FR/3, W8s PMJ VPW, WB8WTS, K8s AAZ KMQ, KC8C, VE3s CWA GOL SB. Central Area (W5GHP/W9JUJ, Directors) — W4ZJY, WD4HIF, K4YZU, WN4KKN, N4MD, W5s KLV RB, WA5s BHF INJ RKU, WB5s OXE YDD, WD5HHK, K5s AJM GM MC, N5s RB TC, W9s CXY DND HOT JIJ JUJ NXG, N9TN, WB9WGD, WØs AM HI, WAØTNM, KØs CW EZ. Pacific Area (W5KH, Director) — N5s MR NG, W5KH, N6s GW PZ WP, K6OE, W6s EOT OA SX VZT, WB6PVH, W7s DZX EP GHT LYA VSE, K7s HLR KSA MC, WA7GYQ, ADØA, KØs BN DJ, WØFG, VE7ZK.

Independent Nets (February 1980)

	2	3	4
Amateur Radio Telegraph Society	29	1410	463
Central Gulf Coast Hurricane	29	226	2758
Clearing House	29	390	487
Early Bird	29	753	323
Empire Slow Speed	28	97	427
Hit and Bounce	29	332	478
IMRA	25	488	952
Mission Trail	29	269	1415
North American SSB Traffic	23	250	210
North American Traffic and Awards	28	31	970
Piconet All Day Watch	159	242	3604
Washington Region PON	17	24	344
West Coast Slow Speed	29	179	337
20-Meter ISSB	25	294	448
40-Meter Interstate RTTY	29	83	92
75-Meter ISSB	29	1213	1170
1290 Traffic	46	574	2707

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll February 1980

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, max. 5. This listing is available to Novices and Technicians who achieve a total of 40 or more points.

322
KA9CPA
263
K4TH
230
N7AKX
188
WD4COL
176
WB3GZU
174
WB6PVH
155
W2ZOJ
148
K2GCE
144
WA3PXA
143
W9JUJ
142
W2RQ
137
K9PNG
136
WB8YRY
128
N2YL
127
VE3FGU
126
KB6FR
WB7WOW
124
AA2H
KA5CDX
N4CCT
WA3NAZ
WD4HIF
123
WA3WQP
WB3FEH
122
W4MEE
120
WA2SPL
119
WB2BNY
117
W3GQJ
W7VSE
WA1TBY
116
W2UEZ

115
KL7HSF
VE3JIR
WA5RVT
114
WB2EAG
113
AF2L
AG2R
112
K4SCL
WB2TOM
111
N4NK
WA2UWA
WA4JDH
109
VE3GOL
108
KB4N
W5DTR
WA2MVQ
107
AJ3R
KA4FZI
WB1DXR
WD8NYN
106
K7GXZ
105
W2CS
104
K8ND
VE1WF
VE5AE
WA2ZJP
103
N5TC
WB2RMI
102
KA1BJY
KB4OZ
N9AUG
WØOYH
W1TN
W2MTA
W6OA
WB2PJU
101
WA4STO
WB5YDD
100
KB2HM
N8CW
W2AHV
WA2MFV
WB8MTD
WD5EUE

99
AA3S
AF8V
WB3KYL
WB4FVV
WD4RNI
98
WA4CCK
97
KC8C
N2APB
WBØZBJ
WB3JYZ
96
K3ORW
K4BKX
KA4IVO
KB8MX
N6AWH
VE1BMN
VE3CWA
W1WP
W5KLV
WA4SRD
WB4VVL
WB5NKD
95
K5TL
W4NWM
WB8YDZ
94
VE3DPO
VE3JRT
VE5HG
W7GHT
WB8YTD
WD8KZX
93
WB4WYG
WD4AWN
WD5IVD
92
KA2CTU
WB8SYA
91
W4CKS
W8VPW
90
K8OZ
W2SO
89
W5HMR
W5VMP
WAØTNM
88
N9ASX
WB1CPF
WB7TQF

87
K4EV
N4LE
85
WA2HEB
WB4ZOJ
84
KØEZ
KL7JEB
N4AZI
WA1VAB
WB3CAI
83
VE3KK
WØVJD
82
K8AAZ
KA2DOH
N8ABA
WA2AFE
81
AFØO
K1BSO
WA2KOJ
WA4ZHC
WB7OFI
WDØBMR
80
AA5J
K3JL
KA2GQQ
N2GR
N3AKC
KB2KW
79
VE3IFP
78
K7JV
KB8GC
N7AFZ
77
K1JHC
KA2CNN
WB1ANT
WB4ZDU
76
K2VX
WA7IHS
75
W1EOF
W7EP
W9BCM
74
N6GW
W4ANK
WB5LBR
73
KØPIZ

K5OWK
N2BC
W4LXB
W9XD
WA8GMT
WB9JSR
WØOTF
72
AF1L
WØHZU
WA2CUW
71
VE5KS
W2AET
W7FJZ
W7LNE
WA1LOU
WB5CIT
WB5MMI
70
KA1CC
N5EK
N6RD
W5VMY
WA4EYU
69
AJ5F
K4DZM
W1BJ

W2PZL
WB1FZX
WD5JYI
WD8KBW
67
W4FMN
W2SZ
66
K4VHT
VE1OC
W8GGX
WB5NKC
65
K6YD
N3EE
W3YQ
W9JIJ
WA5QFD
WB2KCT
WD8PEI
64
W9HOT
WA7MEL
WB3KDQ
WD4PDK
WD5DQR
WD9GXW
63
K8PXM

WA8QAF
WB8WTS
WD5GKH
62
K7NTG
N1AMF
W1TM
W4MQL
W9IEM
WAØTFC
WBØHOX
WB2NAO
WB8UBR
61
K9UN
KAØAIT
N5RB
VE3GT
WB3GZV
WB8SIQ
WD4CNQ
WD4CNR
60
KA3DYN
KB4OW
KC5M
VE3JRP
W5SBE
W7GB
WA2OVE

WB2OTC
WD8QMP
56
N2BGR/T
55
WD4CFZ/T
54
WD4JJK/N
52
KA1CGP/T
KA2GTY/T
WB2AIU/T
50
WD8BHE/N
N2BDW/T
49
KA4BBA/T
WB1EZT/T
WB2RMJ/T
47
WA1ZLQ/T
45
WB7CFH/T
42
WD4JTO/N
WD4SIH/T
41
KA2DBW/T

Brass Pounders League February 1980

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: VE1WF, WA2HSB, VE3JIR, K3NGN, W4FMN, W6OA and WB8WTS.

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.

	2	3	4	5	6
W3CUL	753	2492	2996	73	6314
WØWYX	51	953	237	716	1957
WA3WQP	0	981	916	34	1931
W4MEE	5	786	734	33	1558
K1BCS	53	699	734	23	1509
WA2SPL	1	684	694	19	1398
WAØHJZ	1	897	23	410	1331
KA9CPA	30	814	133	280	1257
W9JUJ	12	538	595	17	1162
W7DZX	26	553	563	2	1144
WA4JDH	1	566	556	5	1128
WØMZI	0	513	25	513	1051
KB6FR/3	317	417	200	59	993
WBØZQY	0	473	0	473	946
WD4HIF	3	446	445	40	934
W7VSE	5	429	400	16	850
WØZWL	0	411	0	411	822
W3VR	73	352	369	14	808
KB4N	3	366	410	12	791
WB3GZU	82	286	329	80	777
K4TH	20	343	226	162	751
N4MD	4	404	282	9	699
W2RQ	2	356	262	41	661
WA4CNY	60	290	248	62	660
WB6PVH	0	300	319	24	643
W5KLV	3	335	262	26	626
WAØRWM	37	340	15	221	613
K4SCL	1	322	277	11	611
AJ3R	4	241	329	6	580
KL7JEB	20	291	230	25	566
WB4PNY	2	279	245	16	542
WAØAUX	23	172	326	2	523
VE3CWA	28	203	260	30	521
K1BQB	0	250	266	0	516
WA3ATQ	267	128	113	6	514
VE3JIR	0	245	237	28	510
W4JK	0	254	256	0	510
K8AAZ	2	268	218	18	506
WB5YDD	4	230	225	42	501
Multioperator stations:					
W4DUG	5124	52	5164	2	10342
WD4IIO	264	26	265	26	582

BPL for 100 or more originations plus deliveries:

W9JIJ	203	W1WP	123
K5OWK	188	WD5FGY	121
K8ND	169	AG2R	119
WB6YID	141	KL7P	113
W7LUP	139	WB7TQF	111
N4PL	135	W3EGJ	106
WD4COL	128	K7NTS	105
W2SZ	126	WB3KYL	101
KBØIP	124	WØBMA	100
Multioperator stations:			
W4LX	238	W2CXM	189
K4KDJ	205	W8UPD	164

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

Up, Up and Away

If all goes well, the New Phase-III-A OSCAR satellite will be launched at the end of this month. This OSCAR 9 will open up a new vista for amateurs. Large areas of the earth (up to an entire hemisphere) will be workable for approximately 10 hours per orbit. The potential user-population is staggering. Also unique to Phase-III is the concept of special-service channels, one of which has been AMSAT-designated for ARRL's National Traffic System. See "Public Service," September 1979 *QST*.

This 4-kHz-wide channel is dedicated to daily formal message handling for NTS. The reliability of the satellite will bring us closer to two long-sought-after goals.

The first is an around-the-clock message traffic facility, now limited by ionospheric propagation considerations. This would greatly improve the handling of crisis communications from the disaster site because of both the ultimate reliability of the system and the ease with which an effective ground station can be set up. No longer will propagation limit communications effectiveness. The second goal is a progression from the National Traffic System to the *Inter*National Traffic System. Theoretically, the ITS would provide an organized link between North America and Central/South America, and whatever other areas wish to become involved. This special-service channel is the culmination of the activity which first brought amateurs together — relaying of messages.

It is incumbent on NTS operators to keep this channel active. Transcontinental Corps Directors should compile a roster of those who will have Phase-III capabilities (435 MHz in, 145 MHz out). The next step is to lay the groundwork for TCC skeds on the channel. But it is not appropriate to restrict this segment for inter-area message handling only; Area and Region nets can put it to good use as well. Stations can be dispatched to OSCAR 9 rather than "down 15." Net managers should get the ball rolling. As the saying goes, use it or lose it.

Admittedly, there is not a great deal of equipment available to conveniently operate on the new satellite. It wouldn't hurt to send a letter to your favorite manufacturers, urging them to produce such gear.

If you are into traffic and interested in joining the satellite crowd, but are a little mystified by it all, join the club. Please read the articles by WB1EYI in December 1979 and April 1980 *QST*. These articles explain Phase-III operation in detail, as well as describing what the typical ground station should consist of. Elsewhere in this issue, you will find a writeup on a brand new OSCAR 9 locator. Other sources of information on satellite communication are chapter 14 of the 1980 *Radio Amateur's Handbook* and chapter 11 of the new ARRL *Operating Manual*. The information is there, for those who want it.

After launch, the spacecraft will spend several weeks in its transfer orbit before the onboard motor "kicks" it into final orbit. During this period, listen only — do not transmit up to the satellite. Once access commences, listen first and get to know the procedures first-hand. After an adequate monitoring period, start practicing finding yourself in the downlink and make some casual QSOs. Shortly, you will have enough experience to really feel at home.

This is a marvelous opportunity for NTS — if traffic-oriented hams will eschew their traditional tendencies and get behind this program. Besides, if you're equipped for Phase-III, you can enjoy working DX in the 124-kHz-wide general operating passband, making casual contacts all over the globe. It's going to be like having another 20- or 15-meter band at your disposal. So, "take to the sky on a natural high. . . ."

The undersigned had been designated the coordinator of the NTS channel. But because of the pressure of other responsibilities, the mantle must reluctantly be passed to another. Amateurs who are knowledgeable in the NTS realm and who plan to be routinely operational on OSCAR 9 are urged to step forward and assume this challenging position.

So what say? — *Robert Halprin, K1XA*

FREQUENCY MEASURING TEST

"Minimal QRM" and "excellent propagation" conditions favoring the February 10 FMT were among the reports of the 104 participants who submitted a total of 1266 measurement results. The FMT official umpire measured the transmitted frequencies for the early run at 14,074.424, 7028.752 and 3562.254 kHz. The late run checked out at 14,101.100, 7088.797 and 3526.280 kHz.

Eighty-two of the 104 participants who submitted entries measured within 100 Hz, a requirement for QO "precise frequency measurement." They are listed as follows with average error preceding their calls: (0 Hz) WA4CAW W5FMO W5IJW W6CDF WA6IQL W7ANF WD8BTU W8CUJ W9FN W9TJ K9WMP AE1J (1) K1BC W1JH W1PLJ K2RG K2SM W3BFF W3SV WA4AXA W4IBU K4KA W4NTO WB4PMG N5BQK N5DZ K5FSA W7SC WA7PHD WB7VIO W8NWU KØMOZ KØWM (2) AG1R W6CBX VE3AC (3) KD5Y WB6ZHN WA3RXE (4) W2AET W4HU (5) K6RB (6) K5DL K6MZN WB8UPN NØND (7) WD4APM K4ZN (8) W2AIQ (9) WB8RSQ (10) WØGW (12) KH6CZ (14) W4NM W8RZL VE2JN (15) K1QBP K8EF (16) K4TCV AD8J (17) W4DRF WØSS (21) WA9PVS (23) N1QY (30) N4CDE (32) W4PKD (36) AAØJ (37) K8AXL (38) WB2YIZ (40) K8AIT (42) KØJCF (60) W6SSB KØEZ (61) W8UCI (69) W9TGN (72) K4SGR (73) WBØNVL (75) WB4RRC (78) VE3FCU (80) W4UCL (82) W3FYK WB9LUK (83) KBØAB (90) W2ND. All entries measuring over 100 Hz have been notified.

Excerpts

My equipment consists of a Collins 32S-1 transmitter, connected to a Heath Cantenna and a DSI 3550K MHz counter (non-oven). The Collins 75S-3 receiver picked up the stray rf from the transmitter, which I adjusted to match the strength of the received signal. The receiver was offset from W1AW by approximately 1 kHz and the transmitter was tuned slowly for zero beat (matched 1-kHz tone) until I could hear a slow rising and falling of the W1AW carrier, which was accompanied by a matching rising and falling S-meter, indicating zero beat. The receiver was connected to a folded dipole (cut for 40 meters) with a 4:1 coaxial balun to match the impedances. The counter was calibrated once at 15 MHz (WWV) about 3 hours before the early run, using a separate receiver (an old BC-779 Super Pro), zero-beating the S-line against the a-m carrier of WWV. This is my first FMT, but certainly not the last! (WD8BTU). Measurements were made with a Yaesu FT-301D receiver, homebrew switch box with built-in audio generator, Heath SB-610 scope and a Heath IM-4100 frequency counter. The technique is somewhat crude, but I believe it to be effective. The signal to be measured is peaked in the cw passband of the FT-301D. Audio from the '301 is fed to the horizontal input of the '610 scope. The premix frequency and BFO are tapped off of the '301 and connected to the switch box. The premix frequency is selected by the switch box and read on the IM-4100 counter and recorded. The BFO frequency is then read and recorded by the same method. Audio from the homebrew generator is injected into the vertical input of the '610 scope. This generator has both fine and coarse frequency-adjust controls. These controls are adjusted to obtain a "0" on the scope and read and recorded by selecting the proper position on the switch box. By a simple mathematical calculation, the frequency of the received signal is obtained. Even though the IM-4100 is only rated at 10 ppm 0-40°C, after aging the crystal, the short-term stability is good.

A known frequency standard (CHU) is measured before, during and after the test, and a calibration factor is calculated. All readings are adjusted according to this factor. This is my first FMT and I really enjoyed the preparation and the participating in this event (WB7VIO). I used two receivers and a transceiver with a counter. The main receiver is a Hallicrafters R-274D which was used to tune the W1AW signal. The Drake TR-7 transceiver provided the frequency reference which was coupled to a Heath IB-101 counter. The second receiver was tuned to WWV and the counter clock was coupled to the WWV receiver to enable the counter clock to be at exactly 1 MHz. I used the cw position on the main receiver to produce an audio pitch, the TR-7 was tuned to produce the same audio pitch or simply to permit matching the tones by ear. That is much easier and just as accurate for me than using an oscilloscope to produce the curves. Actually, tuning by ear is better for me because I can hear the smallest pitch change instantly (KØMOZ). Pretty decent signals on all bands this time (NØND). Equipment used was assembled in a hurry, shortly before the test, and consisted of a Sky Buddy receiver (vintage 1939), an LM-14 frequency meter which was loosely coupled to the antenna, a MAX-100 frequency counter to read out the LM-14 frequency and an old Waterman pocket scope for zero-beat indication. I will try for a more professional arrangement next time (W4NM).

*Communications Manager, ARRL

Consult "Contest Corral," April *QST*, page 99, for full information on the upcoming May FMT.

Feedback

W6SSB averaged a 26-Hz error for the November FMT instead of 79 Hz as reported. — *Jeannie DeMaw, WICKK*

SCM ELECTION NOTICE

To all ARRL members in the Southern Florida, North Dakota, West Indies, Oklahoma, Minnesota, Connecticut, Idaho, Western New York and Ohio Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

Petition forms (CD-129) are available on request from ARRL headquarters but are not required. The following form is suggested:

(Place and date)

Communications Manager, ARRL
225 Main Street, Newington, CT 06111

We, the undersigned full members of the . . . ARRL Section of the . . . Division, hereby nominate . . . as candidate for Section Communications Manager for this Section for the next two-year term of office. (Signature . . . Call . . . City . . . ZIP . . .).

An SCM candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, June 6, 1980.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on July 1, 1980, returns counted August 19, 1980, and SCMs elected as a result of the above procedures will take office October 1, 1980.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition, for a two-year term beginning October 1, 1980.

If no petitions are received for a section by the specified closing date, such section will be resolicited in October *QST*, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.

John F. Lindholm, W1XX
Communications Manager

REPEAT SCM NOMINATING SOLICITATION

Since no petitions were received for the South Dakota and Louisiana sections as a result of notices in the October and November *QST*, nominating petitions for these sections are herewith resolicited. See the above notice for details on how to nominate.

SCM ELECTION RESULTS

The following elections were conducted for two-year terms of office beginning April 1, 1980:

Balloting Results: In the Eastern Pennsylvania Section, Karl W. Pfeil, W3VA, received 827 votes; Douglas W. Fearn, K3KW, received 446 votes and Drew W. Smith, K3PA, received 197 votes. Mr. Pfeil is declared elected.

In the North Carolina Section, William C. Parris, AA4R, received 880 votes and Charlie J. Knowles, K4NBH, received 238 votes. Mr. Parris is declared elected.

In the Virginia Section, Richard L. Genter, K4BKX, received 1391 votes and Robert L. Follmar, N4RF, received 322 votes. Mr. Genter is declared elected.

The following were elected for two-year[1] terms of office beginning July 1, 1980:

Uncontested:

Indiana	Bruce Woodward, W9UMH
Maine	Clevis O. Laverty, W1RWG
Santa Clara Valley	Jettie B. Hill, W6RFF
Vermont	Robert L. Scott, W1RNA
Wisconsin	Roy A. Pedersen, K9FHI
Santa Barbara	Robert N. Dyruff, W6POU

[1]18-month term of office because of resolicitation.

DATE (UTC)	OSCAR 7 Orbit No.	OSCAR 7 Time UTC HR MN	OSCAR 7 Eqx W. Long. Degrees	OSCAR 8 Orbit No.	OSCAR 8 Mode	OSCAR 8 Time UTC HR MN	OSCAR 8 Eqx W. Long. Degrees
1 May	24,972	00:20	74.6	10,983	A	00:12	54.2
2 May	24,985	01:14	88.2	10,997	AJ	00:17	55.4
3 May	24,997	00:14	73.0	11,011	J	00:22	56.7
4 May	25,010	01:08	86.6	11,025	J	00:27	57.9
5 May	25,022	00:07	71.4	11,039	A	00:31	59.2
6 May	25,035	01:01	85.0	11,053	AJ	00:36	60.4
7 May	25,047	00:01	69.8	11,067	X	00:41	61.6
8 May	25,060	00:55	83.4	11,081	A	00:46	62.9
9 May	25,073	01:49	97.0	11,095	AJ	00:51	64.1
10 May	25,085	00:49	81.8	11,109	J	00:56	65.4
11 May	25,098	01:43	95.4	11,123	J	01:01	66.6
12 May	25,110	00:42	80.2	11,137	A	01:06	67.5
13 May	25,123	01:36	93.8	11,151	AJ	01:10	69.1
14 May	25,135	00:36	78.6	11,165	X	01:15	70.4
15 May	25,148	01:30	92.2	11,179	A	01:20	71.6
16 May	25,160	00:29	77.0	11,193	AJ	01:25	72.9
17 May	25,173	01:24	90.6	11,207	J	01:30	74.1
18 May	25,185	00:23	75.4	11,220	J	01:35	75.3
19 May	25,198	01:17	89.0	11,234	A	01:40	76.6
20 May	25,210	00:17	73.9	11,248	AJ	00:01	52.0
21 May	25,223	01:11	87.4	11,262	X	00:06	53.3
22 May	25,235	00:10	72.3	11,276	A	00:11	54.5
23 May	25,248	01:04	85.8	11,290	AJ	00:16	55.8
24 May	25,260	00:04	70.7	11,304	J	00:21	57.0
25 May	25,273	00:58	84.2	11,318	J	00:26	58.2
26 May	25,286	01:52	97.8	11,332	A	00:31	59.5
27 May	25,298	00:52	82.7	11,346	AJ	00:35	61.7
28 May	25,311	01:46	96.2	11,360	X	00:40	62.0
29 May	25,323	00:45	81.1	11,374	A	00:45	53.2
30 May	25,336	01:39	94.6	11,388	AJ	00:50	64.5
31 May	25,348	00:39	79.5	11,402	J	00:55	65.7
1 June	25,361	01:33	93.0	11,416	J	00:00	66.9
2 June	25,373	00:32	77.9	11,430	A	01:05	68.2
3 June	25,386	01:27	91.5	11,444	AJ	01:09	69.4
4 June	25,398	00:26	76.3	11,458	X	01:14	70.7
5 June	25,411	01:20	89.9	11,472	A	01:19	71.9
6 June	25,423	00:19	74.7	11,486	AJ	01:24	73.1
7 June	25,436	01:14	88.3	11,499	J	01:29	74.4

Orbit predictions by Project OSCAR, P. O. Box 1136, Los Altos, CA 94022. To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW, AMSAT bulletins transmitted around 29.490 MHz on Mode A, 145.960 MHz on Mode B, and 435.160 Mode J, during O 7 and O 8 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz lsb); (nternational net at 1800 UTC Sundays on 14,280 kHz usb).

Soviet RS data have been discontinued.

O 7 progresses an average of 28.7363° W. per orbit in a period of 114.9433 minutes.
O 8 progresses an average of 25.7874° W. in a period of 103.2249 minutes.

O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesday and Friday — Mode AJ. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D.
Mode AJ is simultaneous operation of both transponders.

Spacecraft Frequencies

Spacecraft	*Uplink*	*Downlink*	*Beacon*
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz

Formulas for calculating approximate downlink frequencies. x = downlink frequency.

OSCAR 7	
Mode A	x = uplink frequency − 116.450 MHz ± Doppler shift
Mode B	x = uplink frequency − 578.100 MHz ± Doppler shift
OSCAR 8	
Mode A	x = uplink frequency − 116.458 MHz ± Doppler shift
Mode J	x = uplink frequency − 581.106 MHz ± Doppler shift

Note: A minus sign in front of the downlink frequency indicates that the passband of the satellite is inverted in that mode. This means that signals transmitted up to the satellite at the low end of the uplink passband will appear at the high end of the downlink passband.

Additionally, upper-sideband signals transmitted on the uplink will appear as lower-sideband signals on the downlink.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq. OSCAR locators for O 7, O 8 and Soviet RS are available in the *Satellite Communications* package at your dealer or direct from ARRL; $4.75 U.S., $5.50 elsewhere.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1KI

MAY

3-4

New York State QSO Party, April *QST*, page 99.

SEANARC Totem Pole Contest, April *QST*, page 99.

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ARRL Frequency Measuring Test (0200Z and 0500Z May 10), April *QST*, page 99.

10-11

World Telecommunications Day Contest, phone, April *QST*, page 99.

CQ-M (USSR), April *QST*, page 100.

Rocky Mountain Division QSO Party, April *QST*, page 100.

Georgia QSO Party, sponsored by the Atlanta Radio Club, from 1600Z May 10 until 0200Z May 12. Single operator or multioperator-single transmitter categories. Georgia stations send signal report, serial number and county. Others send signal report, serial number and state, province or country. Count one point per QSO. Georgia stations multiply QSO points (including Georgia QSOs) by sum of total number of states, provinces and countries worked. Others multiply by number of Georgia counties worked (159 maximum). No repeater QSOs. Suggested frequencies: cw — 1805 and 60 kHz from the bottom edge of the other bands; phone — 3900, 7245, 14,290, 21,360, 28,600 kHz; Novice/Tech — 3718, 7125, 21,110, 28,110 kHz. Try 160 meters at 0300Z, 10 meters on the hour and 15 meters on the half hour during daylight hours. Awards. Complete log information, score summary and check sheets should be sent by June 1, with a large s.a.s.e. for results, to Atlanta Radio Club, c/o Johnny Jones, WD4OPT, 1671 Bristol Dr., Atlanta, GA 30329.

12

W1AW Qualifying Run, 35-10 wpm at 0200Z on May 13, (10 P.M. EDT May 12). Transmitted simultaneously on 1835, 3580, 7080, 14,080, 21,080 and 28,080 kHz, and 50.08 and 147.555 MHz. The complete W1AW schedule appears on page 97 of April *QST*. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. Since this is a reversal of the normal order of speeds, your comments will be appreciated. A large s.a.s.e. will help expedite your award/endorsements.

17-18

ARRL International EME Contest-II, February *QST*, page 92.

Armed Forces Day, this issue, pages 75-76.

World Telecommunications Day Contest, cw, April *QST*, page 99.

Common Market DX Contest, sponsored by the Belgian Union of Radio Amateurs (U.B.A.), from 0600Z May 17 until 2400Z May 17 for cw, and 0600Z May 18 until 2400Z May 18 for phone, 80-10 meters. Single operator all band, high band (20-15-10), low band (40-80) and multioperator-single-transmitter categories. Exchange signal report and serial number. Common Market (CM) countries are DJ EI F G I LX ON OZ PA. Non-European stations count five points for CM country QSOs and two points for other European QSOs. QSOs with ON4UB (National station) count 25 points. Multipliers for non-European stations are call areas (not prefixes) of each CM country. ON4UB QSOs count for an extra multiplier on each band. For final score, multiply QSO points times sum of multipliers per band. Awards. Send usual complete log information, with summary sheet, to Common Market Contest Committee, Michel Le Bon, ON4GO, Chee. de Wavre 1349, B-1160 Brussels, Belgium.

Florida QSO Party, sponsored by *Florida Skip*, from 1500Z May 17 until 2359Z May 18. Florida stations are divided into two classes: Class A for those portable or mobile running 200 watts or less and outside their home county; class B are all others in Florida. Florida stations send signal report and county; others send signal report and state, province, country. Suggested frequencies: cw — 55 kHz from lower band edge; phone — 3945, 7279, 14,319, 21,379, 28,579 kHz, and 50.2 and 146.52 MHz. Florida stations count one point for all QSOs, multiply by sum of states (max. 49), provinces (max. 12), DX countries (max. 25), and ITU zones (max. 5) worked. Others count two points per QSO and multiply by number of Florida counties worked (max. 67) for final score. Florida class A stations multiply score by 1.5 for final total. Phone and cw logs should be separate. Usual summary and log information and a 15-cent stamp should be *received* before June 15. Send to Florida Skip Contest Committee, Box 660501, Miami Springs, FL 33166.

Massachusetts QSO Party, sponsored by the Greater New Bedford Contesters, from 1600Z May 17 until 0200Z May 19. Massachusetts stations send signal report and county; others send signal report and state or province. Suggested frequencies: cw — 1810 and 60 kHz from the lower band edge; phone — 1830, 3960, 7260, 14,290, 21,390, 28,590 kHz, and 50.110 MHz, fm simplex; Novice — 7120, 21,120, 28,120 kHz. Count two points for phone and four points for cw QSOs. Massachusetts stations multiply QSO points by sum of Massachusetts counties, states and provinces worked. Others multiply QSO points by total Massachusetts counties worked. Club competition for Massachusetts clubs. Awards. Usual summary and log information should be sent by June 30, with 30 cents postage for results to Ed Peters, K1KJT, 29 Greenbriar Dr., New Bedford, MA 02745.

Michigan QSO Party, sponsored by the Oak Park ARC, from 1800Z May 17 until 0300Z May 18, and from 1100Z May 18 until 0200Z May 19. Exchange signal report and county (Michigan only), state or country. Suggested frequencies: cw — 1810 and 35 kHz from the lower band edge; phone — 1815, 3905, 7280, 14,280, 21,380 and 28,580 kHz, and 50.125 and 145.025 MHz; Novice — 3725, 7125, 21,125, 28,125 kHz. Count one point for phone and two points for cw QSOs. Non-Michigan stations count five points for QSOs with club station W8MB. Michigan stations multiply QSO points by sum of Michigan counties, states, and countries (max. multiplier of 85) for final score. Others multiply by number of Michigan counties worked (max. 83). Vhf-only entries add multipliers per vhf band for total multiplier. Count five points for OSCAR QSOs and no points for repeater QSOs. Club competition for Michigan clubs. Awards. Mail complete summary and log information by June 30 to Mark Shaw, K8ED, 3810 Woodman, Troy, MI 48084.

24-25

CQ WPX Contest, cw, March *QST*, page 98.

Ibero-American Contest, sponsored by the Union de Radioaficionados Espanoles (U.R.E.) from 2000Z May 24 until 2000Z May 25, 80-10 meters, phone only. Work stations from CE CO CP CT CX C3 C9 EA HC HI HK HP HR KP4 LU OA PY TG TI XE YS YV ZP. Exchange signal report and serial number. Count one point per QSO and multiply by sum of Ibero-American countries worked per band for final score. Award for a minimum of 50 QSOs. Send complete summary and log information by June 15 to U.R.E., Box 62, Mollet del Valles, Spain.

29

W1AW Qualifying Run, 10-35 wpm at 2000Z (4 P.M. EDT). See May 12 listing for more details.

JUNE

3

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0400Z June 4 (9 P.M. PDT June 3). Frequencies are approximately 3590/7090 kHz. Other details the same as the May 12 listing.

7-8

Teenage DX Contest, sponsored by the Twin City Teenage DX Club, from 0000Z June 7 until 2400Z June 8. Operate only 36 hours. Operators over 21 years old work those under 21 only. Exchange signal report, age and QTH. DX stations send serial number. Count one point for W/VE stations, two points for DX. Double points for cw QSOs and triple points for DX QSOs on 40-80-160 meters. Multiplier is sum of states, provinces and countries per mode per band. Final score equals QSO points times multiplier. Mail complete summary and log information to be received by July 29 to TCTDXC, Greg Deuhs, KB0CV, 1945 Ashland, St. Paul, MN 55104.

11

W1AW Qualifying Run, 10-40 wpm at 0200Z June 12 (10 P.M. EDT June 11). See May 12 listing for more details.

14-15

ARRL VHF QSO Party, this issue, pages 74-75.

21-22

All Asia Contest, phone

West Virginia QSO Party

24

W1AW Qualifying Run

28-29

ARRL Field Day

JULY

12-13

IARU Radiosport Championship

19-20

SEANET DX Contest, cw

QRP Summer Contest

26-27

CW County Hunters Contest

AUGUST

2-3

ARRL UHF Contest

SEPTEMBER

13-14

ARRL VHF Contest

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 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 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 you 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.

*Asst. Communications Manager, ARRL.

Section Activities

A-1 OPR ≠ EC ≠ DXCC ≠ RCC ≠ WAS ≠ STM ≠ OES ≠ OTS ≠ NM

SCM ≠ ARES ≠ OVS ≠ SEC ≠ OBS ≠ TCC ≠ OO ≠ NTS ≠ WAC ≠ CP ≠

CANADIAN DIVISION

ALBERTA: SCM, S. T. Jones, VE6MJ.— SEC & Asst SCM: E. Roy Ellis, VE6XC. NMs: (APSN) VE6APO (ATN) VE6BBL. NARC announces anticipated Edmonton Hamfest is cancelled for this year. Hams interested in emergency communications are gearing up for the Provincial Wide Radio Communication Exercise to be held the last week in March. Visited Hinton Radio Club in connection with the exercise and was given a royal tour of their new repeater site by VE6SJ and VE6FV. Traffic: VE6AAT 307, VE6BBL 135, VE6CHK 62, VE6HO 37, VE6XC 22, VE6ABC 21, VE6ZV 13, VE6YW 7, VE6CE 6, VE6ON 6, VE6VS 6.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — British Columbia Public Service Net, Net Manager VE7QC, Asst VE7DDF and BCEN (cw) Net Manager VE7COA, Asst VE7CCJ are always looking for your QNI and QTCs. BC FM Assn general annual meeting elected VE7MP, pres.; ex-7AET, vice pres. All 7 EWB secy. VE7BCN. Dues are due to VE7ACJ. VE7DAR has suffered two strokes in past two months but is home, and improving. Totem ARC VE7CSK, pres., VE7ND, secy. Nanaimo ARC conducted very active SET in Nanaimo. Traffic: VE7ZK 106, VE7COA 52, VE7CCJ 20, VE7DFY 20, VE7FB 20, VE7BLO 7.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst SCM: VE4JP. SEC: VE4TR. STM: VE4RO. NMs: VE4s TE NM AEJ VJ. Look for report in public service in QST on another successful ski-athon in Pinawa. Congrats to VE4AEJ on his appointment as Net Manager for MTN. Several VE4s are still in the sunny south, VE4s JA GB and a few others. VE4JF is reported undergoing surgery, we wish him well. Nets: MEPN QNI 1190, QTC 28, sess 29; MMN QNI 536, QTC 30, sess 29; MTN QNI 215, QTC 63, sess 29; WRIN QNI 114, QTC nil, sess 4. Traffic: VE4AEJ 47, VE4PG 42, VE4QJ 37, VE4RO 26, VE4TE 25, VE4ID 16, VE4AAD 8, VE4ADS 6, VE4FK 6, VE4JI 6, VE4NE 6, VE4LB 4, VE4LN 4, VE4IW 3, VE4AAU 2, VE4BE 3, VE4CR 2, VE4DS 2, VE4NM 2, VE4AEE 1, VE4ND 1, VE4XN 1.

MARITIME — NFLD: SCM, Aaron D. Solomon, VE1OC — A/SCM: VO1FG. STM: VE1WF. SEC: VE1ASW. NMs: VO1JN VE1WF. Silent Keys: VE1AMM VO1GP WB6RKW/VE1. Condolences. Hospital: VE1ASG VE1DF VE1FN. Speedy recovery. Also VE1SZ. VE1 CW/Ph contest popular agn this year. MAARC planning Lobster Rally and Flea Market activities. VE1BXC/AK4L has new position Tech Dept ARRL. Ex VE1AFM now VE3ACY signing 5Z4YW, 21,250 & 28,480. VE1BC comp Hist of Marine Comm wants info new book. HARC revising VE1 Callbook. MAARC Bull contains up-to-date countries list. VO-News. VO1FX instr class 18 new Amateurs. SONRA had station in Cabot Tower, rec'd media coverage. SONRA working on new VO Callbook. HUMBARS setting up Em Comm for Corner Brook Hospital. VO1CM, A/Dir CRRL, outlined WARC proposals at recent SONRA dinner meet. VO1GT Rptr relocating Holyrood Hill with auto-patch via uht link. VO1CU rec'd PR in Gander News & CBC radio. APN sess 29, ANI 198, QTC 128/112. ECN sess 58, QTC 462, Rate 0.6087 (Jan) NPN sess 31, QNI 1298, QTC 22. Traffic: VE1WF 367, VE1ICR/RO 125, VE1BMN 73, VE1OC 55, VE1BXA 30, VE1XF 27, VE1KR 11, VE1HJ 9, VE1AUL 9, VE1ABG 4.

ONTARIO: SCM, Larry Thivierge, VE3GT — A/SCM: VE3BMG. SEC: VE3APK. STM: VE3GOL. Welcome to our new A/SCM, VE3BMG, who has been appointed to replace VE3GOL. VE3GOL is stepping down in order to devote more time to her STM duties. VE3BGM will be responsible for club liaison. VE3OT had the pleasure of presenting an ARRL Certificate of Merit to VE3KK, one of the section's most capable and prolific cw traffic handlers — congrats from the NTS gang. The presentation took place at a recent KWARC meeting. VE3GNW joined the professional loafers. The new board of directors of the Toronto FM Communications Society, who operate repeaters VE3s RPT SIX MPU and TWR are: VE3PQ N8AJK and VE3s MB EJW ARE AYT BDW. New members of the Metro ARC: VE3s JNL KDT and LEK. VE3BVD heard signing /ST2 from Khartoum in the Sudan while on a work assignment. Bancroft ARC, resting after the hectic pace of XJ3TBC is considering operating FD. They have also added VE3s LXC and MHF to their ranks: 1980 is the 125th anniversary of the city of London's founding. In celebration, the London Club, recently League affiliated, has been given authority to use the special prefix, XL3. This applies only to the club station and thus XL3LON will be on the air. VE3KOD has taken over as NM of the Twin Soo-Mini Net. Oakville ARC celebrating their 25th anniversary, have new members in VE3s QT LLN and ACN. VE3RL and HPN working on a 1296 MHz project. SEC, VE3APK, happy with his new 101-ZD. VE3KXB, Peterboro, is into cw traffic handling along with VE3s BZB and CYR. VE3FDX presented with WAVE Award #10-12 by VE3MDL. Ex-VE3BWK now VE4AT has been awarded a Life Membership in the Northtown ARC on the basis of being a founding member. W1AW broadcasting a weekly DX bulletin every Friday (GMT) with all the latest DX info. In addition, any bulletin that has information pertinent to Canadian amateurs will be identified in the preamble as a CRRL Bulletin. New field appointees: EC Almonte and OTS, VE3IHZ; OTS, VE3JLL. Stations interested in becoming Official Bulletin Stations are requested to contact me. Are you ready for FD? Traffic: (Feb) VE3CWA 521, VE3JIR 510, VE3GOL 420, VE3KK 371, VE3ISW 212, VE3JRT 207, VE3DPO 205, VE3CYR 194, VE3FGU 132, VE3GT 91, VE3SB 87, VE3IFP 85, VE3EWD 68, VE3JPP 60, VE3BVG 54, VE3DVE 48, VE3GFN 47, VE3APK 39, VE3DUK 35, VE3IXB 38, VE3JRO 39, VE3ANJ 29, VE3WG 28, VE3GJG 27, VE3ABG 25, VE3EBC 23, VE3AJN 21, VE3KXB 21, VE3HCS 16, VE3KLX 14, VE3CBR 12, VE3AIZ 8, VE3FPI 6, VE3JHE 6. (Jan) VE3AYZ 25, VE3AWE 20, VE3WG 12, VE3LVE 8, VE3GNW 7, VE3FPI 5.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. New appointee: VE2DLH as OTS and OO. VE2EBQ (pres. of MARC) has started a net on VE2BG repeater every Tuesday night at 1930 local time. Few ARC's are already making plans for Field Day on June 28-29. We should have a good participation this year. Depuis tres longtemp a toutes les semaines sur 3780 MHz, VE2BZL's s'occupe de reseau "Le Marche aux Puces." Felicitations de Tous pour tes services. Traffic: VE2FFE 58, VE2APT 56, VE2FEX 14, VE2EKC 12.

SASKATCHEWAN: SCM, Norm Waltho, VE5AE — SEC: VE5WM. NMs: VE5DC VE5HG VE5WM VE5SF. SPN: QNI 1163, QTC 32; SATN: QNI 366, QTC 29; PwxN: QNI 530; Rara: QNI 407, QTC 3; A new 2-mtr net has just started up in Saskatoon on 146.04/64 at 0300Z. Bulletins from ARRL/CRRL and CARF are now being heard on the Sask nets when they become available. SARL is still alive I hear! Don't forget the hamfest this year in Battleford on the weekend of August 2 & 3, '80. Traffic: VE5AE 49, VE5HG 22, VE5BBD 12, VE5WM 9, VE5BBH 5, VE5AAT 4, VE5OI 4, VE5UX 3, VE5XS 3, VE5KS 2, VE5LK 2, VE5NJ 2.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: W3PQ. STM: W3QQ W3WD. PSHR: K3JL 80, N3AKC 80. K4CHE reports joining WB3ILO K3JLY and WA3CTL on the air via ATV. WB3HSP seeks USAF MARS applicants. New DARC Novice liensees include KA3EWG KA3EWH and KA3EXI. W3MDJ and W3HGA wish to thank all hams who donated blood for Ralph. W3LEU WB3ITC W3DQZ and AF3D are reported recoving at home following hospitalization. Dover Hams expect to have their 146.19/79 repeater back on the air from the Court House soon. DTN: QNI 286, QTC 60; DEPN: QNI 53, QTC 10. Traffic: (Feb) W3PQ 279, N3AKC 124, W3QQ 49, N3ND 40, W3DKX 35, WA3WIY 35, WB3DUG 24, K3JL 22, W3WD 16. (Jan) W3PQ 205, N3ND 18.

EASTERN PENNSYLVANIA: SCM, G. S. Van Dyke, Jr., W3HK — SEC: WA3PZO. STM: K3NGN. NMs: W3VA WA3WQP AJ3R K3NGN. Net Reports: PFN QNI 402, QTC 570; AREC(2) QNI 15; EPA QNI 588, QTC 271; PTTN QNI 265, QTC 99; EPAEP&TN QNI 414, QTC 100. OO reports: W3CL W3KEK W3KCM W3GOA K3RDT W3FAF. OVS reports: N3CP W3GOA WB3AZE W3CL WA3BJQ. OBS reports: WA3JYZ W3VA W3CL W3ID. PSHR: KB6FR/3 WA3WQP KA3DYN AJ3R WB3CAI WB3FEH WB3GZV. BPL: KB6FR/3 (In one day!) AJ3R WA3WQP WA3ATQ. New officers HRAC: WB3FQL, pres.; WB3EYB, vice pres.; W3MWK, secy.; WA3TKV, treas. Many Hams took part in the torch run. Thanks to the following clubs: Delaware Co, Mid Atlantic, Philmont Penn Wireless, Holmsburg, Phila, Southern Chester Co, Riddley HS. Coordinators were N3AYK Delco, WA3PZO state, WB3ELA east state, WA3AOP & K3UKW Phila, AG3R Bucks Co. KA3AHX has new IC255A plus IC701. K3MWA has new jr op. WB3DXF sporting commercial second ticket! WB3FKO got his tribander in air. WB3FYT using TRS 80 for cw. Gang at Wilkes Barre working hard for exams coming up. WA3ATQ reports tough sledding, no snow! WB3GZV on borrowed gear, not time. AA3B assisted Red Cross in apt fire evacuation with PWA. Reading rptr 146.31/91 has code practice every Monday evening. W3BUR had a contact with KC4USR at bottom of world. I wonder if cw comes in inverted from there? Thanks for all the well wishes and don't forget the new SCM is W3VA. Send your reports to him and on time! It has been fun being SCM. Again tnx for all your help. Will see you on the bands. Traffic: WA3WQP 1931, KB6FR/3 993, AJ3R 580, WA3ATQ 514, WA3CFJ 219, WB3FEH 218, W3IPX 190, W3BI 173, K3NGN 169, WB3GZV 164, WB3JYZ 145, K3EIO 131, W3VA 109, W3FAF 97, AF3R 77, KA3DYN 69, WB3CAI 67, AA3B 49, W3HK 47, N3CD 42, W3ADE 28, WB3GUR 28, WB3FPL 22, W3ID 20, W3CL 15, W3BUR 11, N3CP 11, WA3VIL 8, K3AKN 4, K3EBZ 4, WA3YOE 4, WA3BJQ 3, KA3CHB 3, K3RHI 2, K3AI 1, WB3AZE 1, W3EU 1, W3GMK 1, W3GOA 1, W3KCM 1, W3KEK 1.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — We need a SEC for MDC. WB3GZU and WB3KYL made the BPL list for Feb, and they are joined on the PSHR list be AA3S K3ORW W@VJD/3 and WB3KDQ. Congrats to you all. KA5BQF/3 and WA3BGC are interested in ARES. WB3KQU has relieved K3EUG as EC Frederick. W3MR sends a post card from PA@-Land. WA3SXH is in business for himself, but at age 21 manages DXCC 302/296. W3CDQ is plotting good times for the QCWA banquet. W4MLR/3 is an OO. N3AFM may be our sole 6 meter man, except WB3JRW just bought a new rig for six. W3ECN makes his splash on weekends. With the nets: Net/Manager Sessions/Traffic/QNI average. MDC PON/W3CYY 4/8/22.5; WR PON/W3DFW 17/24/20.2; MEPN/AA3S 31/198/28.1; 100% W3ADQ AE3W and WB3GZU. Others were N3AGM N3AMA WB3BFK W3FA WA3IHW K3ORW K3ONU and WA2YFM. Congrats to you all. MDD Jan/W3PQ 62/237/10.2. Brass N3AKC W3FA and WB3GZU. MDD Feb/W3PQ 58/330/11.8. Brass N3AKC and W3FA. W3FZV was in the cw portion of the QCWA party. N3SJ loves the eastern shore. WB3CES relays traffic via 2-meters. K3IU and K3KU teamed up for the Fone DX test. Their new motto is "cw forever!" AA3S has been known to travel for the sheer fun of it! N3QA is on the western side of the eastern shore. Bulletins that help are the So Md ARC, Mt ARC and the FAR. We miss AA3A's Ham Arundel news as do the members. Congrats to new Generals KA3DUG and WB3JDV. The So MD ARC Rpt Maintenance Committee finally get a job to do on the club repeater after years of zero defects. WB3AXV is the Mt ARC's Man of the Year. N3AWG and WB3BKJ are top notch instructors. In their class of 24: 23 got Novice tickets and 1 got his Technician ticket. Congrats to you and your students. Traffic: WB3GZU 777, WB3KYL 241, K3IU 227, W@VJD/3 205, N3SJ 175, K3ORW 136, W3FA 130, WB3KDQ 127, AA3S 54, W3FZV 24, N3QA 21, W3ECN 14, WB3CES 10, WB3JRW 10.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: WB2LCC. Special congrats to the Jersey Shore ARS for getting their repeater back on the air. For those who do not know, JSARS had the misfortune of having their machine stolen from their site late last year. A massive fund raising effort paid off handsomely, as they have now taken delivery of a brand new machine. JSARS provides a valuable public service by sponsoring the JSARS Traffic Net which meets at 8:30 P.M. daily on their machine, 146.91 in Toms River. It provides outlets for a lot of Ocean County traffic that may not otherwise get delivered. While we're on the subject, a reminder of the other nets might be in order. Serving Mercer County is the Mercer County Traffic Net (MCN) meets nitely at 10:30 P.M. on the 147.075 repeater in Robbinsville. The Shore Points Amateur Radio Traffic Net (SPARTN) meets nitely on the 146.94 machine in Brigantine to handle traffic throughout Atlantic, Cape May and parts of Cumberland counties. SPARTN is sponsored by the Shore Points ARC (SPARC). Last but not least is the South Jersey VHF Net (SJVN), serving Burlington, Camden, Gloucester, Salem and the rest of Cumberland counties. SJVN meets nitely at 10:30 P.M. on the Bellmawr 146.895 repeater. SJVN will be moving to a new machine shortly, so check with me if you can't find it. See you on two??? Traffic: AA2H 283, WA2CUW 86, KC2A 80, WA2HEB 64, WB2LCC 60, WA2ONW 59, WB2HUV 57, W4NLC 41, WB2IQJ 32, WA2WSV 28, KA2GTE 24, N2AEP 19, K2UL 18, K2YBN 18, WA2WUL 11, WA2PTO 10, W2ZQ 10, AA2C 6, KB2OE 5, WA2GTJ 3.

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — STM: W2MTA. SEC: W2BCH. As you can see above, I am pleased to announce the appointment of W2BCH of Camillus, NY as SEC. Welcome aboard! Also, welcome to N2ALI, appointed EC of Yates County. PSHR this month to W2ZOJ WA2ZJP W2MTA WA2MFV N2APB KA2CTU WA2AFE WA2KOJ W2EAT W2PZL WB2NAO and WB2OTC. KA2BGX/N also is a late listing for January. I'll say it again — if I don't get your monthly reports around the 5th or 6th of the month, they will not go in until the following month! TA WA2ANU gave talks at Ft. Herkimer ARC and Schenectady ARA in April. If you would like a talk to your club, drop him a line. W2RQF now has coverage 160 thry 440 with additions of a Icom 551D and Drake LW3. A correction in club officers — KA2EGZ is the new secy. of the Lockport ARA. Must have gotten lost in the mess — Santa (K2RMG) and elves N2BER N9TE/2 WB2ODH WB2ODK K2OS K2JXE WA2ODD KA2ATB W2ZPT and KA2ATH traveled to various locations and pediatric wards in Genessee Co. hospitals for Christmas. Very successful event, and even though late, thought it should be included here. 1980 Griffiss AFB ARC officers are: W2TPB, pres.; W4BNY, vice pres.; WA2VXX, treas.; WB2RWW, secy. WB2RWW also promoted to Staff Sergeant. New WNY CW Net freq — Sundays, 8 P.M. local, 3715 kHz, N2APB NCS, 7 wpm. CNY now firmly established, 9:15 P.M. local, Syracuse 90/30 daily. W2ZOJ mgr. Still looking for ECs for the following counties: Cattaraugus, Chautauqua, Chenango, Delaware, Essex, Franklin, Jefferson, Lewis, Madison, Ontario, Otsego, Schoharie, Schuyler, Seneca, Wayne. Traffic: (Feb) W2CXM 421, WA2MFV 391, W2ZOJ 374, WA2HSB 353, WA2ELD 312, W2MTA 305, WA2AFE 193, KA2CTU 175, WA2KOJ 170, W2PZL 115, W2FR 107, WA2ZJP 107, AF2K 82, WB2EOX 81, W2RQF 73, WB2QIX 72, WB2OMZ 53, WB2OWO 52, WB2NAO 48, WA2MFU 42, WB2OTC 39, N2ALB 37, WA2AOG 36, KB2GT 27, W2AET 24, WB2MVC 24, WB2PID 24, WA2GJU 14, WA2ANU 12, K2DNN 12, WA2UAR 6, K2VR 5. (Jan) KA2BGX/N 152, WB2RWW 80, K2GWN 65, W2RQF 45. (Dec) WB2RWW 166.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM: N3FM. SEC: WA3VUP. Asst SECs: WA3JBQ. STM: W3YO. NMs: W3NEM W3KUN W3MML WA3PXA & WB3JDI.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	29	339	130	3585	8:00 P/Dy
WPAPTN	29	652	293	3983	6:15 P/Dy
WPA2MTN	29	582	163	146.28/88	8:00 P/Dy
NWPAPTN2M	25	198	32	146.04/64	9:30 P/Dy

WPARACES 3990.5 kHz 9:00A/S. Pttn 3610 kHz 6:30 P/D. Radio Assn of Erie new officers: WB3IFD, pres.; WB3KHK, vice pres.; KA3CKR, secy.; W3YLI, treas. Foothills ARC: WB3CQA, pres.; K3EAS, vice pres.; WB3HZM, secy.; KA3DFK, treas.; WB3EKR, mem at large. Somerset ARC: K3JQO, pres.; WA3BKF, vice pres.; W3PVG, secy.; W3WJB, treas. I hope when this is read W3UVD and N3AKV will be well on the road to recovery. Upgrading: KA3DJM to Advanced; KA3CSP KA3ECU and N3BDH to Tech, congrats. ECs are needed for Potter, Fulton, Somerset, Westmoreland, Cambria, Greene and Fayette Counties, perhaps one or two will be found before this goes into print, but volunteers are welcome. I have asked the SEC for his ideas on the DEC prom as planned by the League. The section can be divided into five or more districts to better coordinate operations in an emergency. Any suggestions are more than welcome from ARES and RACES members. Here in Allegheny County the groups are now one. K3GP is on 147.87/27 with RTTY bulletins. Traffic: WA3PXA 407, W3EGJ 346, N3EE 165, W3NEM 165, WB3JDI 134, KA3DJM 122, W3KMZ 117, WB3HGE 114, W3YO 112, W3SMV 109, W3UHL 79, WB3HUJ 68, K3SMB 66, W3UTD 59, W3MML 58, KB3DT 57, N3FM 57, W3GWJ 47, WA3UNX 42, W3KUN 34, K3HCT 30, N3KB 29, W3RUL 27, WA3VRE 21, WA3JBQ 20, W3EXC 19, WB3JGD 18, W3TTN 16, WB3KBV 12, WB3KJU 12, N4DR 11, W3SN 10, AF3B 9, N3BDH 8, WB3GUK 7, N3AZH 6, WB3BOB 6, K3ISO 6, W3LOD 5, KA3DXP 2, WB3JCW 2.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst SCM: W9RYU. SEC: W9AES. NMs: WA9KFK and WB9JSR. Cook County EC: W9HPG.

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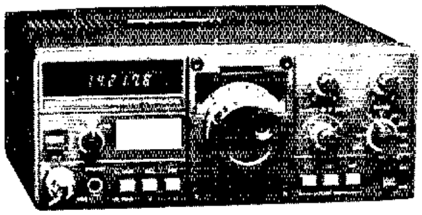

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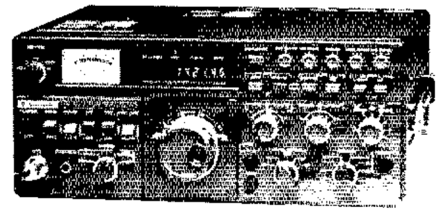
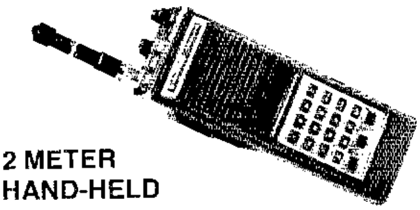


KENWOOD TR-2400



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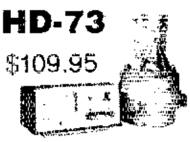

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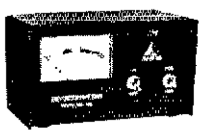

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Net	Freq.	Times/Days	Tfc	Sess.
ILN	3690	0030/0400	358	58
ILL Phone	3915	2130 Dy	139	29
NCPN	3915	1200/1700	269	49
IEN	3940	1400 Su		no report
W9VEY Mem Stn	2 meter Net		11	4

KA9FIM is now Tech and WB9ZBF has upgraded to General class. The Hamtesters Radio Club Novice class has graduated 15 new amateurs. Our sympathy to the family and friends of WA9BWB who passed away on Feb 22. He is the father of W9AVB. K9YMZ also joined the ranks of the Silent Keys on Feb 19th. W9HOT reports that the 9RN daytime net passed 410 messages during 87 sess and Illinois participation was 100 % with W9JIJ W9YCE WD9FDB WB9WGD WA9AQ and WB9SYT checking in. KA9EKK is now Tech. KA9EKN is now General with new call of N9BFD and WD9HAQ KA9AMF N9AYO and N9AKS are Advanced. WD9IXE has Extra. All received their licenses with the upgrading efforts of the Lamoine Emergency Amateur Radio Club. New station appointees include WB9HTC as an OVS and K9DUE as an OO. W5KLV reports that the CAND during 58 sess had a traffic count of 620 with 9R-Land participating 100% with K9SVE W9HOT W9JIJ W9NXG WD9FDB and WB9WGD checking into the net. The ARCH Convention will be held May 24 and 25 at Cervantes Center, St. Louis, MO. The Wheaton Hamfest was a success. A new location and date helped make it their greatest. WB9ARR was selected Ham of the Month by the Sterling-Rock Falls Amateur Radio Society. W9JIJ is the only BPL recipient for the month. Traffic: W9JIJ 372, W9HOT 248, K9PNG 247, K9EEA 235, K9BZE 193, WB9JSR 178, W9OK 163, W9YCE 150, W9OBS 146, WD9FDB 111, WA9KFK 110, WB9PUK 89, N9TN 81, WB9EVV 76, W9TLU 74, KA9ALR 73, WB9WGD 67, W9OYL 66, K9UN 58, KN9BAM 54, KA9DTE 40, W9LNO 35, W9KR 25, W9PRN 22, WD9EDQ 15, WD9HZF 7, W0RJW 7, AA9R 2, K9DQU 1.

INDIANA: SCM, J. M. Kell, W9LTU — SEC: W9UMH. STM: W9JUJ. Net Managers: ITN W9QYY AIN WD9GXW ICN N9AEI VHF W9PMT. February net reports, times in UTC and freq in kHz.

Net	Freq.	Time	QNI	QTC	Sess.
ITN	3910	1330/2300 Dy	1969	334	58
QIN	3656	1430/0100/ 0400 Dy	762	461	87
ICN	3708	0015 Dy	126	32	29
IPN	3910	2130 Dy	1198	220	29

Ind 100% on D9RN in Feb. IPON report QTC 1. VHF net list conclusion.

Net	Freq.	Day	Time	Mgr.
VC ARES	146.25/85	Sun	8:30 A.M.	W9MIJ
VC RACES	146.52	Wed	7:30 P.M.	W9IHO
WC ARES	147.87/27	Sat	8:00 P.M.	WB9LCN
WC ARES	147.75/15	Wed	8:15 P.M.	N9EV
WC ARES	146.675/075	Tue	8:30 P.M.	K9TKE
HC ARES	146.46	Tue	8:00 P.M.	WB9EBI
TARS	147.075/675	Sun	8:15 P.M.	WB9VQK

Space limitations did not permit much description on net name. Most were listed by county (i.e., VC is Vigo Co). Hopefully there is enough info to find the time of your local net. A complete list with full description if you send the SCM a s.a.s.e. VHF managers please send a monthly report to W9PMT on 1st of each month. VHF nets report for Feb: QNI 2783, QTC 164 with 16 nets reporting. Silent Key K9QFU. Traffic: (Feb) W9JUJ 1162, W9TG 175, WD9CIS 156, WD9GXW 141, WB9UYU 136, W9QLW 119, W9FC 116, W9PMT 77, W9DLF 76, WA9QCF 74, N9AEI 72, W9XD 64, W9EI 63, WB9JHD 53, K9WWJ 47, W9HUF 45, WA9OKK 37, WA9TJS 37, WB9VJE 30, KA9CVZ 27, K9TKE 24, WD9JAB 23, N9PS 19, W9IOH 18, K9CGS 16, K9DIY 16, W9VAY 16, W9WEI 9, W9RTH 7, N9AST 6, W9BDP 4, W9ENU 3. (Jan) W9EI 70.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. NMs: W9AYK W9IEM WB9ICH N9AUG K9LGU W9DM. Please note WNA picnic at a new place, Dells of the Eau Claire near Hogarty, east north east of Wausau, camping facilities. New Novice Watertown, KA9GRH; Eau Claire, KA9GED KA9GGX KA9GNG KA9GMW KA9GTE KA9GNE; Baraboo, KA9GPJ. La Crosse, KA9GRI KA9GTB. Get your station activity reports to me as soon as possible after end of month. Does your county have an EC?? We need more. WNA meeting on the air was very successful. Please fellows and gals, any bits of news you have, send it to me. WD9IUX, new XYL to Wisconsin nets, has certificate for WIN-E. Green Bay 2-meter Net had 55 QNI, 9 QTC. KA9DQQ WD9CRC have upgraded. W9ACG is on 220 MHz. KA9CPA made BPL. New Novice Omro, KA9GVI. New Novice Madison area KA9GPY. WB9YSD in Oshkosh has phone patch facilities. NWTN had 423 QNI, 52 QTC. Traffic: (Feb) KA9CPA 1257, W9GXY 262, WD9ESZ 225, W9DND 151, W8IEM 139, K9FHI 138, WB9YPY 135, N9AZI 133, N9AUG 132, W9YCV 109, WD9DHF 107, W9UGL 81, WB9NRK 75, W9AYK 74, WD9BCM 63, WB9ICH 63, W9DM 61, K9AO 49, W9WNA 45, W9OT 42, K9HDF 41, K9AKG 40, KB9FA 40, K9LGU 40, K9JPS 35, W9FDY 32, WB9WHO 31, W9IHW 30, W9LDO 30, W9MFG 30, WD9AJA 29, KB9FM 29, K9UIJ 27, N9CP 26, WB9JSW 23, WB9YPZ 23, K9CPM 21, WD9IUX 21, W9UW 21, WB9ESM 20, WA9LDX 18, K9ANV 17, WB9PAW 17, AG9G 16, K9KSA 14, W9SFL 10, WA9WYS 10, WB9RRU 9, AI9K 6, W9CJE 5. (Jan) K9CPM 2, KB9CT 2. (Dec),K9CPM 10.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX —

Net	CDST	MHz	ANI	QTC	Sess.
MSPN N			186	53	29
MSSN			148	28	28
MSNE			765	146	29
WNX			456	335	29
RARES	0130Z	22.82	94	19	4
Austin RES	0330Z Su				
Moose Lake		146.4/00 in 147.0/00 out			is on air no net sch yet
Mankato RES	0330Z	147.84/24			
S MN Waseca RES	0300Z	3494			
RedWing RES	0100Z Tu	147.90/30			
Hampton RES	0315Z Su	147.96/36			

After some 18 years absence from NCS, QTS, etc., KØJCF started as NCS with a bang on MSN2. K9EFI/8R1 needed North Dakota so he checked in on the net. You might say MSN2 became a DX net. Welcome back to the fold. Like father like son in Rochester: WDØFCX, the father has his Extra Class and son KAØCSE has his

WILSON SYSTEMS, INC. PRESENTS . . .

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3 MONOBAND ANTENNAS IN ONE. EACH WITH FULL MONOBAND PERFORMANCE

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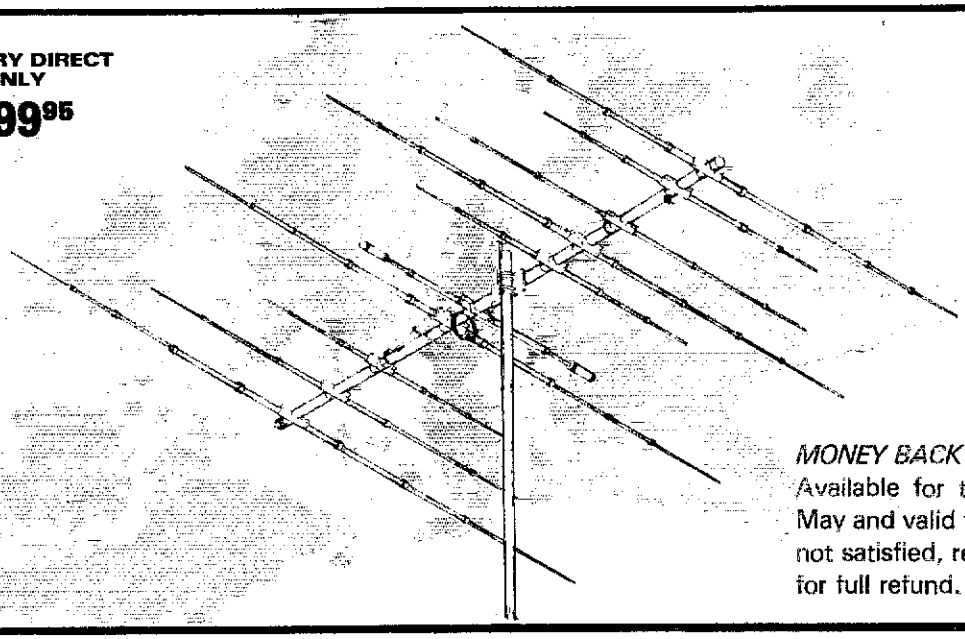

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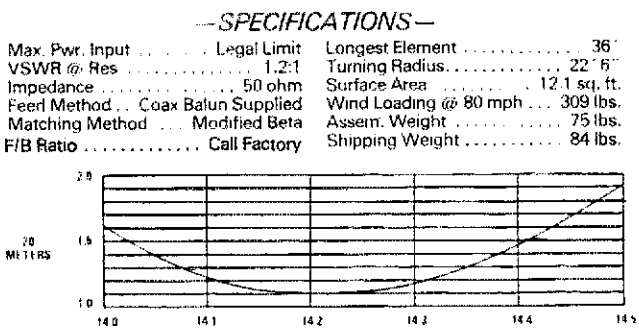
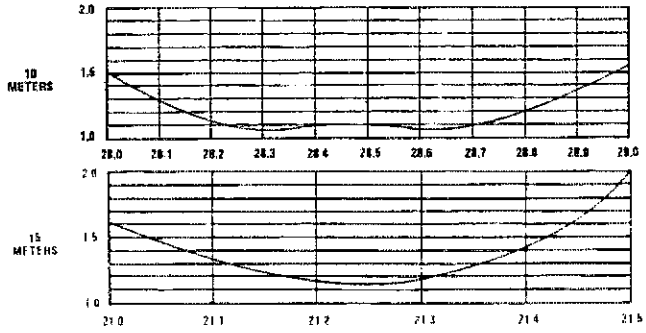
A NEW CONCEPT IN ANTENNA DESIGN USING A 26 FT. BOOM

- FOR THE SERIOUS DXer WHO WANTS MONOBANDERS ON 10-15-20
- FOUR FULL SIZE 20 MTR ELEMENTS—CALL FACTORY FOR GAIN
- THREE WIDE SPACED 15 MTR ELEMENTS—CALL FACTORY FOR GAIN
- FOUR WIDE SPACED 10 MTR ELEMENTS—CALL FACTORY FOR GAIN
- ONLY ONE FEED LINE REQUIRED
- DESIGNED WITH NO INTERACTION BETWEEN ELEMENTS
- ALL PARASITIC ELEMENTS ARE FULL SIZE
- BROADBANDED — NO SEPARATE SETTINGS REQUIRED FOR PHONE OR CW
- SAME QUALITY HARDWARE AS USED IN ALL WILSON ANTENNAS

—SPECIFICATIONS—

Max. Pwr. Input	Legal Limit	Longest Element	36'
VSWR @ Res	1.2:1	Turning Radius	22' 6"
Impedance	50 ohm	Surface Area	12.1 sq. ft.
Feed Method	Coax Balun Supplied	Wind Loading @ 80 mph	309 lbs.
Matching Method	Modified Beta	Assem. Weight	75 lbs.
F/B Ratio	Call Factory	Shipping Weight	84 lbs.





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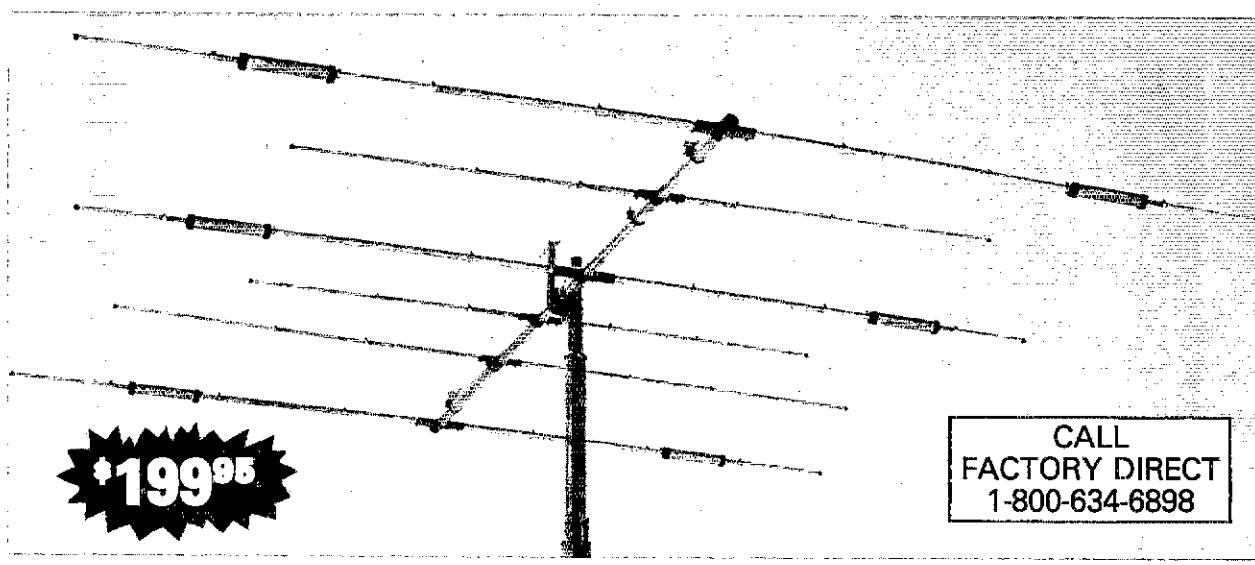
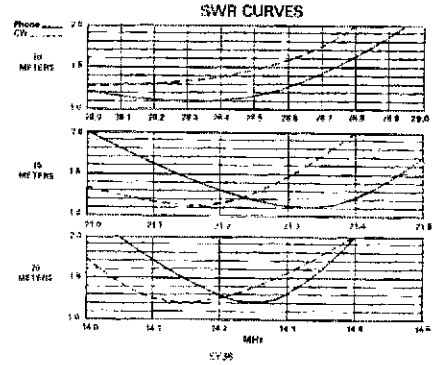
WILSON SYSTEMS, INC.

the SYSTEM 36



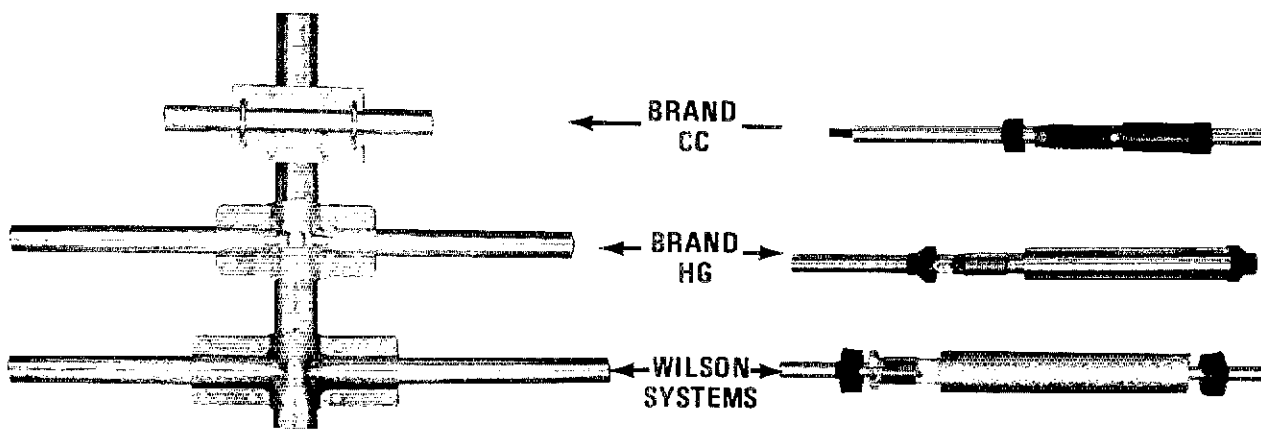
A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Q Wilson traps. Designed to handle the maximum legal power, the traps are capped at each end to provide a weather-proof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.



SPECIFICATIONS

Band MGz	14-21-28
Maximum power input	Legal Limit
Gain (dBd)	Call Factory
VSWR @ resonance	1.3:1
Impedance	50 ohm
F/B Ratio	Call Factory
Boom (O.D. x Length)	2" x 24' 2¼"
No. of Elements	6
Longest Element	28' 2½"
Turning Radius	18' 6"
Maximum Mast Diameter	2"
Surface Area	8.6 sq. ft.
Matching Method	Beta
Wind Loading @ 80 mph	215 lbs.
Maximum Wind Survival	100 mph
Feed Method	Coaxial Balun (supplied)
Assembled Weight (approx.)	53 lbs.
Shipping Weight (approx.)	62 lbs.

Compare the SY-36 with others . . .



Compare the size and strength of the boom to element clamps. See who offers the largest and heaviest duty. Which would you prefer?

Wilson Systems traps offer a larger diameter trap coil and a larger outside housing, giving excellent Q and power capabilities.

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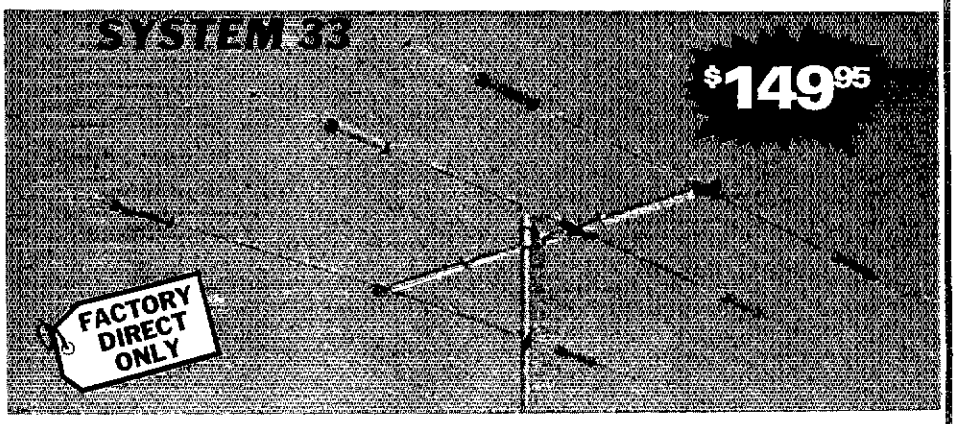
WILSON SYSTEMS INC.

SYSTEM 33

$149.95



Capable of handling the Legal Limit, the *SYSTEM 33* is the finest compact tri-bander available to the amateur.

Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excells with the *SYSTEM 33.*

New boom-to-element mount consists of two 1/8" thick formed aluminum plates that will provide more clamping and holding strength to prevent element misalignment.

Superior clamping power is obtained with the use of a rugged 1/4" thick aluminum plate for boom to mast mounting.

The use of large diameter High-Q Traps in the *SYSTEM 33* makes it a high performing tri-bander and at a very economical price.

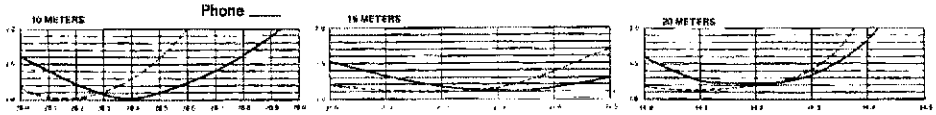
A complete step-by-step illustrated instruction manual guides you to easy assembly and the lightweight antenna makes installation of the *SYSTEM 33* quick and simple.

SPECIFICATIONS

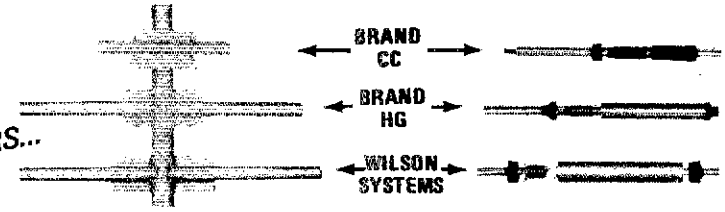
Band MHz.....14-21-28	Boom (O.D. x length)2" x 14'4"	Wind load @ 80 mph.. 114 lbs
Max. power input...Legal limit	No. elements..... 3	Assembled Wt..... 37 lbs
Gain (dbd)..... Call Factory	Longest element.....27'4"	Shipping Wt..... 42 lbs
VSWR at resonance.....1.3:1	Turning radius.....15'9"	Direct 52 ohm feed
Impedence.....50 ohms	Max. mast diameter...2" O.D.	no balun required
F/B ratio..... Call Factory	Surface area.....5.7 sq. ft.	Max wind survival ... 100 mph

ACTUAL SWR CURVES

CW ------
Phone ____



COMPARE THE SY33 WITH OTHERS...



Compare the size and strength of the boom to element clamps. See who offers the largest and heaviest duty. Which would you prefer?

Wilson Systems traps offer a larger diameter trap coil and a larger outside housing, giving excellent Q and power capabilities.

NEW! ADD 40 METERS TO YOUR TRI-BAND WITH THE NEW 33-6 MK

$49.95

— IN STOCK —

Now you can have the capabilities of 40-meter operation on the *SYSTEM 36* and *SYSTEM 33.* Using the same type high quality traps, the 40-meter addition will offer 200 KHZ of bandwidth at less than 2:1 SWR. The new 33-6 MK will fit your present SY36, SY33, or SY3 and use the same single feed line.

The 33-6 MK adds approximately 20' to the driven element of your tri-bander, increasing the tuning radius by 5 to 6 feet. This addition will offer an effective rotatable dipole at the same height of your beam. The 33-6 MK will not interfere with the operation of 10, 15 or 20 mtrs.

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$49.95

WV-1A

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a base mount bracket to attach to vent pipe or to a mast driven in the ground.

Note:
Radials are required for peak operation.
(See GR-1 below)

SPECIFICATIONS

- 19' total height
- Self supporting — no guys required
- Weight — 14 lbs.
- Input impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q traps with large diameter coils
- Low angle radiation
- Omnidirectional performance
- Taper swaged aluminum tubing
- Automatic bandswitching
- Mast bracket furnished
- SWR: 1.1:1 or less on all bands

GR-1

$12.95

The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded copper wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the GR-1 by providing the correct counterpoise.

WILSON SYSTEMS TOWERS

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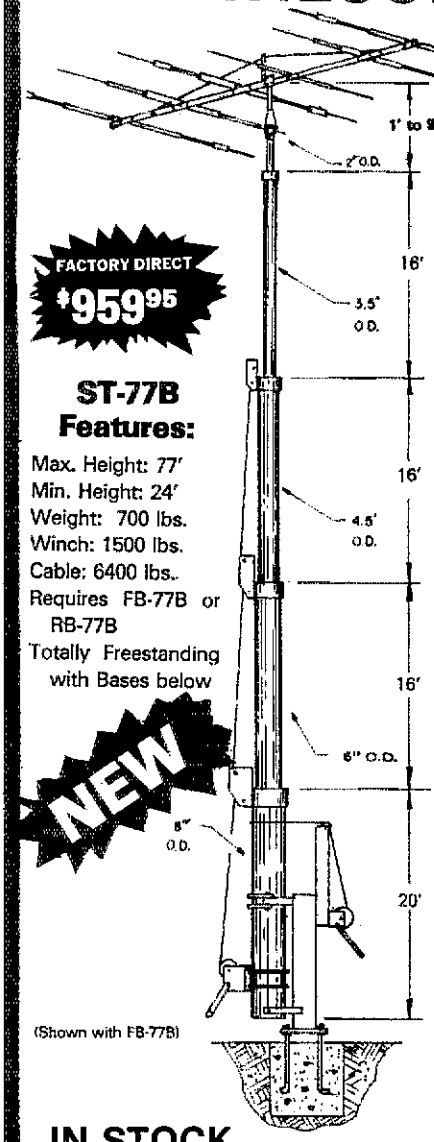


(Shown with FB-77B)

FACTORY DIRECT $959.95

ST-77B Features:

Max. Height: 77'
Min. Height: 24'
Weight: 700 lbs.
Winch: 1500 lbs.
Cable: 6400 lbs.
Requires FB-77B or RB-77B
Totally Freestanding with Bases below

NEW

FACTORY DIRECT $554.95

MT-61B Features:

Max. Height: 61'
Min. Height: 23'
Weight: 450 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against house.
For completely freestanding installation, use RB-61B or FB-61B below.

FACTORY DIRECT $319.95

TT-45B Features:

Max Height: 45'
Min. Height: 22'
Weight: 250 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against eve of house.
For completely freestanding installation, use RG-45B or FB-45B below.

WIND LOADING			
Tower	Height	Sq. Ft.	
ST-77B	69	18	Square Footage Based on 50 MPH Wind
	77	12	
MT-61B	53	18	
	61	12	
TT-45B	37	18	
	45	12	

BASE CHART		
TOWER	WIDTH	DEPTH
TT-45B	12" x 12"	30"
FB-45B	30" x 30"	4½'
RB-45B	30" x 30"	4½'
MT-61B	18" x 18"	4'
FB-61B	3' x 3'	5½'
RB-61B	3' x 3'	5½'
ST-77B	See Below	Bases
FB-77B	3½' x 3½'	6'
RB-77B	3½' x 3½'	6'

IN STOCK

Wilson Systems uses a new high strength carbon steel tube manufactured especially for Wilson Systems. It is 25% stronger than conventional pipe or tubing. The tubing size used is: 2" & 3½"-.095; 4½" & 6"-.125, 8"-.134. All tubing is hot dip galvanized. Top section is 2" O.D. for proper rotor and antenna mounting.

The TT-45B and MT-61B come complete with house bracket and hinged base plate for against-house mounting. For totally freestanding installation, use either of the tilt-over bases shown below.

The ST-77B can not be mounted against the house and must be used with the tilt-over base FB-77B or RB-77B shown below.

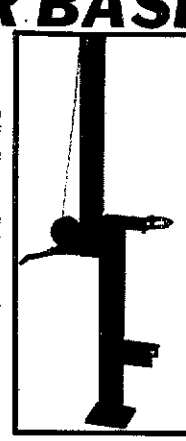
All three towers above are able to handle large arrays of up to 20 sq. ft. at 80 mph WHEN GUYED with one set of 4-point Guys at the top of the 3½" section. Guying Kits are available at the following prices: GK-45B—$59.95; GK-61B—$79.95; GK-77B—$99.95. When using the Guy System with RB Series Rotating Base, an additional thrust bearing at the top is required. The WTB-1 is available for $49.95.

TILT-OVER BASES FOR TOWERS

FIXED BASE

The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower.

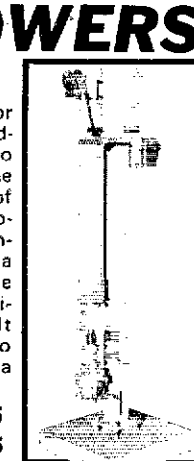
FB-45B . . 112 lbs. . . $159.95
FB-61B . . 169 lbs. . . 219.95
FB-77B . . 250 lbs. . . 304.95

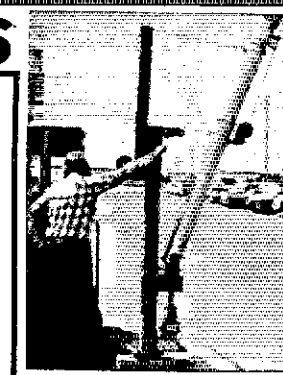


ROTATING BASE

The RB Series was designed for the Amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system.

RB-45B . . 144 lbs. . . $224.95
RB-61B . . 229 lbs. . . 304.95
RB-77B . . 300 lbs. . . 454.95





Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

ORDER FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

General, likewise WAØWQY has his Extra and son KAØCRO has his Tech. Nice work guys. From General to Advanced: WBØETR WBØDHG KAØBGA KBØN formerly WDØFFE WBØFNL WDØFMY WDØFNW WBØZBJ KØBJQ. Novice to Tech: KAØGHU KAØCRX now NØBLX and Novice to General KAØFZA. How's that for ambition. Congrats to all of you. Our deepest sympathy from the Minnesota Section to AIØD in the loss of his father; WAØYVT in the loss of his mother and to Mr. and Mrs. Ivan Hibna in the loss of their son, KØQBI, who became a Silent Key February 16. Just a reminder of the swapfest in Duluth May 3 and the hamfest in Hibbing July 12-13. Mark your calendar and watch for more hamfests in the future. Traffic: WAØTFC 282, WBØHOX 254, WØHZU 238, AFØO 162, KØPIZ 124, WAØONE 120, KAØAIT 110, NØHY 106, NØADQ 104, WBØXBJ 88, WØJFX 82, WDØCGM 80, WAØAIN 64, WBØNZB 51, WBØUKI 49, KØCSE 48, KAØBZP 46, KBØN 45, WØDUW 17, KØJCF 10, NØJP 6, WØSZJ 6, KØTS 4, KØFLT 4, WAØLUT 4.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØRWM — SEC: WBØTEE. OBS: WØDM. OO: WDØCLD. NM: WAØCRH. I want to thank everyone who gave WX reports on the YL WX and DATA Nets for the NWS. The YL WX Net will close April 1, but the DATA Net will continue at 0030Z 6:30 P.M. Events to mark on calendars are: June — Mayville Hamfest, ARRL Field Day; July — Peace Garden Hamfest; August — KØPYZ Memorial Cornfeed; Sept — ARRL Dakota Division Convention. Congrats to KAØGWC new Novice from Hettinger. WDØDFT and NØAFP Advanced. WAØCHR Extra. WBØUXC Tech to General with new call NØBMS, also WDØECS now KBØM. AKØT has WAS 1×2 in Extra Class cw of 80 meters. AKØS would like to start a ND CW Net if enough interested, get in touch with him or WAØRWM. Net reports:

Net	kHz	GST/Dy	Sess.	QNI	QTC	Mgr.
Goose River	1990	0900 Su	4	57	4	WØCDO
DATA	3996.5	1830 Dy	28	361	30	WAØCRH
YL WX	3996.5	0730 Dy	28	507	483	WAØRWM

Traffic: WAØRWM 613, KBØIP 235, WAØCRH 122, WØFNZ 55, NØAFP 29, WØCDO 29, KØBWZ 28, WBØJGM 22, KØGGI 8, WDØGMD 6, WAØSUF 3.

SOUTH DAKOTA: SCM, Lydia S. Johnson, WØKJZ — Asst SCM: WØDVB. SEC: WAØTNM. NMs: WØWE WØZWL WAØs TNM VRE. Congrats to PSHR earners WAØTNM 89 points and WDØBMR 81; BPL to WØs MZI and ZWL. So Dak Annual Hamfest will be July 25, 26, 27 in Rapid City. There will be a "Folks March" in Sturgis June 21, 22; contact WAØOVR. Signal Hill ARC members will provide communications via 2-meters for the event. EC, WAØBWF, reports that the Lawrence/Harding County CD Net had 84 check-ins in 4 sessions and EC, WAØBZD, for the Tri-State 43 in Roberts Co. Recognition must be given to YL, WØZWL, who has been Weather Net Manager for 25 years, and continuous YLRL member 40 years! SHARC new pres. is WBØRQJ. How about news of your radio clubs activities? Tnx. Traffic: WØMZI 1051, WØZWL 822, WDØBMR 172, KØFRE 160, WAØTNM 158, WØHOJ 126, WAØVRE 124, WØDVB 116, WAØUEN 100, WBØOMF 35, WØKJZ 20, KØAS 12, WØIG 8.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: K5TML. NMs: KC5E W5MTZ W5POH WA5ZWZ. Nets freq time/day QNI QTC Mgr. ARN 3.995 0030/dy 1364 112 KC5E; OZK 3.760 0100/dy 208 31 W5MYZ; APN 3.937 1200/M-S 841 40 W5POH; M-Bird 3.928 2230/M-F 837 39 WA5ZWZ. Our sympathy to the families and friends of N5AZL W5EMO W5FPF who became Silent Keys. Cancel EC apt of W5YDP WB5DQJ WB5MWI. W5KL took part in QCWA CW party. A note to all ECs, our new SEC requests your cooperation and monthly reports. His address is Nelson Bailey, K5TML, 141 W. Mill St., Malvern, AR 72104. A check will be made by K5TML and W5UAU of all ECs with ref their activities and those that are not active will be cancelled. Traffic: (Feb) K5AJM 86, K5AO 52, W5QFU 49, W5SYH 48, KC5E 26, W5UAU 20, WB5WWA 18, W5BLP 17, WB5GQH 17, W5KL 14, K5DW 13, W5EIJ 3. (Jan) WD5CAA 6.

LOUISIANA: SCM, S. T. "Tom" Losey Jr., K5TL — Asst SCM: K5DPG. SEC: WB5TPG. NMs: N5RB K5TL WB5LBR WB5TPG. N5EK WD5CWK K5BLV WA5TQA WA5ZWR KB5Q WB5JZP and WB5KBA all active on DRN5. K5TL N5RB W5MI WB5LBR W5VMY WA5CAV WA5PRI N5BFV and W5GHP all active on cw RN5. Congrats to WD5GJB on DXCC confirmation. New officers for LARC are: WA5CGF, pres., WA5KNC, vice pres.; K5DPG, secy.; K5ARH, treas. New officers for MTARC are: WB5HVS, pres.; KA5HAP, vice pres.; N5BUN, treas.; KB5JM, secy. New officers for Jefferson ARC are: K5EF, pres.; K5PO, vice pres.; WD5DWO, secy. Upgrading to Advanced are: K5ABD WA5AWM WD5EUJ WB5FZT. To General: KA5DGX. Congrats to the MTARC Club and all the amateurs that took part in this year Mardi Gras Parade Coverage Net. Demonstrates once again the quality of hams in the New Orleans area.

Net	Freq.	Time	QNI	QTC	Mgr.
LAN	3615 kHz	7 & 10 P.M. Dy	274	155	N5RB
LTN	3910 kHz	6:30 P.M. Dy	463	62	K5TL
LSN	3703 kHz	7:30 P.M. M-F	102	19	WB5LBR
LRN	3587.5 kHz	6:30 P.M. Su	12	8	N5RB
LEN	3910 kHz	8:00 P.M. Su			WB5TPG

Traffic: N5TL 129, N5RB 112, W5MI 106, N5EK 65, WB5LBR 61, W5VMY 56, N5BFV 47, WD5GJB 16, WB5JZP 14, WB5EMU 11, WD5CWK 9, K5BLV 8, KB5AS 6, WB5IKT 4.

MISSISSIPPI: SCM, E. Ed Robinson, W5XT — SEC: WB5FXA. Good reports from various clubs statewide and ham activity picking up as winter weather clears. Tornadoes are already upon us and local emergency nets, etc. need your support. The real thing can be handled much easier if simulation and practice are pushed. Jackson/Metro/Red Cross had one very successful simulated tornado exercise. Field Day, coming up, gives us a big emergency trial. Now is the time to evaluate and update your personal emergency gear. Congrats to KF5R (ex-WD5GMK) and KF5V (ex-WD5OJT) on upgrades to Extra. CAND (W5KLV) sess 58, QTC 670 with MS rep 100% by N5AMK. DRN5 (WB5NKD) sess 29, QTC 521 with MS rep 100% by N5AMK K5DMD WA5OPT W5EDT AG5Z WD5MWJ KA5AFT WA5DVV. CGCHN (AG5X) sess 29, QNI 2758, QTC 226. MSBN (K5MK) sess 29, QNI 2320, QTC 76. MTN (K5OAF) sess 29, QNI 102, QTC 58. MN (WA5OPT) sess 29, QNI 594, QTC 5. RACES (N5AMK) sess 4, QNI 197, QTC 6. JCARCEN (KB5W) sess 21, QNI 583, QTC 17. Traffic: N5AMK 185, K5OAF 123, WB5FHA 101, W5EDT 56, WB5SNB 42, KA5AFT 21, W5XT 21, WD5EYM 6.

TENNESSEE: SCM, Earl Leonard, KB4G — STM: W4ZJY. SEC: W4NZW. By now we are all aware of the changes

on the evening phone net. The changes have been for the better, shorter net-more traffic, though I still hear some expressions of dissatisfaction. We are all in the traffic business, so pass along your suggestions and criticisms to the net managers, don't drop out without a fight. Hamtest time is upon us again and at the same time higher gas, so when you can, play it cool and car pool. Phone nets: 247 sess, 8173 QNI, 802 QTC. CW nets: 84 sess, 678 QNI, 249 QTC. CW Net honor roll: WA4CNY WB4LEH AF4T K4WOP K4XE W4ZJY and WB4ZSZ. This is the beginning of forty years in traffic handling for W4OGG, nice going. Several calls that used to be associated only with the phone nets are showing up on the cw net now, such as WA4CGK W4FLW WB4PRF. Lets hear it from some of you other dual mode ops. Appointments: N4ZZ, OO; W4TYU, OBS. Traffic: WA4CNY 660, AF4T 174, WB4BKF 166, W4ZJY 153, WB4PRF 138, W4OGG 124, KA4GSS 96, K4JGW 93, WD4NJR 73, K4WWQ 69, WA4FMR 62, WD4SIG 55, K4WOP 53, N4BGA 52, W4MRD 51, WB4ZSZ 50, K4XE 41, N5BVY 40, WB4LEH 33, W4EBT 32, W4PFP 31, W4VS 26, WA4CGK 23, KD4C 16, N4CUM 15, W3EWR 12, W4RUW 11, W4PSN 9, W4TYV 7, W4DTI 6, WA4GSS 6, W4VJW 6, WA4WVW 5, K4VMO 4, K4YPO 4, N4UMW 3.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joe Miller, K4DZM — STM: K4HRF. SEC: WB4ZML. Net Reporting. (Section Nets*)

Net	QNI	QTC	Net	QNI	QTC
KRN*	455	28	4-ARES	23	1
MKPN*	1214	166	5-ARES	72	1
KTN*	1362	180	6-ARES	179	13
KNTN*	405	135	PAWN	430	30
KTN*	320	141	CARN	215	35
KRTN*	123	73	SEKEN	36	0
KSN*	209	56	AATN	49	4
KPON	84	4	TS2MN	307	42
9RN-D	93%	410	BARES	79	25
CAN-D	100%	670	EWPN	239	0

PSHR: KB4OZ WD4RNI WB4ZDU K4DZM WD4JTO. Charter presented to UEI ARC. W4RHZ has new DXCC. Hope all enjoyed the Lincoln Trail Hamfest, 6th Dist. ARES handling communications for Derby Parade. OO reports from KK4Y & W4YOK. OVS rpt: WA4SWF. Traffic: KB4OZ 137, WB4AUN 133, WB4ZDU 107, WA4AVV 94, K4JLX 90, K4DZM 86, KS4V 85, WA4EBN 61, WD4RNI 61, KA4AZT 58, WA4OMH 58, WD4KDG 45, K4HOE 43, WA4JTE 36, WD4JTO 36, W4PKX 35, WD4BSC 31, W4BAZ 29, WB4RIT 26, K4HRF 24, WD4LXX 24, WA4SWF 20, WD4CJO 19, W4CDA 18, KC4AV 15, WA4YPO 15, WA4AGH 13, KA4IKH 13, WD4COF 12, KA4GFU 12, W4HKT 12, WA4NOG 11, K4AVX 9, WB4ILF 9, K4AML 7, WA4JAV 7, WB4RRI 7, K4MHL 5, KB4YH 5, WD4LTD 2.

MICHIGAN: SCM, James R. Seeley, WB8MTD — Asst SCM: WA8DHB. SEC: WA8EFK. STM: WB8YRY. NMs: N8ABA WD8BHE WA8DHB K8LNE K8KMQ WD8LRT AF8V WB8YOZ.

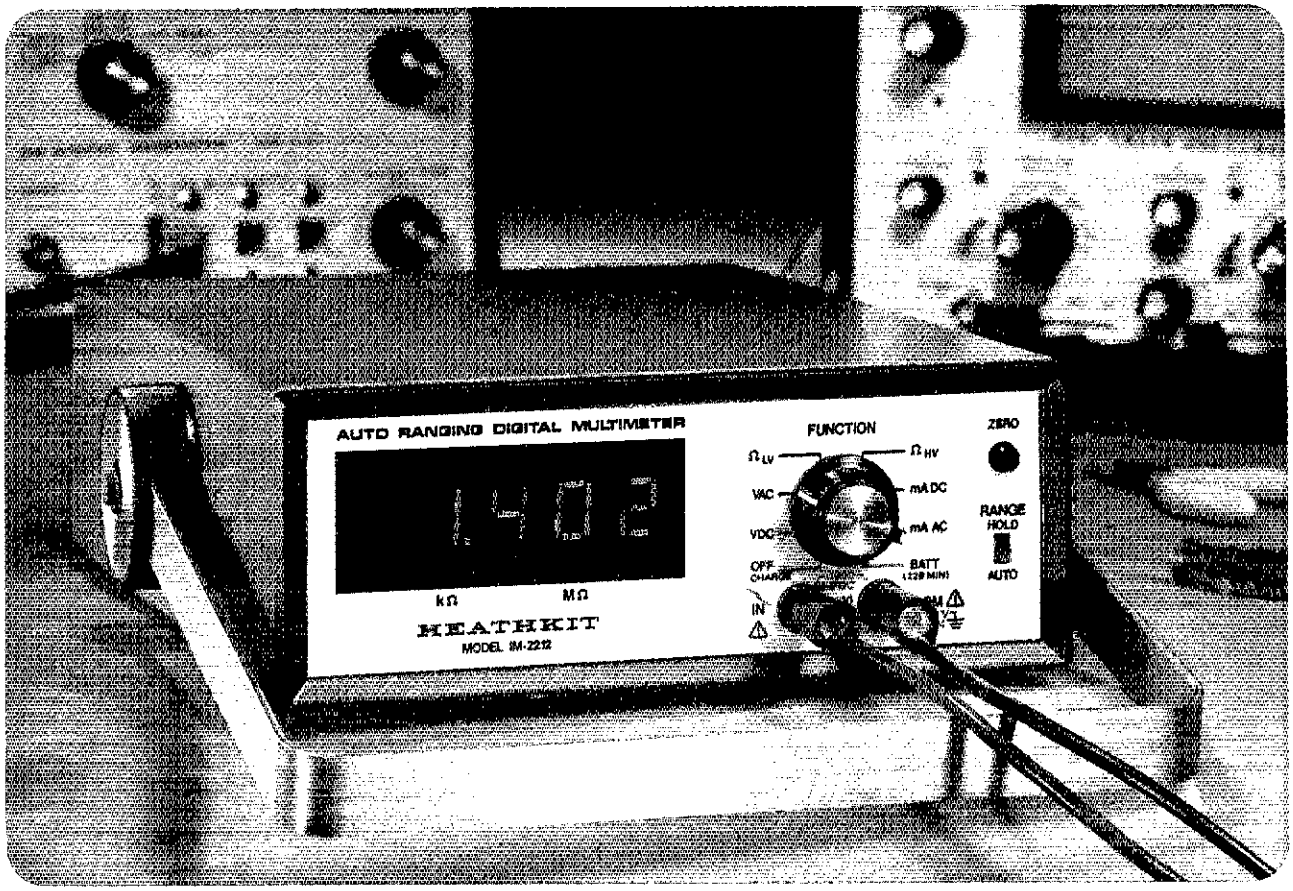
Net	Freq.	Time/Day	QNI	QTC	Sess.	Mgr.
QMN*	3663	1800/2200 Dy	1391	462	87	N8ABA
MiTN*	3953	1900 Dy	938	272	29	WD8LRT
GLFTN	3932	2100 Dy	1147	269	29	WD8BSE
MACS*	3953	1100 Dy	764	172	29	K8LNE
UPN*	3922	1700 Dy	897	121	33	WA8DHB
MNN*	3722	1730/2000 Dy	353	90	29	WD8BHE
WSSBN	3935	1900 Dy	775	43	29	WB8VAI
BR	3930	1730 Dy	479	31	24	W8HIN
ARES	3932	1730 Sa	82	7	4	W8VWY
VHF activity 16 reports			1041	50	-	AF8V

*NTS Section Nets. Field appointments: OO: AG8U; OTS: WD8BSE WB8WYO. Silent Keys: W8CRP WD8LCB WB8NAC W8NOH W8UCE. OO reports: K8JH W8QG WB8RUQ W3GQJ. OBS reports: AF8D K8NKB. Your SCM is now a country boy, after 50 plus years of city living. My thanks to all who helped on the air during the move. You'll notice I've bitten the bullet on listing net times. UTC is great, but our nets all stay with the clock summer and winter. Michigan Novice Net (MNN) has added a second daily session at 8 P.M., to provide an earlier net for inbound traffic from 8RN, and to give those who can't make the 5:30 session the benefit of this excellent training and traffic net. WA8AXF reports WBFF 07/67 repeater on the air in the Petoskey area, working well with excellent coverage. Want to know more about traffic? ARRL organization and activities? Emergency preparedness? Invite your STM, SCM or SEC to speak at your local club meeting. Traffic: AF8V 316, WB8MTD 312, K8DTG 240, WD8KZX 232, K8KMQ 207, W8VPW 205, W3GQJ/8 190, KB8MX 184, N8BIK 137, WB8YRY 136, WA8PIM 128, WB8SYA 121, WB8ZIY 95, WD8BSE 90, K8RV 89, N8ABA 84, WA8TAQ/8 82, WB8YDZ 80, WA8DHB 76, W8VIZ 74, W8IHX 65, K8LNE 61, WB8HPZ 56, WD8BHE 54, W8YIO 51, WB8WYO 46, K8DYI 45, W8CUP 44, WD8MJB 42, WD8NKA 42, WB2LZN/8 39, WD8NKT 39, WB8GGC 36, WD8EIB 33, W8WOJ 33, WB8HNB 32, K8ZJU 32, K8GXV 29, WA8QAF 29, W8SCW 28, WD8IXZ 25, WB8NCD 21, AC8F 20, W8HIN 20, W8MOF 20, NRRF 20, W8JXJ 19, WD8IBY 18, WD8ROK 18, WD8BKM 17, K8BEO 17, WA8XF 15, KC8B 15, KA8EPK 15, K9JEO 15, W8JUP 15, WD8NJO 15, WD8RNQ 14, K8UPE 14, WB8TTA 13, W8DI 11, KB8FK 11, W8QFO 11, KB8GT 10, WA8GTG 10, K8OCP 10, WD8ORO 10, W8ITT 8, W8WVI 7, AI8A 6, KB7BC/8 6, WD8JQL 6, WD8OKU 6, N8ACL 5, WB8HSN 5, WB8NDB 5, WD8IYA 4, W8BEZ 3, W8LOU 3, WD8OEP 3, WD8OSE 3, WB8IEK 2.

OHIO: SCM, Harold C. Chapman, WB8JGW — Asst SCMs: W8WOK AF8O W8TP. SEC: K8AN. NMs: K8AAZ WD8KBW WB8KWD WB8MQ WD8PUH WB8YGW. Net reports.

Net	QNI	QTC	Sess.	Time(Local)	Freq.
BN	647	421	58	6:45/10 P.M.	3.577
BNR	193	38	29	6 P.M.	3.605
ONN	121	33	29	6:30 P.M.	3.708
OSN	317	223	29	9:10 P.M.	3.577
OSSBN	2914	911	87	10:30 A.M./4:15 & 6:45 P.M.	3.9725
O6mN	446	61	29	9 P.M.	50.160

Two-meter RTTY activity seems to be on the increase. Cuyahoga County using 147.555 as their RTTY frequency. Other areas are utilizing other frequencies but getting similar enjoyment from that mode. New radio clubs are appearing all over the section. Are you as a club taking advantage of ARRL and OCARC affiliation and what it offers? Give it serious consideration. The Toledo Area DX'ers formed a new group Feb 23 with 15 persons in at-



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- **Automatically places decimal point for correct readings.**
- **Automatically indicates polarity.**

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Any successor to the Collins KWM-2 better be good. It is. The new Collins KWM-380 transceiver.

The remarkable new Collins KWM-380 transceiver continues the Collins heritage for quality amateur equipment.

KWM-380 is a complete fixed station in a smartly styled, self-contained unit.

AC/DC power supply, speaker and accessory VFO function are built in.

Microprocessor frequency control provides rate selectable tuning in 1 MHz, 1 kHz, 100 Hz or 10 Hz increments. Frequency memory provides split VFO function (half-duplex) for transmit and receiver registers. And with minor modification, the KWM-380 will accommodate *WARC* and *MARS* frequency requirements.

The high-resolution frequency synthesizer locked to a high-stability frequency reference is accurate to 10 Hz with no bandswitch. [illegible]

Specifications:

Frequency Range: Tunable in 10 Hz steps.
Receive mode — 2.0 to 30.0 MHz, 0.5 to 2.0 MHz at reduced sensitivity.
Transmit mode — SSB or CW 160- thru 10-meter amateur bands.
Mode: CW, SSB (voice and RTTY, either sideband selectable).
Power requirements: 105, 115, 125, 210, 220, 230, 240, 250, ± 5% V ac (Internal strapping option) 50-60 Hz, 12 V to 15 V dc (Connector strapping). 120 W input in receive max; 600 W input in transmit max.

Frequency accuracy: Accurate to within ±5 Hz when the 39.6 MHz oscillator and the 455.0 kHz oscillator are set within ± 1 Hz. Warm-up time is 10 min.
Frequency stability: Stability is within ±150 Hz over the temperature range of 0-50°C.

TRANSMIT PERFORMANCE
Output impedance: 50 ohms nominal.
Power output: 100 W PEP nominal from 1.6-30 MHz. In *CW* or *RTTY*, duty cycle is 50%, key down 15 minutes max.

With the optional blower kit, power is 100 W average, 50% duty cycle, key down 1 hour max. at 25°C, ½ hour max. at 50°C for all modes.

Unwanted signal suppression: (minimum values below)

Carrier suppression	50 dB
Undesired sideband, 1 kHz ref.	55 dB
Harmonics (all)	40 dB
Mixer products	55 dB

Third order distortion: 25 dB below each tone of a two-tone test.
Audio inputs: Microphone — low impedance type. Internal strap for HI-Z. Line — 600 ohm input unbalanced impedance; level of 40 mV is sufficient to produce full output.

Audio frequency response: Not more than 3 dB variation from 300 to 2400 Hz.

RECEIVER PERFORMANCE

Antenna impedance: 50 ohms.

Sensitivity: Not more than 0.5 uV for 10 dB S+N/N at antenna input for SSB and CW, 2.0 to 30 MHz. Broadcast band attenuation is a nominal 30 dB.

I.F. and image rejection: Greater than 60 dB.

Selectivity: In operating modes of USB, LSB, CW, and AM.

BW at −3 dB (min)	BW at −60 dB (max)
2.1 kHz	4.4 kHz
*1.7 kHz	3.4 kHz
*360 Hz	1.25 kHz
*140 Hz	600 Hz
*6.0 kHz	25 kHz
8 kHz	50 kHz

*optional

Audio output: Not less than 3½ W into 4 ohm load at 1 kHz, at not more than 10% total harmonic distortion. Line audio out-

[illegible] 3 dB variation from [illegible] **AGC:** Audio output [illegible] 8 dB as the RF input varies from [illegible] 100 mV open circuit.

Intermodulation distortion: Two signals spaced 20 kHz at a level of −10 dBm each will produce IMD down 50 dB min.

Size: 15.50" W (39.4 cm); 6.5" H (16.5 cm) (w/o feet), 7.5" H (19.1 cm) (w/feet); 18.00" D (45.7 cm).

Weight: 50 lbs. (22.7 kg).

†Subject to change without notice.

tendance. It was suggested at a recent hamfest by one of the more active cw traffic handlers that the Ohio Novice Net & the Ohio Slow Net join together and change times. The main reasons being (1) OSN and BN run nominally at the same speed depending on the NCS; (2) OSN frequently runs into BNE time slot; (3) more personnel from a welding of ONN and OSN might give encouragement to more Novices to participate. No change will occur unless there is a preponderance in favor of such a change. 1980 officers for Wayne Amateur Radio Tech Society: WD8BVR, pres.; WD8LLD, vice pres.; WD8BVX, secy., WD8BVW, treas. Appointments: Asst SCM W8WOK; EC WD8PEI/Chanpaign/Logan; OES K8NJQ; OTS WD8DYW W8MOK K8NJQ WB8WHF WB8YTD; OVS K8NJQ.

Local Nets	QNI	QTC	Sess.
BRTN	383	185	29
COARES	69	9	3
FRCN	73	11	4
HCCN	46	2	4
MASER	86	3	4
TSRAC	695	108	26
VWCEN	40	4	4

Traffic: K8AAZ 506, K8ND 427, K8OZ 377, W8PMJ 370, W8UPD 348, WB8WTS 186, W8ENI 182, N8CW 130, WA8GMT 129, WD8KBW 126, WB8MEK 114, WB8UBR 114, N2MA 112, WB8YFD 110, WD8OYO 109, K8FE 107, W8QZK 100, WB8JGW 98, WA8HGH 97, W8TH 93, K8AN 83, W8GGX 83, WB8SIQ 79, W8TP 73, WB8SRC 72, WD8KFN 69, WA8SSI 68, W8MOK 62, WD8PID 54, WB8QHV 50, W8RG 47, WB8FWF 46, WB8TRK 45, WD8PUH 43, WD8LPP 41, WB8YGW 35, N8AKS 34, WD8OMP 33, K3RC 31, WB8ICL 29, WB8QHU 29, AF8A 28, WD8OYK 28, WD8PEI 28, WB8PIY 28, WB8NHV 27, W8WEG 27, K8DL 25, W8MGA 24, WB8HMI 23, W8HVA 21, W8QEM 21, W8LZE 18, WA8SOI 18, WB8YTQ 18, W8BHL 17, WB8AWM 16, KB8LQ 16, WD8MKC 16, WB8MRL 15, WD8OZM 15, W8IM 14, WD8JIK 14, N8JR 14, WA8MAZ 14, WD8DOS 12, WA8ROQ 12, WB8TPX 12, KB8KV 11, K8CKY 10, N8AUH 9, K8KWO 9, WB8VZX 9, KA8DJZ 8, WD8OAC 8, WA8TSX 8, W8XT 8, WD8DYW 7, WB8QXN 7, K8DHJ 6, W8KRF 6, K8NQW 5, K8YUW 5, KA8EHA 4, WD8OTO 4, K8BNL 3, W9NJP 3, WB8YUS 3, WB8NTR 2, WB8DTG 1, WB8PTN 1.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Guy L. Olinger, K2AV — SEC: WB2VUK. STM: WA2SPL. ASCM: WB2VUK WB2KDC W2IT. NM: W2CS W2WSS KB2JG WB2QOH WB2ZCM WB2EAG. Nets: NYPON 5 P.M. 3913; ESS (slow) 6 P.M. 3590; NYSPTEN 6 P.M. 3925; NYS 7 P.M. 10 P.M. 3677; CDN (Troy) 6:30 P.M. 34/94; HVN (Beacon) 7:30 P.M. M-F 37/97; SDN (White Plains) 9:30 P.M. S/T/T 66/06 M/W/F 615/015. The "SZ" report from RPI was a real book this time. Oh, how it brings back memories... Congrats to WB2PID for the SZ Gold Star Award. New SZ brass: WB3BPU AD2J KA2EWB WA2RLI WA1VUG. KD2S will be the new trustee for W2SZ. Further, W2SZ made BPL and PSHR this month (multiop). Nice goin'. (Psst ... KD2S is ex-WB2SPK. EC for COL/GREENE). Welcome to new Novices from AARA: KA2HTW KA2HUX KA2HVI KA2HUY KA2HQO. Prep Duel Two now history. Next one probably Oct or Nov. If you don't have scores, see W2IT. We gratefully acknowledge donations to ARRL Foundation in memory of W2RUF, by K2RYH KB2GT W2BU N2YL/W2CS W2NYM W2PKY W2TZ W2ZOJ WA2CJY WA2ENM WA2SPL WB2HDU WB2QIX. Traffic: (Feb) WA2SPL 1398, WB2EAG 445, N2YL 429, W2CS 296, W2SZ 281, WA2EOW 220, W2EFU 168, WB2ZCM 147, KB2KW 111, K2HNW 61, N2BDW 58, AA2Y 44, W2IQK 40, KA2AOQ 31, WB2SON 28, N2EF 18, WA2CJY 14, KD2S 9. (Jan) WB2SPK 13.

NEW YORK CITY — LONG ISLAND: SCM, Paul A. Lindgren, WA2UWA — Asst SCM: WB2IDP. Asst NYC: KA2CNN. STM: WB2BNY. NM: KA2DBW. The following are traffic nets in and around the section.

Net	Time/Day	Freq.	Mgr.
NLI*	1900 Dy	3630	WB2BNY
NLI*	2200 Dy	3630	WB2BNY
NSPN*	1815 Dy	3928	WB2HIQ
BAVTN*	2030 M-F	147.915/315	KA2DBW
ESS	1800 Dy	3590	W2WSS

Nets denoted with an asterisk are NTS section nets. Big news of course around this time is preparation for Field Day. Make sure that you send the SCM a message so you will receive credit for 50 extra points. Traffic nets welcome several new people this month. NSPN welcomes WB2TQC KA2CEF and WA2WBI while NLI welcomes WA2WBI and KA2CEF and also returnees K2KI and WA2SKI. WB2KCT is NYC-LI chairperson for NYSPTEN. WA2SEL reports he is awaiting his 100th QSL for DXCC. EC reports received this month from WB2LOU and N2EM with OO reports from N2NT and N2KR. N2NT operated DX test from W1ZM. As you can see almost no reports this month. If you do not report you will be forced to read the personal philosophy of WB2IDP. Please report! Traffic: W2UWA 242, W2AHV 224, K2GCE 204, W3MLC 185, WB2BNY 170, KA2CNN 133, WA2JKG 116, W2GKZ 104, N2BGR/T 75, WB2KCT 74, WA2SEL 53, KA2CEF 44, WB2IDP 41, WA2MEE/T 38, W2DBQ 18, WA2KXE/T 2.

NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MVQ — SEC: WB2VUF. STM: W2XD. NM: K2VX W2PSU KB2HM WA2GUW WB2RMI W2TCA and W2UEZ.

Net	Mgr.	Freq.	Time/Days	Sess.	QNI	QSP
NJN	W2UEZ	3695	7 P.M. Dy	29	583	237
NJN	W2UEZ	3695	10 P.M. Dy	29	290	156
NJPN	K2VX	3950	6 P.M. Dy	33	660	449
			9 A.M. Su			
NJSN	WA2GUW	3735	6:30 P Dy	29	219	34
NJVN	W2TCA	49/49	10:30 P Dy	29	282	214
OBTTN	KB2HM	147.12/12	Dy	40	319	111
UCETN	WB2RMI	146.85/685	Dy	29	271	115
NJRTTY	W2PSU	147.51	Dy	29		

Statistics for Jan, NJSN QNI 278, QSP 45. KA2GTY has become assistant manager for NJVN and he is looking for operators from Warren and Hunterdon Counties. All NNJ county ops are welcome. He is seeking further cooperation via additional repeaters, permitting late evening traffic operation on repeaters. The following NJVN members attended the recent Livingston Hamfest held by the Split-Rock group: WB2FZY WB2WDW AG2R K1OP WA2EPK WB2LDN W2IWA WA2BCP WB2HJW and WB2WIK. The NJVN group had a traffic table and demonstrated the handling of traffic via 2-meters. News from Ramapo Mountain ARC: K2SJO. Hudson Division Director, spoke on the results of WARC and urged ARRL members to invite nonmembers to join the League. March 23rd they will have a transmitter hunt and the April meeting will feature the League's film "The World of Ham Radio" bring a nonham friend to see this ex-

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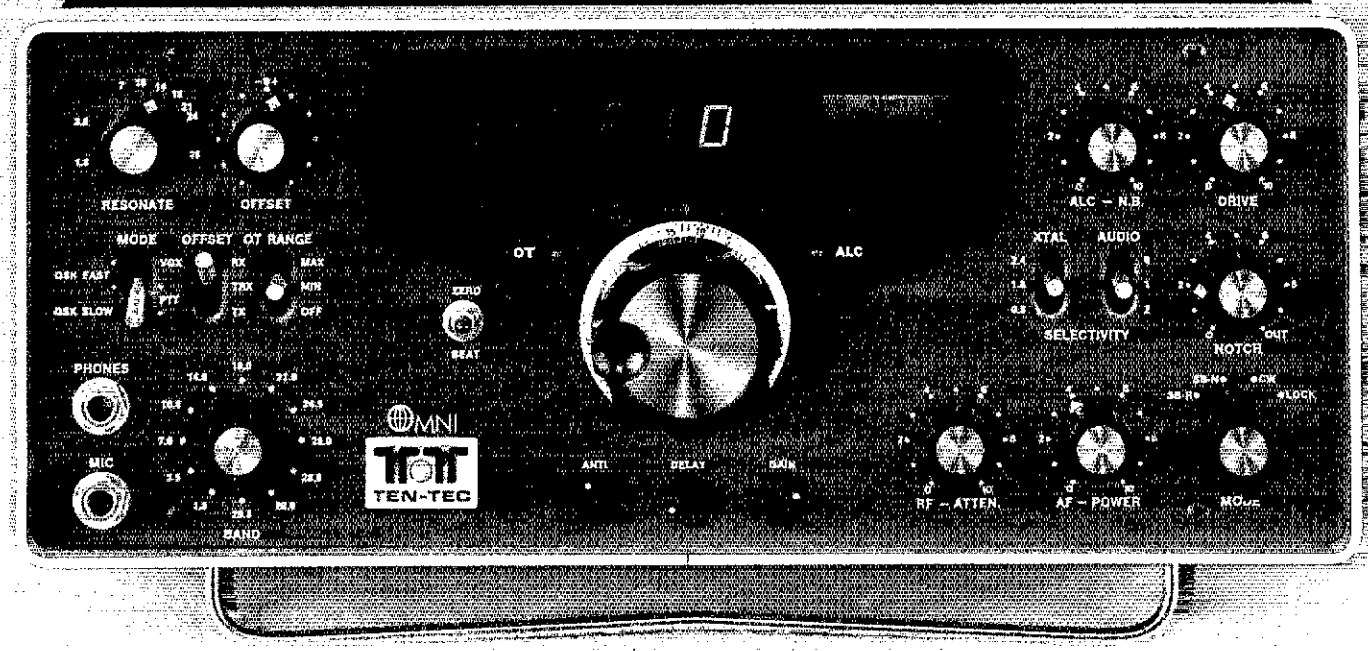

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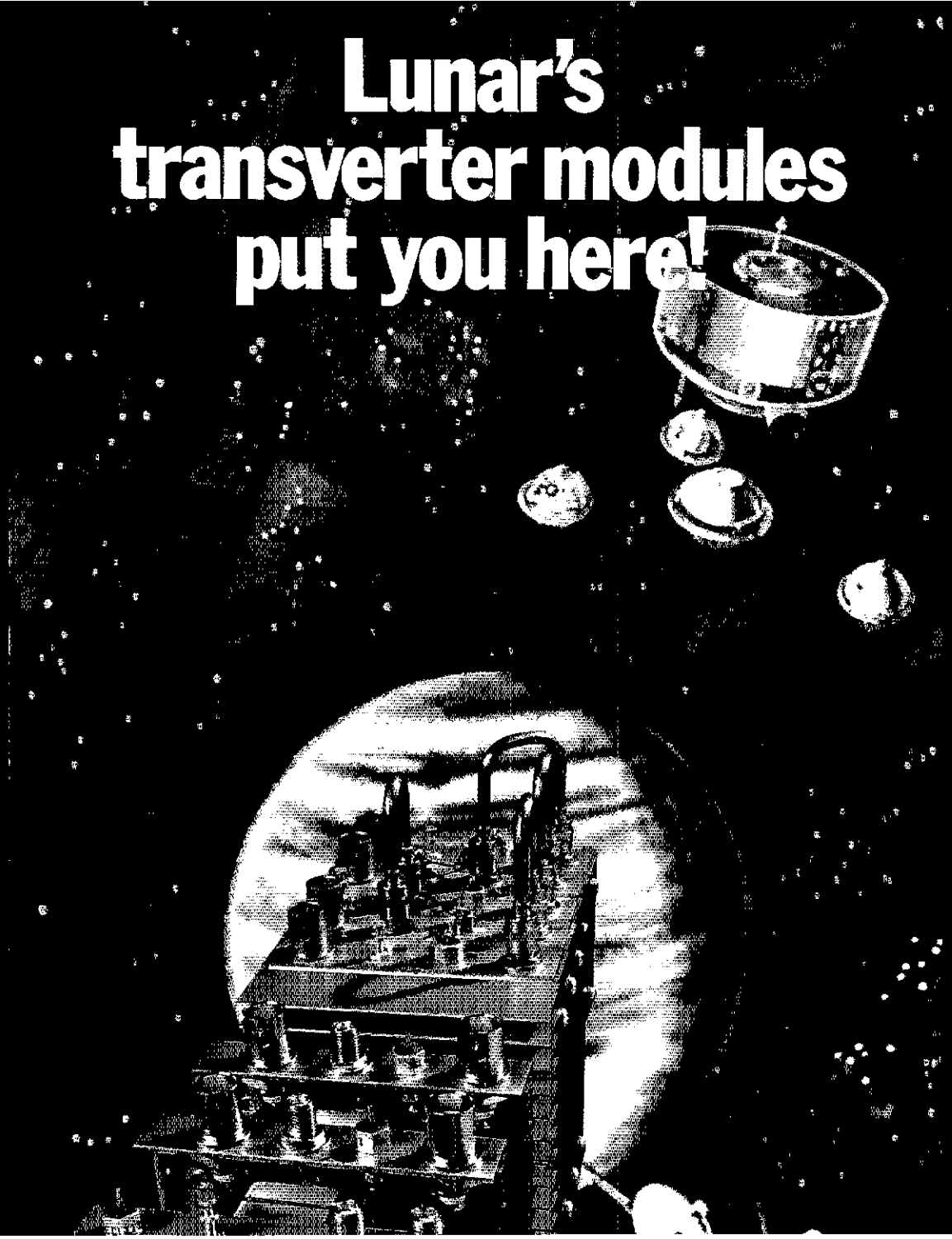

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Lunar's transverter modules, on
other hand, start with the ba
down converter for receive and
converter for transmit. Selecting
appropriate local oscillator mod
determines the band. Additio
modules are added to achieve
sired receiving NF and/or out
power. Changing the local osci
tor module changes the band.
amps you already have or mi
build may be used as desired, s
ilarly, for the transmit side.

It's easier than building your o
modules from scratch, and co
much less than buying a compl
transverter for each additio
band.

Some examples of expected per
mance using Lunar modules.

EXAMPLE 1

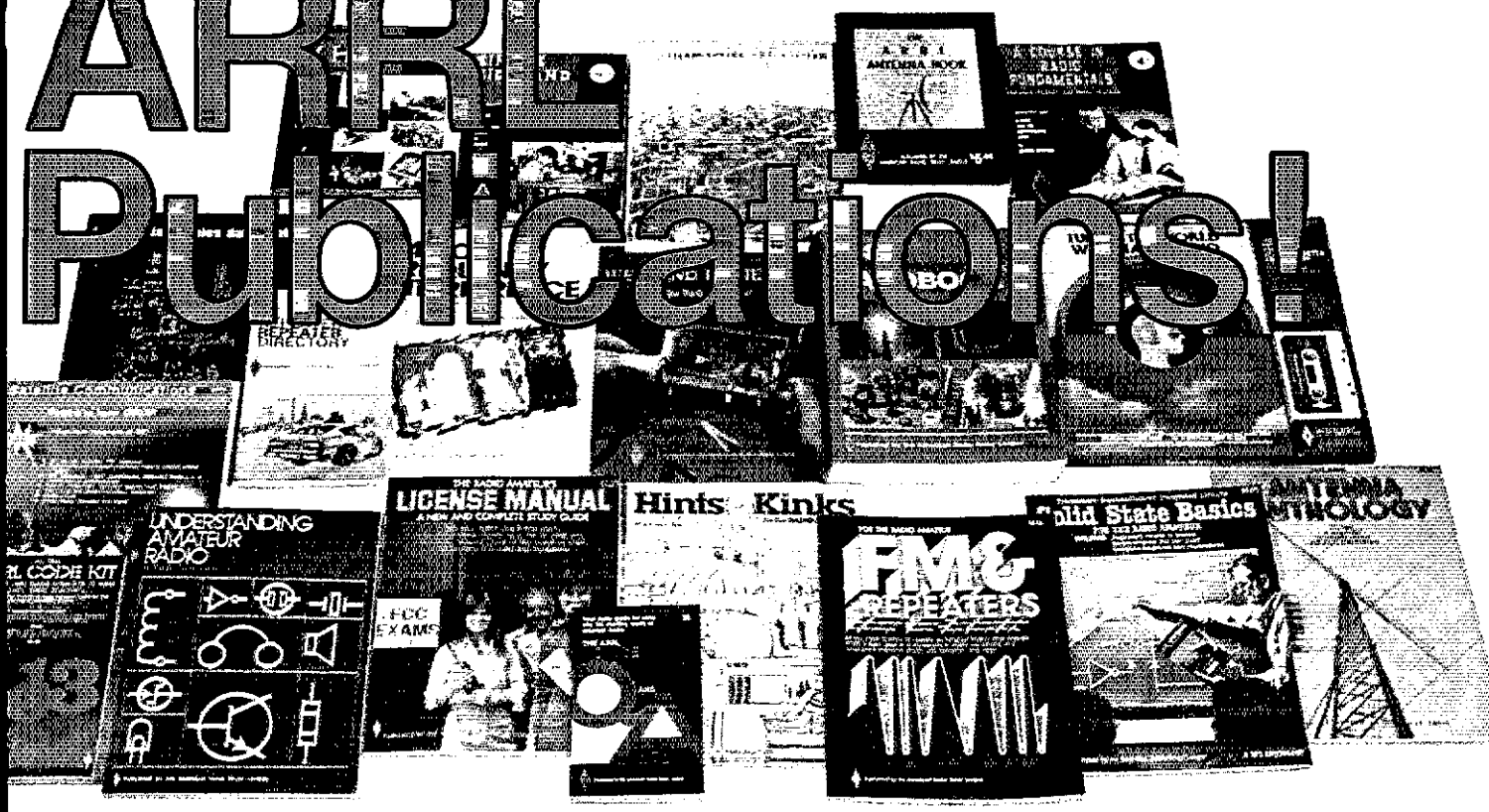
Selected modules:
DC 28
LO 28/144
UC-VHF
PAD 144
PAM 144

This combination gives you:
RF: 144 to 146MHz
IF: 28MHz to 30MHz
Conversion Gain: 25dB
Overall NF: 2 dB nom. 1.6 dB typi
Image Rejection: -30 dB typical
LO Purity: -50 dB max. all spur
harmonics
Drive 28MHz: 1 to 5 mW
Power Output: 20 watts min.
Operating Voltage: 24VDC @
amps. nom.

EXAMPLE 2

Modules added to Ex. 1
LO 28/220/222
PAM 220
PAD 220

ARRL Publications!



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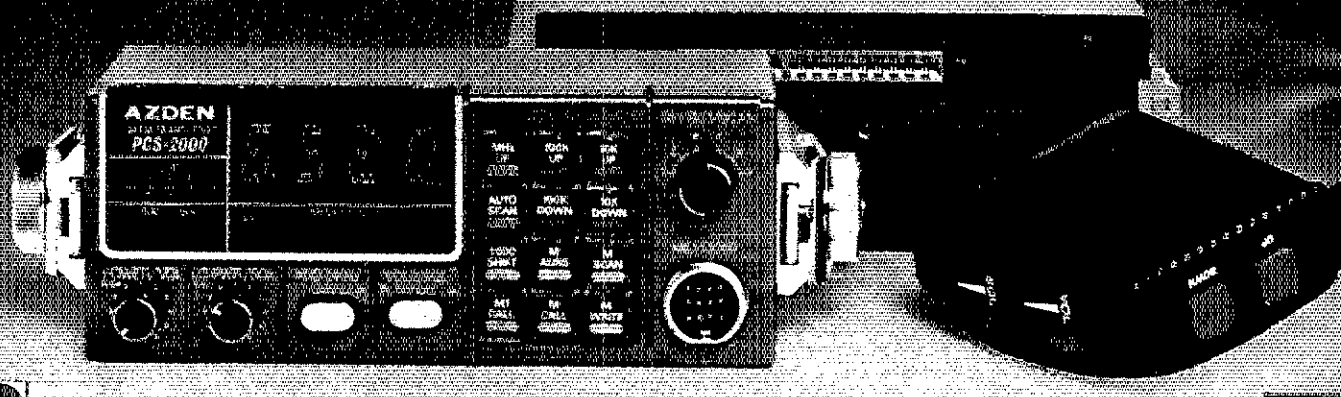

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MICROLOG

INNOVATORS IN DIGITAL COMMUNICATIONS

cellent movie! The New Jersey Radio Information Net for Feb and 31 stations in the net representing 16 clubs and sent 61 bulletins. Let's start hearing from more clubs. The Englewood ARA received a proclamation from the Mayor of Englewood designating June 22-28 as Englewood Amateur Radio Association Week. The Bergen ARA is now meeting on a regular basis the first Sunday 8 P.M. of each month at the Bergen Community College. Come and join them. 82 members were in attendance! Col Carl J. Koenig, Director of Bergen County c.d. presented an excellent talk describing the Civil Defense program. A group attended TV UHF Channel 68 and saw a display of video effects and audio trickery. A note from Nutley Amateur Radio Society advised that KA2HDR participated in the Novice Roundup and scored 12,985 points. Section new hams or upgrades: KA2HNQ Novice; KA2HKM Tech; WA2HEB KA2CHM General and WA2AYF Advanced. Tri-County ARA advises their annual Famfest/Fleamarket will be May 4, 1980 at the Passaic Township Youth Center, Stirling, NJ. W2YFM of the New Providence Radio Amateur Radio Club gave a talk on "TVI Problems and Their Cures" at the TCRA meeting in March. The Old Bridge Repeater supplied Central NJ for the Olympics Torch Run with the following receiving ARRL Public Service Certificates: WB2TZS WB2JHN KB2ET AF2L KB2HN KA2CHM WB2SZI KA2DOH and WB2ZRU. K2WM now teaching a Novice class for Sourland Mountains ARC. WB2WDW has a new FT227 on 2 FM. W2RQ scored 1200 in DXCW single op and W2SQ & W2PA scored 1400 DX fone on multi/single. Traffic: (Feb) W2RQ 661, WB2TOM 488, W2UEZ 475, AF2R 396, W2CQB 336, W2SQ 335, KB2HM 260, WB2RMI 183, WA2MVQ 170, WB2RMJ/T 154, N2BC 135, K2VX 125, AF2L 110, WA2OVE 100, KA2GQO 89, N2CR 84, KA2DOH 54, KA2GTY/T 59, W2UH 41, WB2KLF 31, WB2AIU/T 23, W5DTR 39, WB2YGT 36, WA2OWR 21, W2ZEP 15, W2CC 14, N2IU 13, N2BNB 12, K2WM 9, WB2WDW 8, WA7DPK 7. (Jan) WA2OVE 44, W2ZEP 22.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto — WØLFF — SEC: WØIYW. Congrats to WDØAWH KAØEKC and KAØFXY for upgrading to General. WØGA makes WAC and DXCC after 41 years. WBØZKG made WAS on 6 meters in 5 months, and 600 club in 2-1/2 months. The Cedar Valley Fox was chased three times. WBØJRJ found him in 40 minutes, WBØFHI in 36 minutes and WBØTXL in 23 minutes. The Davenport Club started year off with a bang-up job hamfest. WØRWC has DXCC 300 and 7-Band WAS plus Satellite. AIØQ and WAØAUX gave Iowa 100% on DTRN. KØKQJ worked a ZL on 160. Tri-State ARC and Iowa City ARC had successful mail demos. KØFXM on RTTY with a 18AVT. WAØVUS/R at Muscatine on 222.34/223.94. WØAIX/R at Mingo will be up 296 ft and on 6.07/67. WDØEWD won Gypsum City 10M QSO party with 48 U.S. and 12 DX. WDØHPT came in second. Special award to WBØYWW for all QRP, and to WØYXK for all cw. International 10M SSTV PIX Net 1800-2100Z A3-A5 Sat on 28,680. WBØQCD editor for RTTY Journal and A5 Magazine and has over 500 QRP contacts on 10M SSTV. WBØFBP president of Bi-State Teleprinter Society. Humboldt ARC Officers: WBØTZD, pres.; WBØRKO, vice pres.; WDØDGO, secy.; KAØAAI, treas. New equipment: WBØRMT and WBØZKG FT-101Z; WDØBLA IC255; KØUXA FT227R; WØLPW HW3806; WDØGOS TS520. KAØFOM now NØBLO. KØZOI. WDØKFB WBØQCD WDØAYT and WDØADZ keeping SSTV hot. Time to check FD equipment.

Net	Freq	Time(Z)	Days	QNI	QTC	Sess.	Mgr.
Iowa 75M	3970	1730	M-S	1108	56	25	WBØAVW
Iowa 75M	3970	2300	M-S	1003	70	25	WØYLS
Tall Corn	3560	2330 0300	Dy	405	154	58	WØYLS
Iowa Code	3713	2359	M-W-F	69	28	12	WBØNSS

Traffic: (Feb) WAØAUX 523, WØYLS 153, KAØX 131, AEØR 89, WØSS 78, WBØUPF 48, KØGP 36, WBØNSS 24, WØLFF 20, WDØHND 12, WBØAVW 11, AIØQ 9, KAØEVW 5. (Jan) KAØEVW 1.

KANSAS: SCM, Robert M. Summers, KØRXF — SEC: WØKL. NMs: WØOYH WØFT WDØESF WAØSZS. QKS certificates were sent to WDØESF WDØFAB and WBØYLP recently with many thanks for helping to carry the load of traffic for Kansas. Would you like to help on the nets — NCS, Liaison, Alt. NCS??? All of our state nets are needing your help. Our regulars, I am sure, would like to share some of the activity with you from time to time. CW group take time to talk to WØFT. Phone group discuss the matter with WØOYH. KWN: QNI 951, QTC 530; KSBN: QNI 1345, QTC 100; KPN: QNI 310, QTC 18; CSTN: QNI 1470, QTC 80; QKS: QNI 372, QTC 140. ARES standing at 892 registered members. Are you interested in helping out in an emergency?? Contact your EC or WØKL for more information. Club officers for Parsons ARC: WØRT, pres.; KØOBY, vice pres.; WDØHSK, secy; WAØGCS, treas. For the Pittsburg Rptr Org: WBØYVQ, pres.; N5SD, vice pres.; WAØURJ, secy., WØCLQ, treas. Traffic: (Feb.) WØYH 124, WØHI 114, WDØACG 103, KØEZ 93, WØFT 89, WØAM 70, WAØLBB 67, WØFIR 65, KØBXF 59, NØABA 56, WDØVRZ 53, WØHYC 42, WBØYLP 41, WØCHJ 39, WØPB 28, WØASY 22, WØFDJ 20, WØKL 18, KØYTA 15, WBØLKA 14, WØRBO 12, NØIN 7, WØRT 4, WØNYG 2, WAØWJX 1. (Jan) WØASY 42, WAØOWH 2.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst SCM: Joe Flowers, WØOTF. SEC: WBØFKY. The Kansas City DX Club just returned from a successful trip to Belize. Members of the club spend a week in VP1-Land during the recent ARRL DX fone contest. The operators made over 7,000 QSOs and are now in the process of making out all their QSLs.

Net	QNI	QTC	Net	QNI	QTC
MON	203	171	HBN	403	44
MON2	134	44	ACE	35	1
TNT	54	16	NEMOE	143	3
MEOW	603	37	MOSSBN	930	51

Our deepest sympathy to the family and friends of WØBCD who joined the ranks of Silent Keys. New officers for the Lebanon Amateur Radio Club are: WBØSSB, pres.; WBØRUR, secy/treas. Congratulations to the following new licensees: Novice: KAØs GGE GII GIN through GIR GIY GIZ GJB through GJD GMS GNU GOC GOE GOF GOM GOS GOT GOZ GPR through GPT GPW through GPZ GQA GQD GQF GQI through GQJ GQM GQS GQV GQY GRA GRD GRF through GRH GRK GRO through GRS GRU GRY GSG GSM GSQ GSV GTK GTN GTO GTV GUA GUF GUH GUI GUK GUU GUW GVD and GVE; General: NØBLQ; Extra: WØHMA. Traffic: WØBMA 356, KØONK 216, KØSI 110, WØRV 92, WØOTF 61, WØOUD 39, KØBM 28, KAØE 18, WBØNIE 11, WAØEMX 4.

NEBRASKA: SCM, Rex P. Greenwell, KØKP — SEC: WØASM. I am pleased to announce that the Nebraska Association of Independent Insurance Agents has pick-

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Do not be fooled by the low prices, these brand new lab quality frequency counters have important advantages over instruments costing much more. The models 7010 and 8010 are not old counters repackaged but 100% new designs using the latest LSI state-of-the-art circuitry. With only 4 IC's, our new 7010 offers a host of features including 10 Hz to 600 MHz operation, 9 digit display, 3 gate times and more. This outperforms units using 10-15 IC's at several times the size and power consumption. The older designs using many more parts increase the possiblity of failure and complexity of troubleshooting. Look closely at our impressive specifications and note you can buy these lab quality counters for similar or less money than hobby quality units with TV xtal time bases and plastic cases!

Both the new 7010 and 8010 have new amplifier circuits with amazingly flat frequency response and improved dynamic range. Sensitivity is excellent and charted below for all frequencies covered by the instruments.

Both counters use a modern, no warm up, 10 MHz TCXO [temperature compensated xtal oscillator] time base with external clock capability - no economical 3.579545 MHz TV xtal.

Quality metal cases with machine screws and heavy guage black anodized aluminum provide RF shielding,light weight and are rugged and attractive - not economical plastic.

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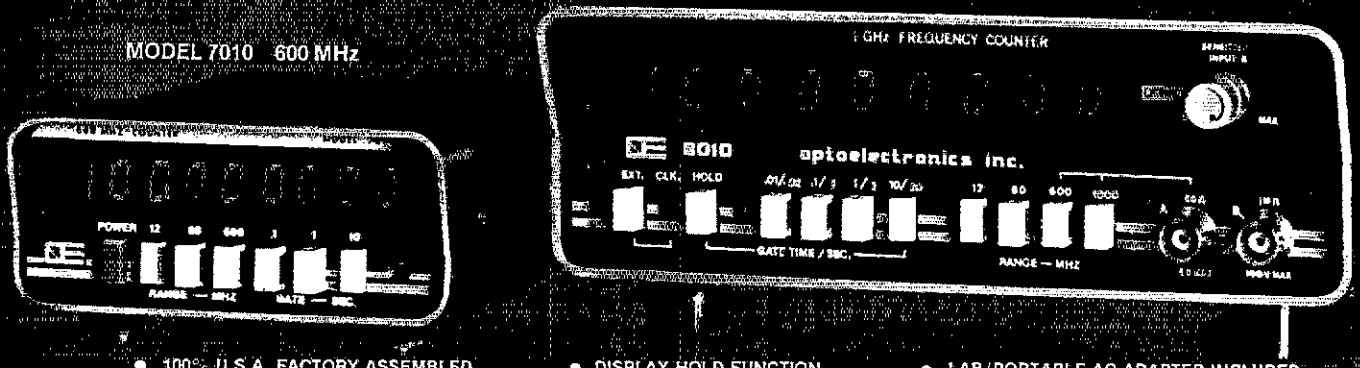
MODEL 8010 1 GHz

MODEL 7010 600 MHz



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- COMPREHENSIVE USER MANUAL PROVIDED
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MODEL	$ PRICE	RANGE 10Hz to	LED DIGITS	SENSITIVITY 50 OHM INPUT 25-250 MHz	250-450 MHz	450 MHz-1GHz	HI-Z INPUT 10Hz - 60 MHz	GATE TIMES	RESOLUTION 12 MHz	60 MHz	MAX. FREQ.	TCXO TIME BASE 20°-40°C	FREQ.	EXT CLOCK INPUT	NI-CAD BATT PACK
7010 *7010.1	145.00 225.00	600 MHz	9	5-20 mV	10-30 mV	20-40 mV to 600 MHz	1-10 mV	(3) .1, 1, 10 SEC	.1Hz	1 Hz	10 Hz 600 MHz	1 PPM 0.1 PPM	10 MHz	YES OPTION $25.	YES OPTION $15.
8010 *8010.1	325.00 405.00	1 GHz	9	1-10 mV	5-20 mV	10-25 mV	1-10 mV	(8) .01-20 SEC	.1 Hz	1 Hz	10 Hz 1 GHz	1 PPM 0.1 PPM	10 MHz	YES STD	YES OPTION $39.

* Has precision 0.1 PPM TCXO time base.

MODEL 7010

#7010 600 MHz Counter - 1 PPM TCXO $145.00
#7010.1 600 MHz Counter - 0.1 PPM TCXO $225.00

OPTIONS
#Ni-Cad-701 Ni-Cad Battery Pack & charging circuitry installs inside unit $ 15.00
#EC-70 External Clock input,10 MHz $ 25.00
#CC-70 Carry Case, Padded Black Vinyl $ 8.95

MODEL 8010

#8010 1 GHz Counter - 1 PPM TCXO $325.00
#8010.1 1 GHz Counter - 0.1 PPM TCXO $405.00
#8010.1-13 1.3 GHz Counter - 0.1 PPM TCXO $495.00

OPTIONS
#Ni-Cad-801 Ni-Cad Battery Pack & charging circuitry installs inside unit $ 39.00
#CC-80 Carry Case, Padded Black Vinyl $ 9.95

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ed the amateurs of Nebraska to receive this year's Community Service Award. This prestigeous award will be made in Omaha in May. The NAIIA wishes to recognize and thank you, the hams of Nebraska for your community service and a job well done!!! Isn't it nice to be appreciated? FB. State Senator Kremer announced the section of LB864 that would have upped the fee to $50 for callsign auto license plates has been stricken from the bill. Tnx KØBRS. The North Platte ARC gang is busy recruiting members for ARES. The Lincoln ARC reports that disaster action team training has been completed, the training was very thorough and sponsored by the Red Cross. Graduates include WAØASM KAØBOZ KAØCBZ WDØFJY KØGND KØNB WBØRJJ and WBØYYE. Your SCM was honored to have been appointed as Assistant Director to Midwest Division Director WØFIR. Everyone had a good time, as usual, at the Midway Spring Convention, the Midway group deserve a hand for a job well done!

Net Report	QNI	QTC
160 MTR Weather	699	0
Cornhusker	1062	33
Morning Phone	1187	29
Nebraska Storm	1283	44
Platte Valley 2-Mtr	64	6
P M Net	271	51
QCWA Net	67	0
Western Nebraska	572	55

Traffic: KØAIE 104, WØVYX 46, KØBRS 33, WØZNI 21, WAØBOK 14, WAØPCC 13, WØYFR 13, KØODF 8, WBØGMO 7, WBØGWR 7, WØHTA 5, WAØKHK 3, WØNIK 3, KØSFA 2, WAØLOY 1.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, William J. Pace, W1ID — Asst SCM: WA1LOU. SEC: W1SY. STM: WB1AIU. NMs: K1EIR K1EIC WB1CPF WA1ELA WA1LOU.

Net	Freq.	Time/Days	Sess.	QTC	QNI
CN	3640	1900/2200 Dy	57	346	361
CPN	3965	1800 M-S 1000 Su	28	90	278
NENN	3720	1815 Dy			
Nutmeg	28/88	2130 Dy	29	119	355
RASON	13/73	2100 MWFSu			
WESCON	78/18	2030 Dy	29	161	417

HI QNI CN: WB2PJU W1WP. CPN: WB2PJU WB1FZX K1AQE. HI QTC Nutmeg: W1DFT. The Tri-City ARC, SCRAMS and RASON joined forces and set up a special events station on two-meters fm and hf to handle traffic from EXPO '80 at the Groton Airport...with 100 K in attendance, ham radio had a chance to make a great impression. Check-out the Conn DX Net for hot tips on those rare ones' K1WJ calls the net up every Sunday night at 9:15 P.M. on the Wallingford repeater, 147.96/36. Big ham events in April: CN/CPN dinner on the 26th (Cheshire) and PVRA auction on the 27th (Newington)...hope to see you there. Congrats to W1WP on BPL. Traffic: WB2PJU 331, W1WP 281, WB1CPF 280, W1DFT 246, W1EFW 202, K1GF 191, WB1CEG 89, K1XA 82, WB1DGR 74, W1BDN 53, WA1LOU 45, K1CE 42, K1AQE 40, WB1FZX 34, W1KV 28, K1EUW 22, KA1CMX 18, WA1ZXT 18, WA1MOG 15, W1CUH 8, W1QV 8.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — SEC: WA1BLG. STM: WA1TBY. ASCM: WA9NEW. OBS report from W1ALP, W1AQV. OO reports from WA1NAE W1EGE W1NF W1HL OES reports from W1EGE AE1X W1AQV.

Net	Mgr.	Freq.	Time(Loc)/Dy	QNI	QTC
EMRI	WA1VAB	3.658	19/220 Dy	365	247
EMRIPN	W1FJI	3.898	1730 Dy	251	201
EM2MN	WA1IFE	90/30	2000 MWF	78	27
EM2MN	WA1IFE	145.8	2000 TTh		
NEEPN	K1BZD	3.945	0830 Su	56	14
HHTN/2	K1BSO	04/64	2230 Dy	526	201
HHTN/1	K1BSO	04/64	2230 Dy	655	202

W1ALP nominated to the ARRL Hall of Fame. Your SCM would like to visit as many Field Day sites this year as possible, so anyone willing to have me, please send your latitude and longitude and I'll try to find you. From time to time people have asked me if I have an Assistant SCM. Well now we have one. WA9NEW has agreed to be our ASCM. He is a good candidate, having already given me lots of help and advise, some of which I've taken. He will be helping me administer appointments and keep the club roster up to date. Please give him your support when he asks for it. The Wellesley Club had a talk by K1PDX on his microprocessor based cw copier/sender. Massasoit Club and East Mass lost a fine amateur in W1DMS in February. He was well known for his traffic handling and willingness to help other amateurs. The Chelmsford Club is active in solving TVI problems for local citizens and amateurs. Whitman Club had an excellent banquet. The Mitre-Bedford Club had K1ED talk on Packet Communications which is being experimented with in Canada and hopefully some day in this country. The Framingham Club station now active with an HD 32 and 75A4 from the Danforth Museum. The Minuteman Repeater Association reports that the Mt. Washington Repeater has changed freq from 07/67 to 055/655 to prevent interference problems — good news. Quannapowitt Radio Association reports that their Field Day site will be at the Mit Electron Accelerator in Middleton. N1AMF planning big effort from the Blue Hill for June VHF Contest. WA1QAA and WA1QAB have moved to the Cleveland area. WA1QAA was an active OBS/OO in East Mass and helped me with the crossbander. W1ALP got a Lerter from W6NZ who used to be with FCC Boston. W1NF out of hospital. Traffic: (Feb) WA1TBY 415, WA1VAB 270, K1BA 235, KA1BJY 209, WA1DXR 147, WA1YWK 128, K1BSO 104, W1ATX 103, KA1CC 90, K1GN 74, W1DMH 72, WA1ZLQ 50, W1PEX 48, N1AMF 46, WB1EZT 45, WB1ANT 31, KA1CGP 30, W1MX 29, WA1FNM 28, WB7TPY 26, WA2ORV 14, AF1Z 13, W1PL 10, WA1IFE 8, K1PJ 8, K1LCQ 6, WA1ZQT 6, N1EE 4. (Jan) N1AMF 59, WA1ZLQ 19, W1CE 7, AF1Z 5.

MAINE: SCM, Ed Bristow, WA1MUX — New ECs: WB1EYS Franklin Cty; WA1GIN, Lincoln Cty; K1ZIT, York Cty. A Statement of Understanding between Maine BCEP & Maine ARES is in the works. PSHR: AF1L W1BJ, AARA turned out 28 members for Caribou Kiwanis' Snowmobile race 16 Feb to supply comm. at 20 checkpoints & Hq. WD4NEK visited York area in Feb. Sess/-QNI/QTC: SPSN 13/116/25; MPSN 4/58/15; MSN 10/63/9; AEN 4/53/0. Traffic: (Feb) W1BJ 192, WB1BYR 116, N5YX/1 107, W1ISO 104, AF1L 89, WB1GLH 83, WA4UJJ/1 54, WA1MUX 38, W1KX 35, W1AHM 31, WA1JZP 20, WA1JHT 19, W1JTH 16, W1QTQ 11, KA1EO 14, W1BMX 10, W1GKJ 10, KA1AYC 9, WA1YNZ 6, WA1ZJL 5, W1CTR 4, KA1DDJ 3 (Jan) W1DHC 67, WA4UJJ/1 33.

NEW HAMPSHIRE: SCM, Robert C. Mitchell,

W1NH/W1SWX — SEC: K1RSC. STM: W1TN. NMs: N1NH & WB1HFI. Endorsements: K1RSC SEC; W1TN STM; N1NH NM; W1TN OES; W1WUO OBS; W1ALE & K1UQX OVS; W1UN W1JB K1GW & WA1PSI OO; K1OIQ W1FYR WA1OUO & KA1CB EC; K1AC W1JY W1BXM WA1PEL K1PQU W1MHX W1QYY W1BYS W1QKA KA1CB & N1NH OTS. Congrats to new Advanced WB1HGQ WB1GXN WB1HJO WA1YAZ KA1DON, WB1FKX WB1ERI WB1HJO & KA1OON on SSTV. W1VAU is home from the hospital. GSEM Net had 460 checkins & 201 traffic. Congrats to K1GQ, appointed to ARRL Contest Advisory Committee. The New Hampshire QSO Party was great. Details next month. AD1Y now AJ7S. State legislator, N1AIX & XYL, vacationed in Florida. It is sad to report K1BCS a Silent Key. He will be missed on the air as one of New England's top traffic handlers. Nashua Area Radio Club had another outstanding display of Amateur Radio at the Nashua Mall. KA1BXN is on 10, 15 & 40. The Interstate Repeater Association held a successful auctiontest. The dinner and dance featured K1NOR singing Irish selections. See you all at the Hosstraders Deerfield Auction May 10. Traffic: K1BCS 1509, W1TN 193, K1OSM 174, WB1FFZ 135, N1ALM 98, WB1HFI 74, W1MHX 67, WA1YAZ 37, WB1DSW 37, KA1BBI 26, WB1HGQ 15, WA1PEL 9, K1NH 4, W1NH 3, WA1HOB 1.

RHODE ISLAND: SCM, J. Titterington, W1EOF — SEC: K1DT. STM: N1RI. K1AUN is new OO & OBS — nice to have you aboard. New officers at Newport CRC: N5BGR, pres.; N1DB, vice-pres.; WA1OSL, rec. secy.; WB1CPO, cor. secy.; WB1GVH, treas. N5BGR and WB1FMB made General. WA1YDU & W1AGB both healing after major surgery. Hope Valley Rptr Assn granted honorary membership to your SCM — a real honor & I am grateful. ARES is doing great — averaging 20 QNI per week. RI stations are going better in QNI to EMRI CW nets but we could do much better. WA1OSL, acting mgr., says RIEM 2-mtr Tfc Net has sess 21, QNI 212 and TFC 52. RI QSO party will be held Aug. 16-17 this year, sponsored by EBAWA. Fidelity Club is doing lots of QRP work — both operation and also construction. Traffic: KA1FE 61, W1EOF 60, KA1BTU 43, N1RI 18, AE1S 6, K1UNA 2, WA1VTZ 2.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. Sorry, Mitch WB ' it is! WB2s JSJ AKA WB1GQR, have been running an info net at 1900 146.34/94 M-W-F. Any late niters on 160? If so, contact AC7D. AZ SCM. AZ hams looking for cw & phone contacts. KA1FJ reports chasing various contests for Feb. VT nets looking for tfc hams in our larger towns and cities (sml ones, too!). Look at VTSSB tfc. VTSSB 29/440/225; GMN 25/472/53; Carrier 25/488/40; VTP 4/58/7. K1BQB's tfc may be a high for a VT stn. Congrats for your 250 rcvd & 226 sent. K1BQB not only talks about tfc, she does it! I want to thank our tfc handlers for the time and effort in handling the Olympic messages. BPL issued to K1BQB for Feb 1980. Traffic: K1BQB 516, N1ARI 73, AE1T 23, W1RNA 31.

WESTERN MASSACHUSETTS: SCM, Art Zavarella, W1KK — STM: W1TM. SEC: W1JP. ASCMs: W1BVR K1BE. NMs: WMPN WA1MJE, WMN W1UD, WMEN W1UPH. New cw slow speed traffic training net started by W1TM, meets Mon thru Fri 6:30 P.M. prior to WMN on 3562. WMEN, Sun 8:30 A.M. on/or 3937 has developed into a valuable all WMA LO forum and ARES meeting place, thanks to former SEC WA1DNB who still takes turns as NCS, and the present team of W1JP W1UPH. With its 9:00 A.M. liaison/subsessions on the six repeaters that cover the entire WMA, in Feb there were 88 QNI on 3937, 271 on the repeaters, with QTC of 32. OTs welcomed: W1ZS W1IHI W1HNJ K1NM W1GG W1EFC W1JWV W1IVK W1ALP. New OO appointee W1TM has begun monitoring 80/40, and OT/OO W1UD reports sending 3 citations along with his other PSHR work. Consecutive month PSHR: K1JHC W1TM. Kudos: WA1MJE 1st Class Radiotelephone; W1UU Chmn Bd WNE College. Traffic: WA1MJE 372, W1TM 233, W1UD 172, W1KK 86, K1JHC 59, K1UV 40, W1BVR 32, WA1OPN 30, W1EFC 26, WB1HIH 26, W1JP 14, W1ZPB 11, W1GQP 8.

NORTHWESTERN DIVISION

IDAHO: SCM, Lem Allen, W7JMH — Club News: Kootenai Club of Coeur d'Alene elected new officers: WA7LOT, pres.; N7AWE, vice pres.; WA7HPR, 2nd vice pres.; WA7VWI 3rd vice pres.; WB7WUB, secy/treas.; WB7WBZ, editor. KARS now has 47 members, is 8 yrs old. They are sponsoring a hamfest, May 16, 17, 18 at Kootenai County Fairgrounds north of Coeur d'Alene. Free overnite parking, no charge for attendance, $2 fee for registration and prize drawings. Bring your used gear to the swap tables. Food for sale but no alcohol on premises. This is going to be a biggy — see you there! People and things: congrats to the mayor of Craigmont, KA7GTN, new Novice. Also congrats to new Novices KA7GUN and KA7GUO. KA7FAH now has SB 104, assisted W7GAT in teaching Novice class. WA7PGD has new TS 520SE. K7TM has been awarded the U.S.A. County Award No. 262 for having worked and received confirmation from all US counties — our envy and heartiest congratulations for this feat! W7HZL has a new archer Kever, just returned from LA where his mother passed away — our condolences. K7JV is an instructor for National Safety Council Defensive Driving Course. Net Reports:

Net	Freq	Time	Sess.	QNI	QTC
FARM	3935 ssb	7 P Dy	29	1507	41
CD	3990 ssb	8:10 A M-F	21	647	17
IMN	3635 cw	8 P M-F	21	190	95
Mini Cassia	146.52/52 fm		4	15	1
Pocatello	147.66/06 fm		4	120	6
Harrison	146.40/ 147.00 fm		4	75	6
Idaho Falls	146.34/94 fm		4	99	2
Boise	146.34/94 fm		4	307	0

A civil defense exercise featuring nuclear radiation and fallout problems was simulated at Caldwell Feb 28. 16 amateurs from Canyon County ARS participated. W@YXB temporary EC was in charge of the amateur participation in the exercise. Traffic: W7GHT 329, AC7P 126, K7JV 34, W7JMH 55.

MONTANA: SCM, Robert Leo, W7LR — Congrats to KA7CPT and K7FR on IMN Section Net Certificates. How about some MT stations for these awards? Check into IMN 3635 M-F on 3635. IMN QTC 95, QNI 19. MTN QNI 1091 QTC 109. W7TGU reports 173 DX total. W7DB sends OBS bulletins. OST discusses the intentional QRM problem. Do you have ideas on reducing this? Prairie Electronics ARC sets June 14, 15 for hamfest at Lewis & Clark Bridge south of Wolf Pt. QSO WB7QDL, QDN for info. N7ANR WB7WFY made snowmobile ex-

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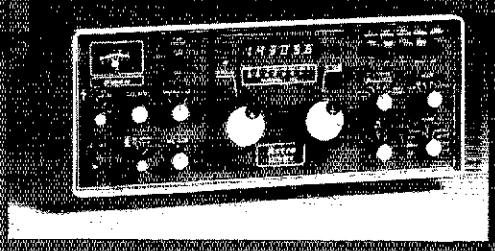
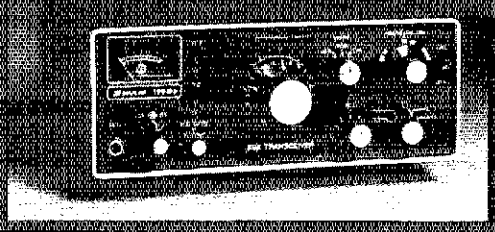
ASTRO 102 BX



100 MX



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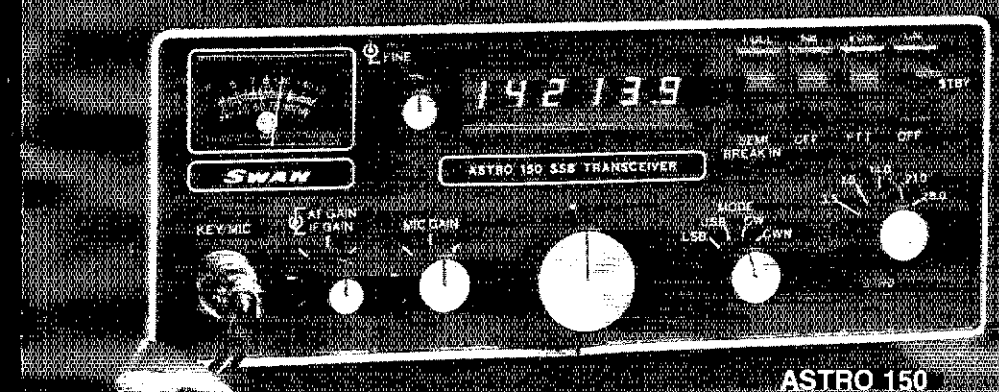

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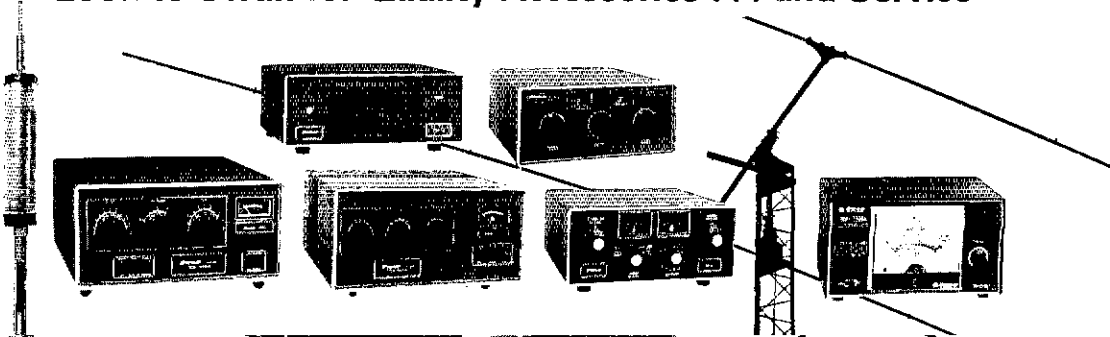
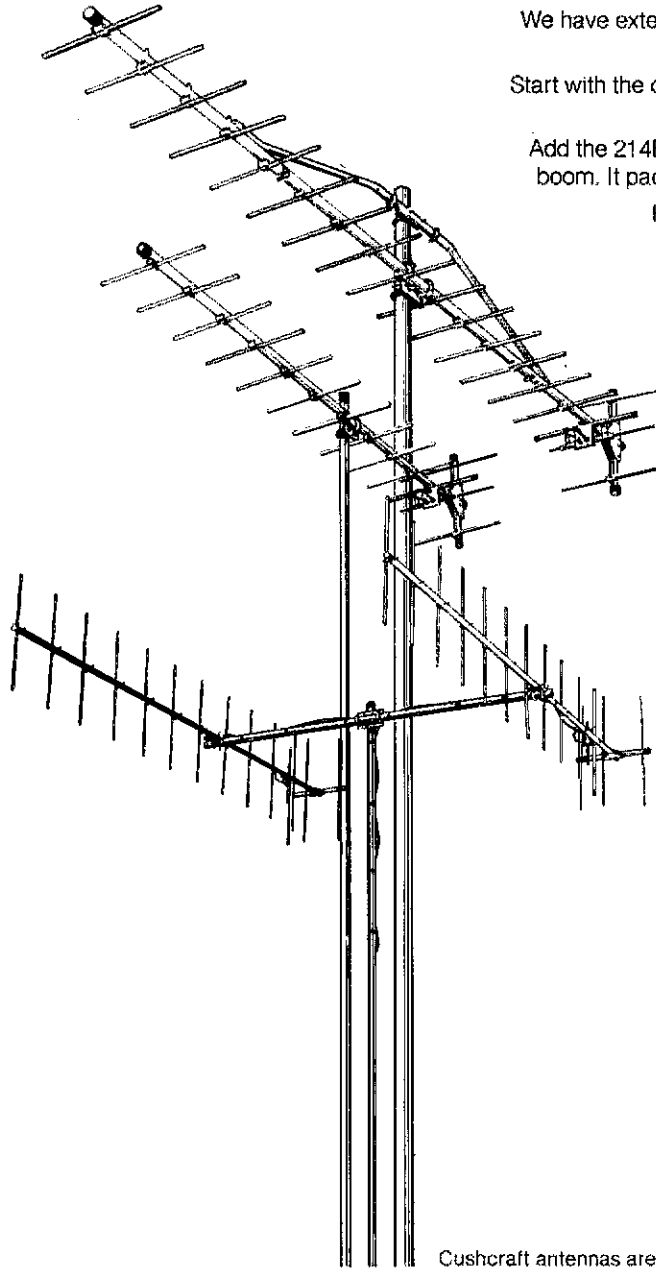


B=DX

BOOMER



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Add the 214B CW/SSB Junior Boomer with 14 elements on a 2.2λ boom. It packages performance in a size that every ham can use.

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The formula for 6-meter DX success is the all new 617-6B, a 33-foot long 6-element Yagi with gain that disproves all of the old formulas.

For maximum front to back ratio, the 2-meter antennas include a trigon reflector. All Boomers feature high efficiency balanced feed systems with integral KW balun for a clear precise pattern; a large diameter round boom for more endurance with less wind load; all stainless steel hardware and easy installation. Boomers have the right combination of features which will give you long path DX capability or allow you to participate in tropo, sporadic E, meteor scatter and EME fun.

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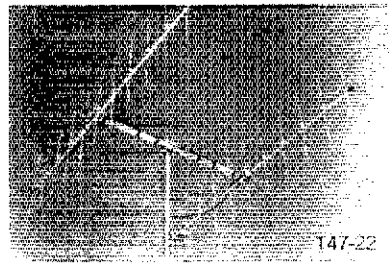
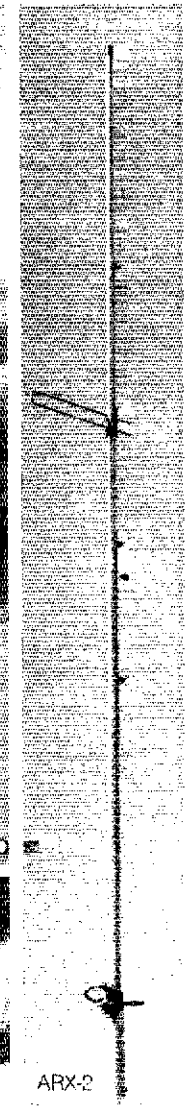
How to enjoy FM





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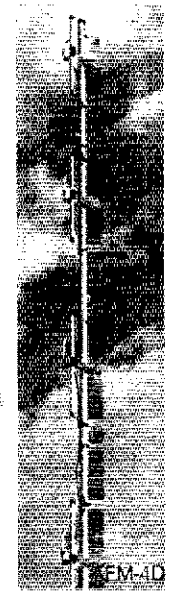

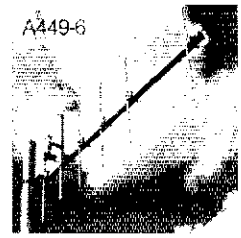

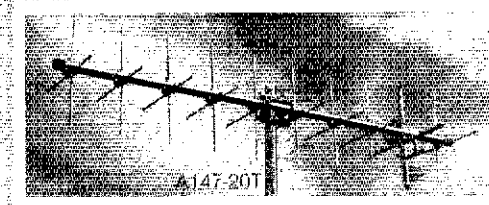

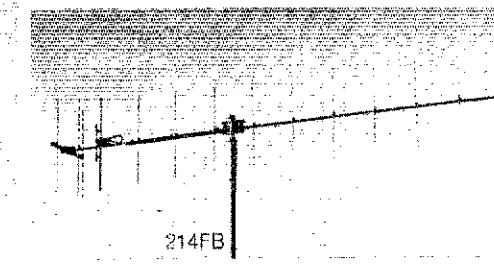

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ped to Steamboat to get WR7ANC back on, by shoveling snow from bldg. Gallatin HRC, Bozeman, provided 2 & 40 mtrs for annual Bozeman to W Yellowstone snowmobile race. Capital City ARC, Helena: KA7CBV, pres.; W7QCW, vice pres.; W7LIT, secy/treas. KA1EA, OVS Bozeman, reports. KA7DLC Oscar DX, & 2-mtr activities. W7IDK, EC Havre, got nice ltr from c.d. on their EC efforts. W1MU Aug 1, 2, 3 in West Yellowstone. See June QST & World Radio ads; request mailing from WA7ZBO. New Butte ARC officers: WA7SLF, pres.; N7AFS, vice pres.; WB7PUE, treas.; WA7PZO, secy. WA7FOB rcvd W7OIO award. WA7CAC master of ceremonies at Butte annual award dinner. W7HAH 6 mtr WAS. Missoula area VHF officers: K7WNE K7IOA WB7SFF W7PX. MT Sect Net 7240 9:30 A.M. Sun. Glacier-Waterton hamfest, Ft McLeod, Alberta, July 18-20. QSO VE6NB. Two Silent Keys: KA7DIN & WB7WCW. Traffic: W7TGU 140, KB7BI 73, W7DEO 69, W7NEG 8, W7LR 4.

OREGON: SCM, Dale T. Justice, K7WWR — SEC: K7OLN. Section nets:

Net	Time/Days	Freq.	QNI	QTC	Mgr.
BSN	0145Z Dy	3908	603	28	WB7POU
OSN	0230Z Dy	3587			WB7OFT
PdxAARES	0330Z Dy	147.32	565	75	K7WWR
WCN	0300Z Dy	3702	337	179	K7ZIG
1676	0300Z Dy	146.76	738	204	W7LRB

New on six meters: N7BLS and WB7PPK. Eager Beaver Ham of the Month is KA7CDD. Hoodview officers for 1980 are: W7DYS, pres.; WB7OYD, vice pres.; WB7RAQ, secy.; WB7USF, treas.; plus WA7IIM WB7WOE W7TWL WB7SRU and WB7OZI. The new Hoodview Club repeater is operational on 147.28. Portland ARC had a dinner meeting with W7ELS showing slides of China. Traffic: (Feb) W7VSE 850, K7NTS 229, WB7OFI 222, WA7IHS 188, K7IFG 118, K7OPW 58, K7SGU 29, W7LNE 24, K7WWR 21, W7LT 20, WB7OIJ 9. (Jan) W7LNE 47.

WASHINGTON: SCM, Bob Klepper, W7IEU — STM: W7DZX. SEC: WA7RWK. Nets reporting: NTN QNI 1572, QTC 114; WARTS QNI 3282, QNI 214, NWSSBN QNI 719, QTC 32; WSN QNI 512, QTC 171; PSTS QNI 123, QTC 69; SNOCO ARES QNI 41. Fort Vancouver Hamfair is May 10-11, Yakima Hamfest May 18, and Wenatchee June 7 and 8. Preconvention registrations for SEANARC '80 are available now from convention hq. BAW-FAW rptr 66/06 holds nightly nets at 2030 local. Mon thru Fri. W7CKZ airs 2-meter version of WARNS on Mon nights same time. New officers of Radio Club of Tacoma are: N7ARO, pres.; WB7ENB, vice pres.; N7AZO, secy.; K7QLC, treas. Looking for code practice? WA7YCM conducts code practice on 3715 kHz, 7:15 P.M. Tues and Thurs. Bears and King Cty ARES making plans for communications for IEEE National Convention June 8-12, contact W7EA or K7GZO if you can help. WB7FGC is training officer for BSA in Spokane District. Olympia Amateur Radio Society (OARS) 1980 officers are: WB7URK, pres., K7HNZ, vice pres.; WA7RDJ, treas.; WB7PSU, secy. W7AB waiting for better WX and manpower to get back on 80 cw. W7BCS has had rig trouble but still maintains his OBS schedules. New officers of PSCARC are: KL7JEB, pres.; W7GY, vice pres.; K7VNI, secy., WN7NXC, treas. After 25 years, W7UGK made WAS on 6 with low power. W7JIE made 71 IW reports during February. Chehalis Valley Amateur Radio Society (CVARS) officers are: KA7EOV, pres.; W7DHZ, vice pres.; KA7CCZ, secy.; N7AID, treas.; W7JMG K7OKC WA6CHW W7MF KB7CZ, board. KL7JEB has added a few more duties to his slate, he is pres of PSCARC, pres of Skagit Cty S&R, and DRN7 manager. RASC at Mt Vernon, W7WMO from George and OARS at Olympia celebrated Washinton's birthday with displays and on the air activities. Members of LCARC and Clark Cty ARC/ARES worked hard during snow emergency. WWDX Club enjoyed a slide presentation by Engineer in Charge of FCC's Ferndale monitoring station. HAMS Club has changed meeting places and time, they meet at the new Marysville Library at 7:30 P.M. on the 3rd Friday of the month. West Seattle ARC enjoyed tour of KOMO conducted by W7FCB. West Seattle ARC planning battery powered operation for FD June 28-29. W7ERH has 2-meter beam repaired after ravages of winter. WB7WOW participates weekly in Island Cty ARES activities. Traffic: (Feb) W7DZX 1144, KL7JEB 566, WB7TQF 438, WB7WOW 398, W7LUP 342, K7GXZ 264, N7AFZ 245, K7GTP 175, W7FJZ 133, W7IEU 120, WA7BDD 113, W7GB 88, N7AJ 86, WB7CFH 66, WB7EBP 42, N7AFY 25, N7RV 20, W7RUN 17, W7APS 15, WB7QWC 9, WB7OAS 8, W7BCS 6. (Jan) N7RV 6.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SCMs: K6UWR W6ZF VE2AQV/W6. SEC: WB6KOU. PSHR for Feb: W6OA. Welcome to new EC, AA6SL, with the SBARA. New SEC, WB6KOU, working at getting acquainted with the section ECs and planning exercise participation. W6OA looking for software for his TRS-80. N6RO repairing antennas almost as fast as they break! Napa Valley Emgy Net provided bike-a-thon communications on the 23rd. SBARA member, WD6DMB, recently won a five day trip to Mexico. WD6FLN is now KB6TQ and KA6BGP is now KB6TZ, both Advanced. WB6ZFZ has also upgraded to Advanced and KA6IMN to General. LARK is planning training sessions and stocking their RACES van with forms and pencils. A work party is being formed to install their new repeater antenna. WA6LYC upgraded to General. MDARC mourns the loss of member W6JXI. WD6FFL WD5FBA WD6GJU upgraded to Advanced and KA6EBT to General. A budget for Field Day has already been approved by MCARC! EBRC meets on the second Friday of each month, 7:30 P.M., at Salvation Army Hq. 36th and Rheem, Richmond. WB6FJC is their new publicity chmn. Traffic: W6OA 230, K6UGS 16, W6ZF 6.

NEVADA: SCM, Ralph E. Covington, W7SK — ASCM: N7RH. SEC: WA7KCD. New officers WADG 1980: N7RH, chmn.; N7BGO, vice chmn.; AB7D, secy.; KH6JVZ, treas.; N7JM, bd. member. New OBS, KH6JVZ. Las Vegas Radio Amateur Club will have a picnic and swapmeet May 18. LVRAC Net on Tuesday 8 P.M. Pacific time, 3494. Phase III OSCAR due up soon. If anyone besides W7BYR ready? Remember, this column provides among other things a historical record. Input from all Nevada stations is welcome, by the first of each month please. Nevada Sagebrush meets nightly 7:30 on a frequency of 3906 kHz. Traffic: N7AKX 230, W7BS 108.

PACIFIC: SCM, Pat Corrigan, KH6DD — New EC Hawaii (Big Island) is KH6B. AH6K found too busy a schedule. Thanks to him for really getting things going on Hawaii. Congrats to KH6CZ for both his good FMT score as usual and for achieving Cent. Club in the OCWA. Had nice visit from HB9RS, pres. of UN ARC (4U1UN) and his wife and were joined at dinner by Swiss Consul, HB9VP,

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28-30 MHz in, 435-437 MHz out; 1W p.e.p. on ssb, up to 1½W on CW or FM. Has second oscillator for other ranges. Atten. supplied for 1 to 500 mW input, use external attenuator for higher levels.

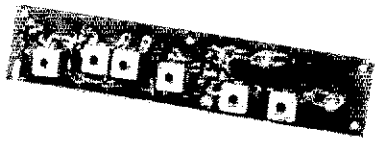
Extra crystal for 432-434 MHz range $5.95
XV4 Wired and tested $149.95

XV2 VHF KIT - ONLY $69.95

2W p.e.p. output with as little as 1mW input. Use simple external attenuator. Many freq. ranges available.

MODEL	INPUT (MHz)	OUTPUT (MHz)
XV2-1	28-30	50-52
XV2-2	28-30	220-222
XV2-4	28-30	144-146
XV2-5	28-29 (27-27.4 CB)	145-146 (144-144.4)
XV2-7	144-146	50-52

XV2 Wired and tested $109.95



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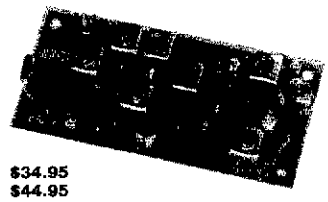
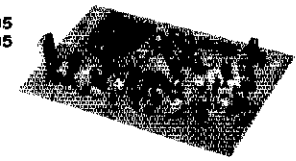


VHF KIT $34.95
VHF Wired $44.95

MODEL	RF RANGE	OUTPUT RANGE
CA28	28-32 MHz	144-148 MHz
CA50	50-52	28-30
CA50-2	50-54	144-148
CA144	144-146	28-30
CA145	145-147	28-30
or	144-144.4	27-27.4 (CB)
CA146	146-148	28-30
CA220	220-222	28-30
CA220-2	220-224	144-148
CA110	Any 2MHz of	26-28
(less xtal)	Aircraft Band	or28-30

Kit less xtal $29.95



UHF KIT $34.95
UHF Wired $44.95

MODEL	RF RANGE	OUTPUT RANGE
C432-2	432-434	28-30
C432-5	435-437	28-30
C432-4	432-436	144-148

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Professional Quality VHF/UHF FM/CW EXCITERS

- Fully shielded designs
- Double tuned circuits for spurious suppression
- Easy to align with built-in test aids

T50-50	6-chan, 6M, 2W Kit	$44.95
T50-150	6-chan, 2M, 2W Kit	$44.95
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See our Complete Line of VHF & UHF Linear PA's

- Use as linear or class C PA
- For use with SSB Xmtg Converters, FM Exciters, etc.

LPA2-15	6M, 2M, 220; 15 to 20W	$59.95
LPA2-30	6M, 2m; 25 to 30W	$89.95
LPA2-40	220 MHz; 30 to 40W	$119.95
LPA2-45	6M, 2M; 40 to 45W	$119.95
LPA4-10	430MHz; 10 to 14W	$79.95
LPA4-30	430MHz; 25 to 30W	$119.95

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Great for OSCAR, SSB, FM, ATV. Over 14,000 in use throughout the world on all types of receivers.

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Specify band when ordering

- Deluxe vhf model for applications where space permits
- 1½" x 3"
- Models available to cover any 4MHz band in the 26 to 230 MHz range
- 12 Vdc
- 2 stages
- Ideal for OSCAR
- 20 dB gain

P8 Kit $10.95
Specify band when ordering

- Miniature vhf model for tight spaces–size only ½ x 2 ⅜
- Models available to cover any 4MHz band in the range 20 to 230 MHz
- 20 dB gain
- 12 Vdc

P15 Kit $18.95
P35 Wired $27.95

- Covers any 10 MHz band in UHF range of 380 to 520 MHz
- 20 dB gain
- 2 stages
- 12 Vdc

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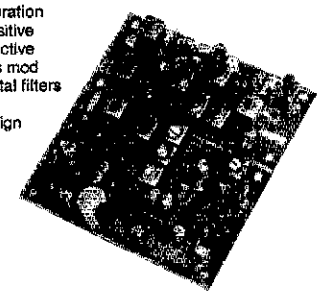
- Easy to align



R75A* VHF Kit for monitor or weather sattelite service. Uses wide L-C filter. -60dB at ± 30 kHz. $69.95

R75B* VHF Kit for normal nbfm service. Equivalent to most transceivers. -60dB at ± 17 kHz, -80dB at ± 25 kHz. ... $74.95

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103 80-20m Xcvr	$289
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TX-62 VHF Xmtr	$ 49
ATLAS	
350XL Xcvr	$599
350XL/braille	599
350XL/DD6 Digital	649
350XL/DD6/305	699
350PS AC supply	149
210 Xcvr	339
210X Xcvr	369
210X/NB Xcvr	399
210X/NB (LE) Xcvr	479
215X/NB/VX/10XB	499
220CS AC supply	99
VX-5M VOX	39
MT-1 Transformer	19
PS-110H 12v p.s.	69
110L Xcvr (RX+TX)	249
CENTRAL ELECTRONICS	
MM-2 Scope	$ 59
CLEGG/SQUIRES-SANDERS	
22'er FM series 25	$129
FM 27A 2m FM Xcvr	129
FM-27B 2m FM Xcvr	149
COLLINS	
75S-1 Ham Rcvr	$299
75S-3 Ham Rcvr	450
75S-3/CW filter	499
75S-3B Ham Rcvr	549
75S-3B Rcvr (round)	599
75S-3B conv to C	575
75S-3C Rcvr (round)	799
32S-1 Transmitter	275
32S-3 Transmitter	499
30L-1 Amp (round)	599
312B-2 Speaker	19
312B-3 Speaker	29
312B-4 Console	199
516E-1 KWM-1 DC ps	69
KWM-2 Xcvr	575
351D-2 Mobile mt	49
516F-2 AC supply	199
PM-2 Port AC ps	125
MP-1 DC supply	49
CC-1 Carrying case	69
COMDEL	
CSP-11 Speech proc	$ 49
CURTIS	
EK-39M Keyer	$ 59
DENTRON	
80-10AT Tuner	$ 39
160-10AT Tuner	99
160-10AT-3kw tuner	119
MT-3000A Tuner	239
MLA-1200 RF deck	175
MLA-1200/AC ps	249
Clipperton L Amp	399
AF-1A Audio proc	129
DRAKE	
2C Ham Rcvr	$189
R-4 Ham Rcvr	269
R-4A Ham Rcvr	279
R-4B Ham Rcvr	329
R-4C Ham Rcvr	429
4NB Blanker	49
FL-500 Filter	35
FL-4000 Filter	35
FL-6000 Filter	35
MS-4 Speaker	19
SC-2 2m conv	69
SC-6 6m conv	69
CPS-1 Conv ps	19
CC-1 Console	39
TC-6 Xmit conv	175
TR-4 Xcvr	375
TR-4/NB Xcvr	425
TR-4C Xcvr	449
TR-7/CW filter	1099
TR-6/NB 6m Xcvr	589
T-4X Transmitter	329
T-4XB Transmitter	369
T-4XC Transmitter	429
AC-3 AC supply	65
AC-4 AC supply	89
DC-3 DC supply	65
MN 2000 Matcher	149
W-4 Wattmeter	49
TR-22 2m FM Xcvr	99
TR-22C 2m FM Xcvr	125
TR-33C 2m FM Xcvr	149
AC-10 AC ps	29
AA-22 Amp/preamp	69
GALAXY/HY-GAIN	
Galaxy III Xcvr	$125
GT-550 Xcvr	199
AC-35 AC supply	65
SC-550 Speaker	19
R-530 SW Rcvr	599
AC-210 AC ps/amp	19
FM-210 2m FM Xcvr	69
GONSET	
911A AC supply	$ 39
GC-105 2m AM Xcvr	49
HAL	
ST-6000 TTY demod	$349
HALLICRAFTERS	
SX-117 Ham Rcvr	$189
HT-44 Transmitter	159
PS-150-120 PS	69
PS-150-12 DC ps	49
MR-150 Rack mt	15
SR-400 Cyclone II	349
SR-400A Cyclone III	399
P-500AC AC ps	99
HA-1 Keyer	49
HEATHKIT	
SB-303 Ham Rcvr	$249
HR-1680 Ham Rcvr	199
HP-23 AC supply	49
IB-1100 Counter	99
IM-4100 Counter	99
HY-GAIN	
3750 Xcvr	$799
ICOM	
IC-701 Xcvr/ps	$975
IC-502 6m SSB Xcvr	159
DV-21 2m dig VFO	129
IC-215 2m FM Xcvr	149
IC-22S 2m FM Xcvr	189
IC-230 2m FM Xcvr	189
IC-245/SSB 2m Xcvr	379
IC-202S 2m SSB Xcvr	179
IC-211 2m Xcvr	475
IC-20L 2m amp	49
IC-30A 450 Xcvr	279
RM-2 Programmer	89
IC-3P AC supply	39
IC-3PA AC supply	49
SM-2 Microphone	19
JOHNSON	
275w matchbox	$ 69
275w matchbox/SWR	99
Kw matchbox/SWR	169
KLM	
Echo II 2m SSB Xcvr	$199
PA10-40BL 2m amp	149
KENWOOD	
TS-120S Xcvr	$499
TS-520S Xcvr	575
TS-820 Xcvr	649
TS-820/dig	725
TS-820S Xcvr	799
VFO-820 VFO	129
R-820 Ham Rcvr	788
R-599 Ham Rcvr	249
R-599D Ham Rcvr	349
S-599 Speaker	19
T-599D Xmtr	375
SM-220 Scope	249
SM-220/BS-8	299
TS-600 6m Xcvr	549
TV-502 2m Xvtr	189
TV-502S 2m Xvtr	219
TS-700SP 2m Xcvr	479
TR-2200A 2m FM Xcvr	139
TR-7500 2m FM Xcvr	189
TR-7600 2m FM Xcvr	239
TR-7625 2m FM Xcvr	279
RM-76 Programmer	89
PS-6 Power supply	49
MIDLAND	
13-500 2m FM Xcvr	$119
13-505 2m FM Xcvr	129
13-510 2m FM Xcvr	249
MURCH	
UT-2000A Tuner	$ 99
NDI	
HC-1400 2m FM Xcvr	$249
NATIONAL	
NCX-3 80-20m Xcvr	$129
NCX-5 Xcvr	199
NCX-A AC supply	75
PANASONIC	
RF-8000 SW Rcvr	1299
RF-4900 SW Rcvr	299
PACE	
Communicator II	$249
RFE	
RFE-100 Dig disp	$129
REDI-KILOWATT	
401 Keyer	$ 99
REGENCY	
HR-2A 2m FM Xcvr	$ 99
EC-175 Counter	149
ROBOT	
70 Monitor	$199
80A Camera	229
SBE	
SB-34 Xcvr	$199
SPECTRONICS	
DD-1K Kenwood dig	$ 99
SC-30 Counter	88
SC-250 Counter	99
STANDARD	
146 2m FM HT	$ 99
146 w/TTP	129
C 118 2m FM HT	129
SWAN	
MB-80A 80m Xcvr	$169
MB-40A 40m Xcvr	169
P-1215 AC supply	49
SS-200 Xcvr	299
PS-20 AC supply	95
14A DC conv	39
350 Xcvr	229
350B Xcvr	299
350D Dig Xcvr	379
500 Xcvr	289
500C Xcvr	319
500CX Xcvr	359
700CX/SS-16	429
HF-700S Xcvr	379
HF-700S/SS-16	429
PSU-3A AC ps	119
102BX Xcvr	849
PSU-6 AC ps	139
117C AC supply	65
117XC AC supply/spkr	99
230XC 110/220 ps	95
14X DC module	49
600T Transmitter	349
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600R/SS-16B Custom	349
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250C 6m Xcvr	275
210 6m VFO	75
NS-1 Silencer	24
VX-2 VOX	29
FP-1 Patch	39
WM 200A Meter	49
WM-6200 Meter	39
ST-2 Tuner	175
TEMPO	
2020 Xcvr	$499
Tempo One Xcvr	289
AC One AC ps	89
TEN-TEC	
Omni-D Dig Xcvr	$769
Omni-D/blanker	799
252M/O AC ps	99
Triton II Xcvr	749
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KR-50 Keyer	69
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FRDX-400 Rcvr	249
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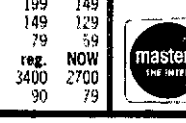
FT-625RD 6m Xcvr	599
FT-225RD 2m Xcvr	589
YG-221 Dig display	79
CPU-2500R 2m FM	299
FT-227R 2m FM Xcvr	329
FT-227R/TTP mic	249
FT-227RA 2m FM Xcvr	249
FT 727RB 2m FM Xcvr	229
200R 2m FM Xcvr	149
FT-224 2m FM Xcvr	99
FT-2 Auto 2m FM	89

(1) This list was prepared from an inventory taken on the date shown. The quantities vary. In some cases there are several of one item, others only one. Due to the lead and distribution time of this publication some of the items may have already been sold by the time you see this ad. But, due to the number of trades we are involved in each day, some items are in stock that are not listed. When ordering state more than one choice if possible. (2) AES reserves the right to sell power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) To insure quality, our used gear is serviced and made ready for shipment after we receive your order. Please allow 5 to 10 working days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment specials, closeouts, etc. shown on this page.

The following are NEW Close-outs, Overstock merchandise, New displays, Demos, etc. Most are factory-sealed, all carry New warranties. Limited quantity. First come, first served. Most Close-outs available at Milwaukee only. Terms of sale: Payment in full with order, Mastercharge, or Visa (Bankamericard); no trades.

	reg.	NOW
ALDA		
103 80-20m Xcvr/nb/cal/mic	$573	399
103A 80/40/15m Xcvr/cal	514	349
ALLIANCE	reg.	NOW
HD-73 Rotor	$154	109
ATLAS	reg.	NOW
DMK/XL Mobile mt	$ 65	39
210X Xcvr	765	499
215X Xcvr	765	519
210XS/NB (LE) Xcvr/blanker	810	599
215XS (LE) Xcvr	765	569
215XS/NB (LE) Xcvr/blanker	810	599
DD-6C Digital display	235	199
DMK Mobile mt	55	39
RX-110 Rcvr/TX-110L Xmtr	438	349
RX-110/TX-110H/PS-110H	636	499
CDI	reg.	NOW
AM filter for FT-101	$ 39	29
CES	reg.	NOW
800-YS Scanner, FT-227R	$ 99	59
251T Program dialer	99	69
CIR	reg.	NOW
Astra 200 Xcvr	$995	699
Astro 200A Xcvr	1095	699
Astro 200A/CW filter	1145	749
BPS-200 AC supply	135	125
SPR-200 Speaker	30	24
SPS-200 AC ps/speaker	165	149
SOC-200 Stn console	295	236
MIC-STA Desk mic	38	29
COLLINS	reg.	NOW
MM-2 Boom mic/headset	$240	199
312B-2 Speaker		29
CUSHCRAFT	reg.	NOW
A14-2 2 el 20m beam Truck	$139	89
A14-3 3 el 20m beam Truck	169	119
A21-3 3 el 15m beam Truck	99	69
A28-3 3 el 10m beam	69	49
A28-4 4 el 10m beam	89	59
A220-22 22 el 220 beam	82	59
DENTRON	reg.	NOW
HF-200A Xcvr	$699	499
160-AT 160m ant tuner	59	39
80-10AT 80 10m tuner	69	49
160-10AT-3Kw Ant tuner	229	129
PS-10 VOM/wattmeter	49	29
PS-20 VOM/wattmeter	69	39
WP-2A PEP meter (Fla)	99	69
WV-1 VHF meter (Clev)	69	49
F-1 FS meter	19	15
AF-1A Speech processor	199	139
HF-ACS 12v 10A supply	129	49
DENTRON (New Displays)	reg.	NOW
GLA-1000 Linear	$379	249
Chipperton L Linear	699	499
MLA-2500B Linear	999	749
MT-3000A Tuner	349	299
MT-2000A Tuner	199	149
Super Tuner Plus Tuner	149	129
Jr. Monitor Tuner Tuner	79	59
DRAKE	reg.	NOW
DSR-2 SW Rcvr	3400	2700
RP-500 Receiver protector	90	79
AN-5 Shortwave ant	8	5
MN-4C Tuner	189	119
MN-7 Tuner	175	139
MMK-3 Mt for TR-4	10	8
MB-22 Mt for TR-22	10	5
7072 Hand mic	19	9
1525EM Encoder mic	49	35
CC-1 Converter console	49	45
UV-3 2m only DEMO	595	499
EDGECOM	reg.	NOW
3000A 2m Xcvr	$549	399
HI-PAR	reg.	NOW
HT2M 8 el 2m beam	$ 24	9
HY-GAIN	reg.	NOW
182 Hy-Tower Truck	$359	288
203BA 3 el 20m beam Truck	139	99
3807 Nicad for 3806	34	19
1106 Wall cgr for 3806	9	5
ICOM	reg.	NOW
IC-245 2m FM Xcvr	$579	379
IC-245/SSB 2m Xcvr	699	479
IC-3PA Power supply/spkr	99	59
IC-211 2m Xcvr	999	699
IC-215 2m FM Xcvr DEMO	189	149
IC-202 2m SSB Xcvr DEMO	289	199
KLM	reg.	NOW
Force 5 Xcvr w/ps	1344	795
FDM-148 Desk microphone	29	19
661 6m Xcvr	695	499
Multi-2700 2m Xcvr	756	649
1500HD Heavy duty rotor	795	595
KENWOOD		NOW
R-599D Receiver	$499	399
CC-69A 6m conv for R-599		35
CC-29A 2m conv for R-599		35
T-599D Transmitter	499	399
PS-5 5A 12v power supply	79	59
MIDLAND	reg.	NOW
13-510A 2m FM synth Xcvr	$399	329
13-505 2m FM Xcvr DEMO	229	179
18-940 2m tnk/roof ant	31	15
18-950 220 tnk/roof ant	31	15
18-951 220 magnet ant	37	19
MIRAGE	reg.	NOW
B 108 5-15/80w 2m amp	$169	149
B-1016 5-15/160w 2m amp	279	249
B-3016 15-45/160w 2m amp	239	209
NYE	reg.	NOW
250-25-3 500w tuner/relay	$212	88
250-25-4 500w tuner	202	88
PALOMAR	reg.	NOW
Kachina 6 & 10m Xcvr	$689	489
ROBOT	reg.	NOW
400 SSTV scan converter	$795	646

continued - next page



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a professor at UH, Manoa. Our condolences to STM WØKON whose mother died in March. If you're planning on attending ARRL Nat Conv in Seattle, contact KH6AN. Only 3 Hawaii sta heard in ARRL DX Test. Get your plans together for Field Day. Hono hams contact KH6CKJ to help HARC effort. San Francisco SCM, W6VV, will be in KH6 then and hopes to help. Former SCM, N7HR sends 73 to all from Japan. So do AH6C KH6HGG and KH6IPN — now in VA. Traffic: KH6IQU 99, KH6H 32, AH6K 16, KH6HIJ 11, AH6K 8.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: WB6GFJ. ASCM: W6NJU. The eighth annual Sacramento Valley Amateur Radio Ham Swap, sponsored by the North Hills RC, will be held on Sunday May 4 from 9 A.M. till 3 P.M. It will again be held at the Machinist Hall, 3081 Sunrise Blvd, Rancho Cordova. Come early. The hall is 1/3 mile south of I-50. The North Hills RC has their new repeater on 144.59/145.19. The Yuba-Sutter ARES was again activated by OES for flood watch. Call changes include KI6O and KB6NF. Congrats to KA6AUK on passing the Advanced test and KA6FHD for Novice. WB6GFJ is representing AREC on the Y-S Emergency Medical Committee. WB6FAA is experimenting with 2300 MHz receivers. Traffic: W6SX 56, W6DEF 20, W6RSP 16, K6RPN 8.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: WB6ZRK. STM: K6TP. G.S. Ladd Chapter was number one in nation in Telephone Pioneer QSO party; W6KXG W6MFZ W6BUY second, third and fourth with national individual high scores, with W6FAK tops in phone only category. K6GWE/R reports memorable breakfast. W6LFJ was on air from Death Valley, operated by Sonoma County Radio Amateurs WB6NBR WA6RNF KB6LO and KA6DEI. Congrats to KA6DBB WB6EFY WB6EIB and W6LAS on upgrade to Advanced and KA6IXM for Novice. N6CT continues his high level of activity as OVS. WA6UHA has new TR2400. Due to illness, W6RQ did not participate in the last frequency measuring test, which broke his string of 108 consecutive times over a period of 27 years; hope you're feeling better! Traffic: (Feb) W6NL 382, W6RNL 192, W6GGR 8. (Jan) W6NL 334.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — Asst SCMs: WA6YAK W6TRP WA6HIN. SEC: WA6YAB. The San Bernardino Microwave Society beacon on 2.3 GHz, is on each day at 1941 PST. WA6EXV building preamps for 2.3 GHz. K6CLP a Silent Key. KA7AFZ N6CAP and KA6IFI now General. WB6FVJ and KA6ENM now Advanced. KA6EKW is KB6WF. WB6HWH has a TS520SE. N6CDD has a 10 meter dipole. WB6HEQ lost his antenna to wind again. W6DPD has DXDC (6 meters). All interested Amateurs should register with their EC for ARES. If you're not sure, send you ARES form to WA6YAB or W6DPD for forwarding. For traffic handling try NCN on 3630 kHz at 1900 or 2030 daily or NCN/VHF at 1930 daily on 144.81/145.41 MHz. The ARRL National Convention is July 25-27 in Seattle. The Fresno Hamfest is May 9-11 at the Hacienda. Traffic: (Feb) N6AWH 134, W6DPD 23, WB6TTP 12, WA6YAB 12, N6AMA 7, WD6FRS 4, K6RAU 4. (Jan) K6RAU 3.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. W6ASH/R now installed on El Camino Hospital, 144.67/145.27. SPECS Net will switch their AREC net to the repeater. MEDEX 80-II was held in Campbell, with 26 hams aiding the Red Cross in communications. EMARC Flea Market will be held May 17. K6TDR and KA6M spoke on "Packet Radio" before FARS. A talk on traffic handling was given by RFF before the Gabilan ARC in Gilroy. Newest member of GARC is WD6CKT. K6JHK lost an antenna to the winds. Memorex ARC meets twice a month and publishes two newsletters/mo. A very busy group! New member of NCCC is N9NC. W6ZRJ & W6VZT gave a talk on antennas to the Santa Cruz CARC. W6EY was elected as an ARRL Honorary Vice Pres. SCCARC has started a new Novice class, and is looking for a club project. The SCVRS has changed their rptr call to WB6OQS/R, also N6MXV gave them a slow-scan demo. WB6OQS organizing communications for SCV March of Dimes Walkathon. The program of SMRC included W6AQR's talk on "Basic Antenna Design." W6AQR and W6SER are teaching a Novice class. SMRC is also holding a monthly club breakfast. SCCARA held a "Homebrew Nite," and many club members had interesting projects to show and demonstrate. SCCARA is looking for help to aid in restarting the Saratoga Radio Club for junior and high school students. A very worthwhile project! K6DYX still runs his finger breaking code practice runs — 35 wpm and up, Sun 1930 local on 3690 and 7025 kHz. New members of NPSARC are: KA6ILN KA6INO WBØDBT KA6INC and WD5IOQ. The Novice members are forming the "Butterfly Net" for Novice and Techs at 2030 local on Sun at 28.1 MHz. NPSARC has new rptr and autopatch up and working and new call of N6EY/R. W6XN discussed the status of amateur satellite programs and OSCAR 7 & 8 before the LERA ARC, also they have KB6VM as a new member. W6RFF visited FARS and SCCARA club meetings. W6ZRJ doing some QO work, and checks into NCN. W6ASH busy with emergency work. W6OII busy with tone nets. W6YBV and W6KZJ active on NCN. Traffic: (Feb) W6YBV 239, W6KZJ 124, W6RFF 45, WA6HAD 19, W6OII 15, W6ASH 10, W6ZRJ 4. (Jan) W6ASH 7.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — Asst SCM: N4UE. STM: K4VHT. New officers of High Point ARC: WA4ZXA, pres.; WA4WCL, vice pres.; WD4ENB, secy.; WD4EMX, treas. Foothills ARC now has a wide area coverage repeater on 144.77/145.37 in the North Wilkesboro area, all are invited to use this fine machine. W4DSU & W1VMD of Concord are establishing a Central NC QCWA Chapter, if interested, please contact them. Interested in starting a 6 meter SSB Net? Contact WA4FSC, Reidsville for more info. The Greensboro and Charlotte Weather services participated in a statewide tornado alert exercise with assistance from ARES groups in counties surrounding these areas. Weather Alert Nets were activated in Charlotte, Greensboro and Salisbury. Thanks to W4OCZ KB4IZ KD4E WD4ABZ and others. Cabarrus ARS provided communications for recent Walk-a-thon held in Concord. Thanks for the good attendance at the Roanoke Division Convention in Charlotte. Get your calendars marked for the Durhamfest May 17-18, and the Gastonia Hamfest May 24-25. See you there. Be sure your club is getting ready for Field Day on June 28-29 this is a good event in which to regain club spirit. New appointees include KA4DNL (OTS) W4EAT (EC Stanly Co) WD4ENB (EC High Point). Traffic: WD8NYN 466, WD4CNQ 409, KF4R 240, AB4S

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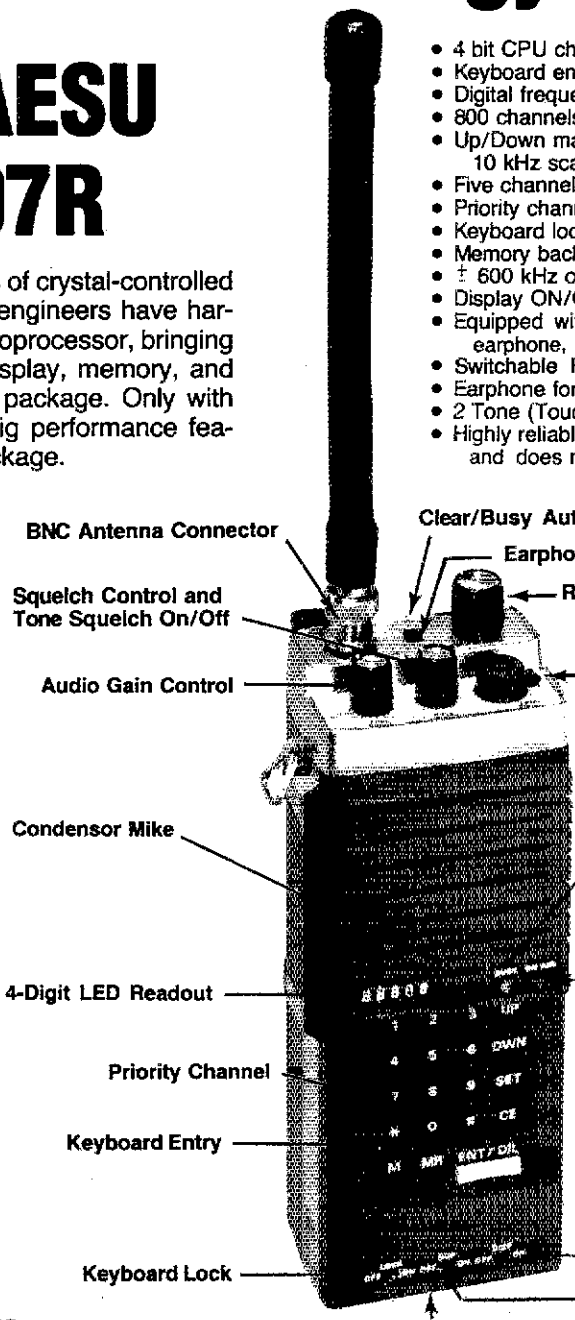
- 2 Tone (Touchtone®) Input from Keyboard
- Highly reliable LED frequency display (works in cold temperatu and does not fade with age)



SPECIFICATIONS:

GENERAL

Frequency coverage: 144-148 MHz
Number of channels: 800
Emission type: F3
Batteries: NiCd battery pack
Voltage requirement: 10.8 VDC ± 10%, maximum
Current consumption:
Receive: 35 mA squelched (150 mA unsquelched with maximum audio)
Transmit: 800 mA (full power)
Case dimensions: 68 × 181 × 54 mm (HWD)
Weight (with batteries): 680 grams

RECEIVER

Circuit type: Double conversion superherterodyne
Intermediate frequencies.
1st IF = 10.7 MHz
2nd IF = 455 kHz
Sensitivity: 0.32 uV for 20 dB quieting
Selectivity: ± 7.5 kHz at 60 dB down
Audio Output: 200 mW at 10% THD

Price And Specifications Subject To Change Without Notice Or Obligation

TRANSMITTER

Power Output: 2.5 watts minimum /20
Deviation: ± 5 kHz
Spurious radiation: – 60 dB or better
Microphone: Condenser type (2000 ohms)

OPTIONS

LC-C7 Leather Carrying Case
YM-24 Remote Speaker/Microphone
Tone Squelch Unit
NB-P9 Battery Pack
NC-2 Quick Charger

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176, K4MC 160, WB4WII 154, KC4AM 142, WA4SRD 136, WB4VVL 113, WA4BFT 109, K4VHT 105, K4DHX 90, W4PCN 78, KU4W 75, WB4MXG 74, K4NLK 72, WB4CYN 67, AA4R 65, K4FTB 64, WA4CUD 63, WA4OBR 62, W4VTP 54, N4BWO 50, N4UE 49, N4AET 46, W4EAT 46, WA4FSC 44, WA4UYS 43, WD4CFZ 42, KA4DNL 41, WD4DCY 40, W4HKB 39, N4ZH 38, W4FMN 35, WA4IHG 35, W4ACY 34, WB4JJK 33, WD4CNR 31, KB4QV 31, WA4OJU 30, WD4AIE 28, WD4NAO 27, WB4CES 26, WD4FCH 25, WB4GSN 25, K4TPK 25, WA4UTC 21, W4OCZ 20, WA4PID 20, WA4FSC 14, W4RVE 14, K4VHQ 14, WB4VQZ 12, WD4PDU 11, WD4KPK 10, KQ4M 10, N4BYV 8, WD4ENB 8, WD4RDT 8, K4AI 6, W4EHF 6, WB5OTS 5, K4FOY 4, WD4JNZ 4, WD4FXY 2.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — Asst SCM: WB4UDK. SEC: WD4HBX. STM: W4ANK. NM: WA4SJS KA4BGX. Congrats to the following, N4ATO, DEC District 6, upgrades WA4OVM WA4WSV KA4GUT KB4BFW KB4TN K4LQO NM Carolina State Line Net. KB4YF EC Greenwood County. Greenville Hamfest May 4. Gov Riley signed into proclaimation week of June 22-28 as Amateur Radio Week. Thks to those who attended the signing. Thanks to those who attended the ARES meeting. North Augusta-Belvedere ARC participated in Triple Crown Road Race on Mar 1. Check-ins/traffic: SC SSBN 1668/253; CNe 350/205; Lancaster County 2-M Net 155/18; Western Carolina ARES Net 100/14; Newberry County ARES Net 63/10; Carolina State Line Net 42/2; Dillon Cty District 5 ARES Net 31/0; Trident ARC ARES Net, 76/0. Traffic: (Feb) K4ZN 358, WD4AWN 294, W4ANK 270, W4NTO 133, W4FMZ 100, W4MTK 100, W4DAW 91, WB4UDK 54, K4FRX 43, W4NQL 42, N4BCD 35, K4VIA 30, WD4BUM 24, WD4EDM 20, WD4HBX 17, AF4E 13, KB4CO 11, K4LYU 11, WB4JNE 8, K4ADI 7, WA4VYS 6, W4DRF 5, WD4DOL 3, WB4DRT 3, N4EE 2, WD4FJP 2. (Jan) AF4E 16, WB4DRT 3.

VIRGINIA: SCM, Rick Genter, K4BKX — ASCMs: Buddy Smith,W4YE & Bill Farone,W4NK. STM: W4SQO. ASTM: WA4STO. SEC: N4AZI. Chief OO: W4HU. Chief OVS: N4CD.

Net	kHz	Time(P.M.)	Sess.	QTC	QNI	Mgr.
VNTN	3907	Noon	29	256	464	N4LE
VSBN	3947	6/10:15	56	758	1379	WA4STO
VSN	3680	6:30	27	132	438	WA4YIU
VN	3680	7/10	58	463	833	WB4FLT

Many changes have taken place during the last month. N4NK has resigned as SEC due to job pressures effective April 1st, to be replaced by N4AZI who has been DEC for the South Piedmont District and Asst SEC. N4NK will join W4YE as an Asst SCM. Since the VSBN has become just too large for one NM, our STM, W4SQO, has divided the early and late sessions into two nets. WA4STO is the NM for the early net and the late net NM is now WA4YIU who has been NM on the VSN for the last two years. WB4KSG has replaced Bob as the VSN manager. To eliminate confusion, the "Late VSBN" will now be called the Virginia Late Net or VLN and the "Early VSBN" will simply be called the VSBN as always. N4CD of Lynchburg has become the Chief OVS replacing WA4PGI who has served well for the past year but has found himself busy enough with job pressures and Quiet Zone fighting. Whew! That's a lot of changing. Traffic: (Feb) KB4N 791, WB4PNY 542, W4JK 510, WA4CCK 455, WA4LJI 430, K4KDJ 416, K4KNP 400, WA4STO 368, W4SQO 294, W4UQ 249, K8LGA 225, WB4FLT 211, K4AXF 184, W3BBN 178, N4NK 175, K4BKX 165, N9ASX 154, W4NWM 129, N4ZAI 121, WB4ZTJ 120, W3BBQ 99, W4OKN 95, KA4BQK 93, WB4KSG 89, WA4RTS 89, WD4NEI 86, WA4YIU 86, N4IF 83, K4EJ 73, WA4KQL 71, N4BJX 68, W4CEU 66, N4RF 64, N4LE 60, WA4QWC 57, W4YVG 55, W4JAZ 52, AA4CK 51, WD4EUV 41, N4YO 40, WB4FDT 38, W4SHJ 35, W4SUS 34, WB4DQZ 33, KB4OG 31, KB4OF 30, WB4UHC 30, WB4RDV 29, W4LXB 27, WD4FTK 26, KA4HRD 26, WD4DUU 25, W4KXE 24, KA4ETG 23, WB4RWY 22, K4VWK 21, WA4FDV 20, WB4KIT 20, WB4MAE 18, WA1VRL/4 18, WA4ISA 17, K4GR 16, WB4ZNB 16, WA4EGW 15, KA4EWG 15, W4SVG 15, KI4W 15, W4CFV 14, KB4OB 14, N4UY 14, WD4MGF 13, WB4ODZ 13, N4ABM 12, WA4YJE 12, KA4GAV 11, K4JRT 10, WB4LAB 10, WB4SHK 10, WA4WOG 10, WA4ONR 9, K4DHB 8, WD4RDF 8, W4WWQ 8, WB4ZWT 8, WD4KUK 7, KA4GIQ 6, W4JUJ 6, W4YE 5, N4ATT 4, W4PVA 4, N4BHI 3, W4DM 3, N3RC 3, KM4X 3, WA4JUO 2, AF4O 2, K4BAV 1. (Jan) AA4CK 87, WB4FNW 21, WB4ZWT 9, N3RC 3, KØLB 2, N4OT 1.

WEST VIRGINIA: SCM, Karl Thomason, K8KT — STM: KC8C. SEC: K8QEW. NMs: W8FZP K8MHR WB8AKQ WD8LDY. WV is now a member of the CVRA, thanks to K8LG and WD8OOR. On the air birthday party for the state of WV to be held June 14-21. Contact N8LW for details. WV QSO Party June 21 and 22. See Contest Corral for more info. Huntington Hamfest expanded to two days this year, June 7-8 at new Huntington Civic Center — nice prizes. WV State Convention and Hamfest as Jackson's Mill July 5 and 6 under direction of WB8GDY. WB8JYM has resigned as Midday Net Manager. Our thanks to her for her dedication to our nets. W8FZP has been appointed to fill her unexpired term.

Net	Freq	Time-Z	Ck-In	Tfc.	Sess.
Hillbilly	14280	1700 Su	198	76	4
8k. Diam.	25/85	0200 Tu	25	4	4
CW	3567	0000 Dy	198	71	28
Midday	3990	1700 Dy		Nothing to report	
Phone	3990	2300 Dy	811	167	29
Novice	3730	2315 Dy	25	6	16

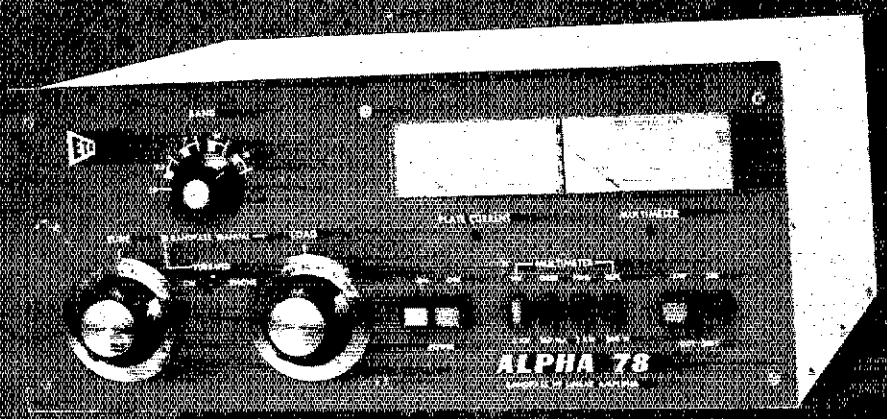
Traffic: KC8C 385, WB8AKQ 131, N8AJC 51, WD8RNR 50, W8HZA 48, W8JWX 44, K8MHR 44, WD8POG 42, WD8EAV 22, W8YP 21, KA8EIV 20, WB8UDY 20, K8QEW 17, W8CAL 16, WD8LDY 16, WD8JYM 12, K8JU 10, W8LYN 9, W8CKX 6, K8KT 6, WD8AXY 5, W8FZP 5, WD8OVZ 5, WD8DHC 3.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Poirier, KØDJ — SEC: WØACD STM: WBØMCL. NM: ADØA WDØAIT KØCNV WØHE WØHXB WBØZQG. ARRL Board of Directors recently passed a motion to formulate a special committee on malicious interference in the amateur bands. Anyone with some time to do some listening and who would like to help this group may contact me or the committee chairman, WØBWJ, for details. All net managers may get their net registration forms from me or by sending an s.a.s.e. to ARRL. Short ES openings into the southwest were noted by WØETT at end of Jan. This writer also experienced openings into Mexico toward the end of Feb. CO WX Net generating lots of interest from neighboring sections. WBØZOY new Advanced Class licensee. Grand County ARC starting Novice classes to increase their totals from four hams in a town

The Sangre de Cristo Mountains - ETO'S backyard

WHY WISH YOU'D BOUGHT ALPHA?



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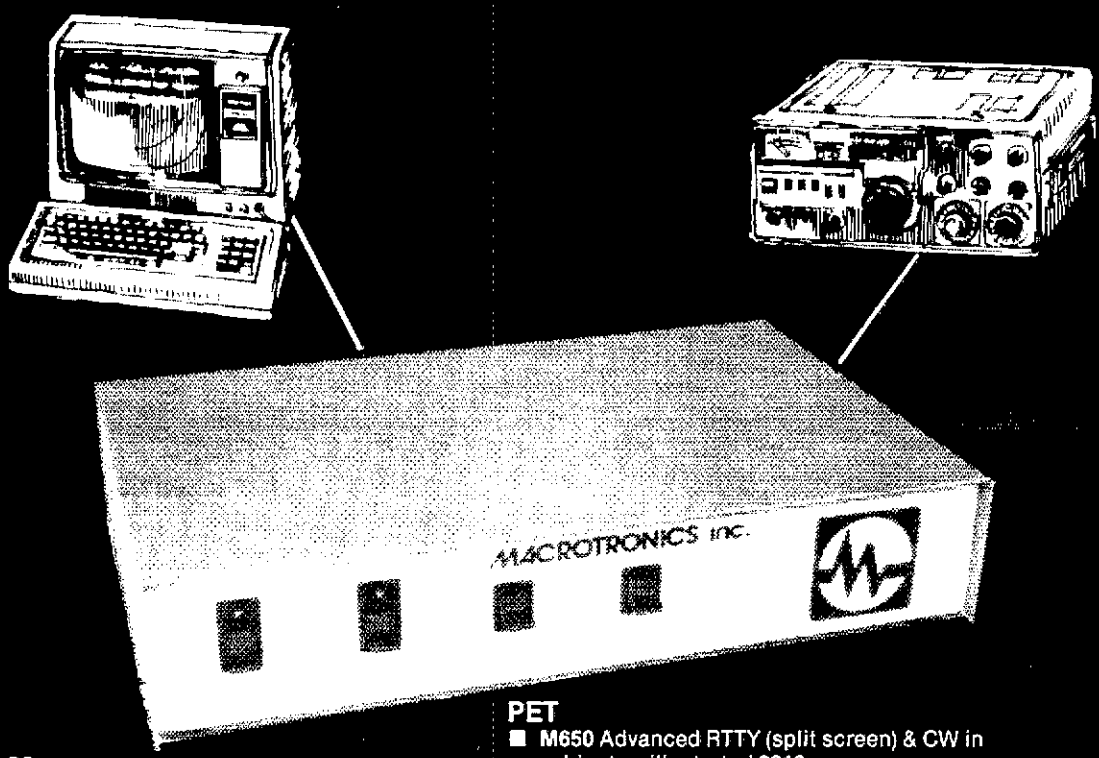

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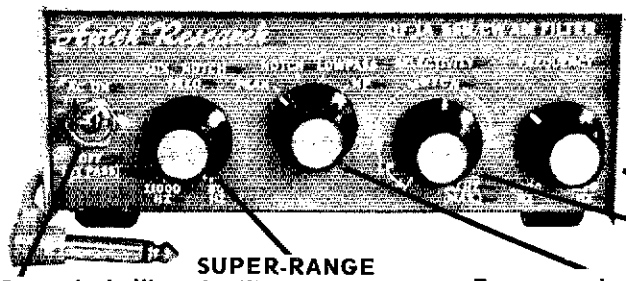

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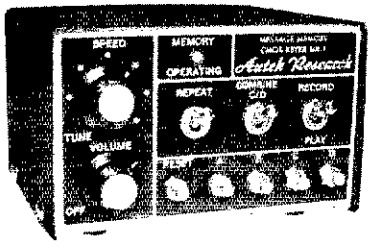

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of six hundred. FB, fellas! Net tfc: Columbine: 29 sess, QNI 1054, QTC 97, informals 238, QNF 995; Hi-Noon: 29 sess, QNI 1488, QTC 139, informals 399, QNF 1191. Traffic: (Feb) WØWYX 1957, WAØHJZ 1331, WBØZQY 946, NØBLU 118, WØGO 81, WBØZOY 74, WØTE 73, WØRE 72, WDØDNM 70, KØDJ 66, ADØA 54, WØEJD 53, WAØYNP 48, WØLAE 34, WAØKHN 31, WØLQ 26, WØNFW 24, WBØYKH 2. (Jan) WDØDNM 51, WØLQ 33.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs: WD5AHH & K5KPS. Southwest Net (SWN) meets daily on 3585 kHz, at 2000 local time and handled 204 msgs with 202 stations reporting in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 kHz at 1800 local and handled 193 msgs with 75 stations reporting in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 73 msgs with 770 checkins. Yucca 2-Mtr Net handled 4 msgs with 315 checkins. Delighted to have VP Carl Smith & RMD Morie Carpenter visit. Many excellent comments on Carl's WARC presentation which was videotaped in color by WD5KED & N5GU for distribution to interested clubs. VA Hospital station very active with 81 msgs. Good SAR (NMESC) meeting in Socorro with WB5TGR & co. Traffic: W5DAD 318, KL7HSF 246, N5NG 217, W5ENI 129, W5UH 110, WA5MIY 40, W5BWV 8.

UTAH: SCM, Royce Henningson, K7QEQ — SEC: WB7FCB. STM: W7OCK. W7BE reports that the Utah VHF Society Weather and Road Net had 1128 checkins for the month of Feb. The Rainbow Canyons Amateur Radio Club elected N7AVJ, pres.; KA7FKG, vice pres.; WB7TUR, secy/treas. Traffic: K7HLR 204, KØAHA 158, WA7MEL 79, K7OCX 20.

WYOMING: SCM, Chester C. Stanwaity, W7SDA — Asst SCML K7IKO. SEC: WB7EIN. NMs: WB7NHR WA7WFC W7LYA. Congrats to WB7RUN of Laramie on upgrading to Advanced, and to WB7PLU and WB7CPC of Lander on upgrading to Extra. W7BKI has a new 15520. Congrats to W7HNI, who as of March 1, has been a licensed amateur for 49 years. W7IRL has been licensed for 48 years and W7PT for 41. The Sheridan ARC has several students about ready for their Novice examinations. The Laramie County ARES activities for Feb included a joint meeting with the Northern Colorado ARC in Fort Collins and a map reading course offered by state Civil Defense. Wyoming Cowboy Net held 21 sess with 663 QNI and 6 QTC. Wyo Jackalope Net held 25 sess with 620 QNI and 5 QTC. Sheridan Co. ARES Net held 4 sess with 13 QNI and 1 QTC. Traffic: W7LYA 372, WA7GYQ 135, K7KSA 60, W7SQT 18.

SOUTHEASTERN DIVISION

ALABAMA: SCM, James M. Bonner, K4UMD — SEC: W4IBU. On March 6th a Simulated National Weather Watch, for 6 southern states, AL had a real good showing. Several 2-meter nets across the state went in simulated emergency, as well as AENM ssb state wide. AENB CW Net looking for Net Controls, try your hand. WA4JDH new manager AENB. Three XYLs' of LARC who came to Birmingham to get their Advanced licenses are: WA4AXA WB4RIV and WB4QXM. BARC had 13 new members join the club in Feb. N4MD, of AENB, reports QNI 196 in 28 sess. N4MD also reports AL represented 57 of 58 sess. to RN5, with WA4JDH WA4GTG W4UT KA4IGA WA4CNY WA4DKE, W4QAU reports AENR QNI 38 in seven sess. Liaison WB4EKJ WD4CPF WA4JPK reports AENJ QNI 556 for 29 sess. CAND 100% in Feb with W4CKS WA4JDH. I like to see our nets doing a good job. Have you tried a traffic net — check in "You'll like it." Due to a prior commitment from Atlanta FCC office, they WILL BE at Birmingham fest '80 in May. So come on, may be your last chance to get or upgrade your license at a hamfest on weekends. Traffic: WA4JDH 1128, N4MD 699, N4CCT 181, W4CKS 154, KA4IVO 118, K4AOZ 68, K4UMD 37, W4UP 37, W4IBU 17, KB4VI 17, WB4EKJ 14, AA4J 12, WA4JPK 10, KA4JOE 8, WB4TVT 8, WA4JYU 7, WA4OSB 5, K4JIE 3.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM: K4VHC. SEC: K4SWJ. Asst SEC: WB4HXE. STM: WA3NAZ/4. NMs: WD4ADV (ARES) K4DMK (GCN) W4GH (GA TFC) W4HON (VHF) W4WXA (GSN) WA4ZHC (RTTY) WB4ZOJ (GTN) WB4ZVX (GSSBN).

Net	Freq.	Time(EDST)
GCN	3995	0700 M/S 0800 Sun
GTN	7118	1815 Dy
GSN	3595	1900 & 2200 Dy
GSSBN	3975	1830 Dy
GA TFC "A"	7243	1200 Dy
GA TFC "B"	3957	1815 Dy
ARES	3975	1700 Sun
GERN	3620	2000 Wed

The section's affiliation with the National Weather Service is just about complete, tnx to our very capable liasion, WA4PZD. He has spent many hours getting the EX Manual together and all of the NWS personnel think it's complete. Many of the repeaters are having WX nets and this will aid the ARES system in the section. At this time the status of the GA QSO party is not known. If any club shows interest please contact K4BAI for info. RTTY net on 3620 continues to gather new enthusiasts. Threatening weather and heavy rains did not stop the multitude from attending the 22nd Columbus Hamfest. The Dutch Supper, GSN breakfast, Repeater Council meeting and of course the splendid job by K4SWJ WB4HXE and WA4PZD on ARES and NWS. Tnx guys for FB job. I am still looking for hams in the section who think they can qualify as OOs. Please contact me if you are interested. As I conclude I want to thank all in the section for the support you have given me during my first year as your SCM. I am always looking for input to make the section better, so please send me your views. Traffic: W4WXA 278, K4AZM 242, WA3NAZ/4 226, N4CMF 153, WB4ZOJ 145, WA4ZHC 112, W4GH 106, WD4ADV 86, WB4ZVX 47, K4JNL 42, K3EV 23, N4UZ 14, W4AAY 13, W4BIA 10, K4PIK 9, W4ISS 3, K4BAI 2, K4HBI 1.

NORTHERN FLORIDA: SCM, Fred Marchman, AA4FG — SEC: AA4FG. STM: N4WA. NM: KU4Q WD4PDK WD4LUG. Congrats to Frank, W4RH, on appt as SE Division Director. He served the N FL Section as SCM for over 22 years. A hard act to follow, so I need the help of all N FL hams. Please send me a copy of your club bulletin and forward late news by radiogram. Also congrats to Evelyn, W4WYR, our new Vice Director. Send your requests for ARRL films to her. New appts: KA4GIJ as EC Putnam County; WD4FNX WA3YMV as OTS. SNCs earned by WB4ADL WD4DIV WB4HDX WB4TZR WD4PGS. Gulf Coast ARC public service events include MOD walkathon Mar 8, Chasco Fiesta parade Mar 22, Home Show message origination in April. Ten Novice exams sent to FCC and students anxiously waiting. New General Class course started Feb 26, instructors AA4FG KC4BG. Hernando ARA 1980 officers are: K4ZC, pres.;

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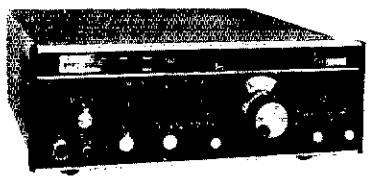

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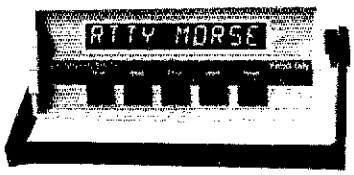

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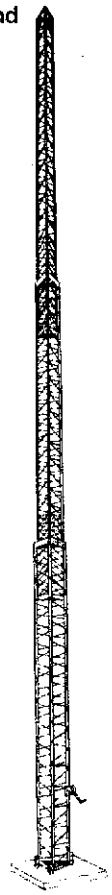

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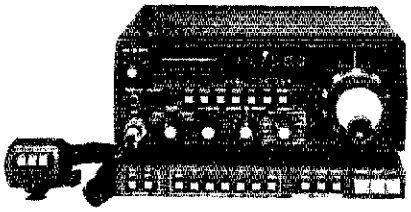

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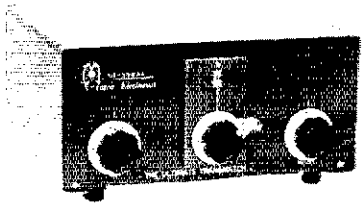
FT-227RB, FT-7B
FRG 7000



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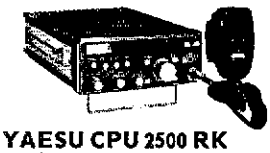

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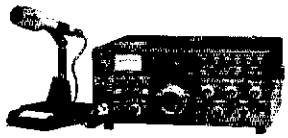

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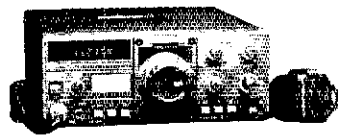

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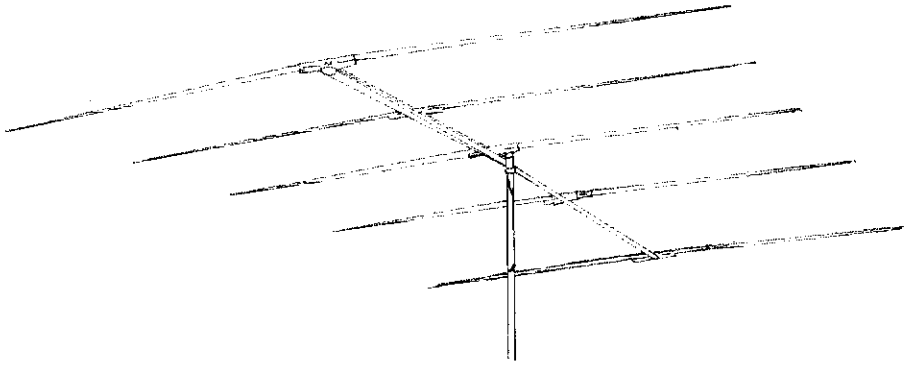

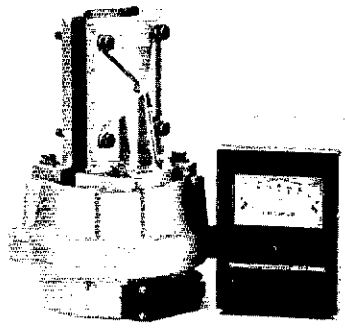

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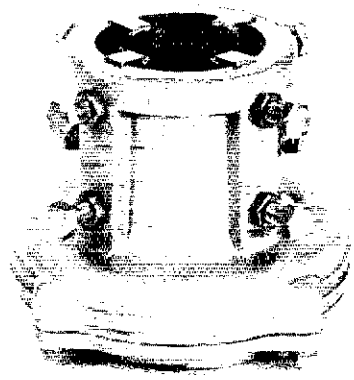

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WA8UIO, vice pres.; N4AZS, secy.; WD4JXH, treas.; K1BUM, bulletin ed. OARC and CFRA have merged and are working on constitution and by-laws change. Club repeater using club call W4PLB/R for time being. PSCs were awarded to 34 members and ESCs to 33 members. N4KF reports planning underway for 1981 ARRL National Convention and welcomes program ideas. Jax Hamfest will move to larger facilities this year at Orange Park Kennel Club. WD4BII is 1980 chairman. Beaches ARS has contest for name of newsletter. W3UBA in charge of FD '80 for BARS. A new J-pole antenna for the Lake Monroe ARS 2-m station donated by G3KDS/W4. Daytona Beach ARA bulletin, Groundwave, received Certificate of Excellence from ARNS. Congrats to Editor W4MGO and staff. Upgrades reported: Gen: N4CPA; Adv: KC4BG WD4MSR N4AZ5 WA4ZUG; Extra: W4KMY W4BSO WB4FAJ KB4CD. Congrats, all. Traffic: (Feb) WD4HIF 934, WD4IIO 582, N4PL 385, KU4Q 297, WB4TZR 204, WD4NYY 168, WD4DNC 143, AA4FG 140, N4BZH 106, WA4CRI 98, KF4U 96, WA4EYU 95, WB4FJY 95, WD4PDK 85, W4JL 75, W4MGO 58, W4KIX 52, WD4PGS 50, WA2GIN/4 43, K4RNS 40, W4MVG 39, WB4DTS 37, K8PXM 22, WB4RIS 20, W4LDM 17, WB4WOO 8, WA4CLY 4, WA4ZTS 4. (Jan) WA4LDM 17, KB4B 7.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. STM: K4TH. New appointments this month: W4GPL EC Pinellas County; WA4HXU OTS. We welcome W4IUO from Kingsport TN wintering in North Fort Myers and active on the traffic nets. W4JM reports Citrus Center ARC of Lakeland has an agreement with the EC WB4FVV, to furnish communications for Red Cross in emergency. W4ROA reports traffic count up due to Broward County ARES gasoline survey for county officials. Listen for N4KB high speed code practice on 7085 kHz Sundays at 8:30 P.M. W4DVO says rig blew up. Also W3CUL says 2 exciters, 2 receivers and 2 linears bit the dust — all apparently precipitated by heavy traffic load from Florida State Fair, Tampa. Our congrats to Tampa ARC as well as other clubs and individuals who helped W4DUG handle a record amount of fair traffic — total 10,342 (5124 originations). This pushed the section total to 25,013 — apparently a new record. Although only 36 stations reported their traffic totals, there were 7 BPLs issued. We were pleased to get the membership bulletin from our new Director, W4RH, and noted with pleasure new Life Members W4WNY K4RHD WA4GYR and WD4COL. Also 40 Year ARRL membership pins to W4BAV and K4NE as well as 25 year pin to WTDLP/4 of Largo. WB4SSP sports a new Azden 2-meter rig and is hearing some strange things. A recent letter from the CM seeking info and suggesting action re the growing problem of intentional interference in the ham bands is being forwarded to all OOs and affiliated clubs in the section. I guess we need more Elmers and Wouff Hongs. Traffic: (Feb) W4DUG 10342, W3CUL 6314, W4MEE 1558, W3VR 808, K4TH 751, K4SCL 611, W4LX 478, WA4PFK 451, K4EUK 446, WB4WYG 345, WD4COL 300, W4DVO 222, W1NJM/4 222, KM4G 216, WB4FVV 215, K4ZK 205, W4IRA 190, WA4EIC 169, N4ET 164, W4ROA 164, WB4PIB 145, N4KB 139, KA4FZI 137, W4GPL 124, N4APE 48, WD4CHO 44, WB4SNX 43, W4WYR 43, W4UIO 37, WB4KYE 20, WB4NJU 19, W4SMK 14, KA4BPO 10, KB4OW 10, KA4BNQ 5, WB4GSV 4. (Jan) KB4OW 19.

WEST INDIES: SCM, Julio Negroni, KP4CV — KP4FEY appointed OTS and will start a Sectional Traffic Net next May 1st on 3710 kHz at 6:30 AST every day. Net will have liaison with NTS. Net will be called WINS (West Indies Net, Slow). KP4FEY also provided the following bits of information: KP4ES reports 6 meters wide open with strong F2 layer skip as well as transequatorial scatter. Also in late Feb strong transequatorial skip open to Argentina on 144.300 ssb from 0000Z to 0200Z. KP4FEY, new OTS, frequently represents our section on the Fourth Region Net of the NTS. KP4EEH and KP4AH have been running RTTY tests on two-meters. A new repeater club has taken over the operation of the Taino autopatch. Check with KP4DPA for details. KV4FZ has done a good job of improving the 146.91/31 repeater in St. Croix. KP4DJ active on 80 meter QRP at 2300Z nightly on 3710 kHz. KP4EMX is working out the bugs on a new two-meter phone patch. KP4BNC has a new 2-mtr. rig. KP4EKA getting out of his sink hole with a new 2-m beam and 500 ft. of coax. NP4A attended the Miami hamfest. KP4FMB has her Wilson HT fixed tnx to OM KP4U. KP4KD is QRT the low bands for awhile until CATV fixes their defective TVI causing cable amplifiers. WP4ACV is the proud owner of a Model 32ASR Teletype. Traffic: KP4FEY 18.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Willard L. Haskell, AG7D — Hualapai ARC '80 officers: KB7AJ, pres.; WB7RYR, vice pres.; KA7ETA, secy/treas. Outgoing pres. K7ZMA presented a plaque and Life Membership - will act as ARCA rep as well. HARC manned a booth at the County Fairgrounds during "Career Education Day" (ARES/RACES members present, on Apr 26-27.) They provided communications for the Annual Gordon Bennett Balloon Races. Plans in progress for the Bike-a-thon to support Cystic Fibrosis in Kingman. (Thats keeping Amateur Radio in the Eyes of the Public!) Thanks to WA7NXL, Asst EC, Coconino County, for the report re: communications for the AZ Special Winter Olympics in AZ. WB7CDO assigned EC directed this project - well done! Congrats to all participants in the CARC. Complete report to N7EH, SEC for publication coordination with QST. AARC Pnx Net going strong on 87/27, Thurs 0200Z. NCS W7OIF. AARC also had the pleasure of entertaining DF3DM, West Germany and LU8EBI, who by the way was a secy of the Australian Embassy in B. Aires. Scottsdale ARC started a new net 16/75, 0530 weekdays called Narcolepsy Net? If you enjoy "T" hunts, SARC has lots of them! ARCA Winter Hamfest was held at Oasis Park, Apache Jct. — good time had by all. SARC also has an interesting net on Mon at 0400Z. Subjects covered: HR and Astrological reports by WB7PXL. An article on Great Circle Bearings by K7CEH appeared in Mar AZ Desert Air Waves, if interested he may provide you with a copy! W8DKV now Extra! MARC's Public Service Net meets at 0200Z and all are encouraged to participate. Instructions on TFC handling, using ARRL guidelines was one of the recent subjects. WD9GXD now Adv. WA7ART and XYL have a new harmonic - baby boy, congrats. Superstition RC is operational on 72/12. TRA/RC now meets at the downtown campus of the Pima Community College - 2nd Sat of each mo. Nets: A-10 ONI 1108, QTC 228; SWN ONI 202, QTC 204; Cactus ONI 994, QTC 101. Traffic: W7EP 225, W7MC 174, K7NTG 136, WA7KQE 74, WB7NJY 27, K7JKM 20, K7NMO 20, AC7D 15, WA7NXL 13, W7LBW 7, N7EH 3, W7DOS 2, N7BCE 1, WA7WEB 1.

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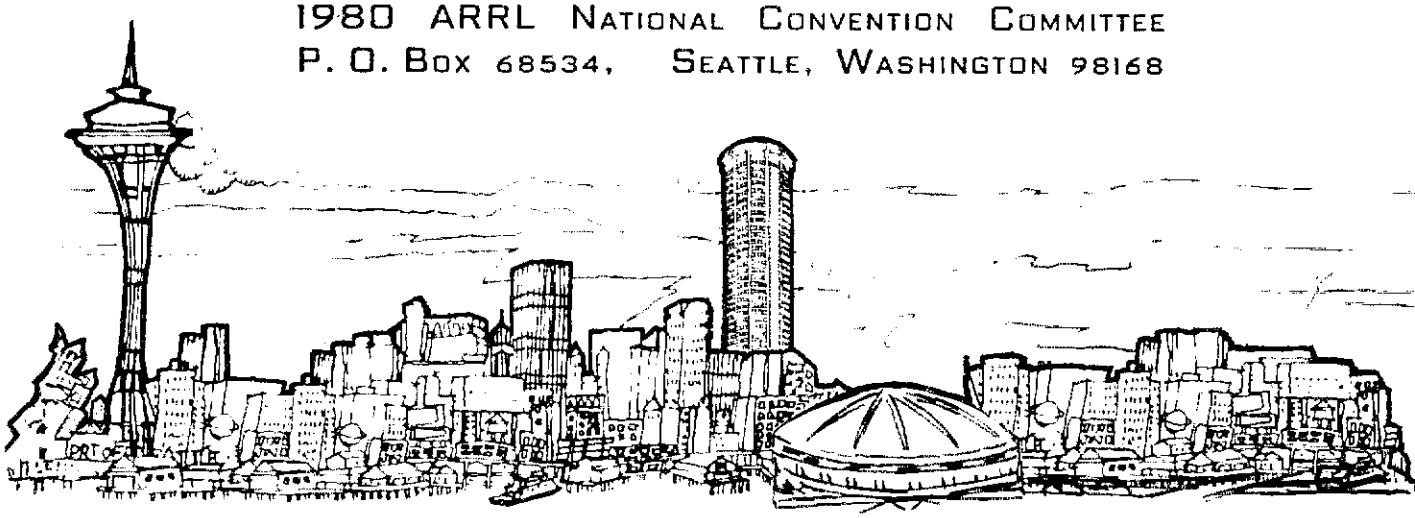

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LOS ANGELES: SCM, Perry Masterson, KD6C — M thanks to all of you who assisted in anyway during th emergency created by the rain. I have had severa reports from a number of sources. W6INH injured his hand on 31 December and has been unable to operate He says things are coming along now. I hope so, he is traffic mainstay. K5DY is back now and has a new rig He is also installing a new Wilson 33 Tribander. The news was not too plentiful this month. I believe all the operating time put in handling the emergency traffic has worn everyone down. W6RIQ reports that 10 meter am is ative and doing very well. His Globe King is doing a fine job. Malicious interference is on everyone's mind these days. Drop me a card describing any of this type of in terference you happen to run across. Traffic: (Feb WB6YID 300, N6NO 120, N6PZ 105, KB6FC 93, K6QWA 88, WA6LVO 76, K5DY 49, W6BRO 36, W6VWG 25 W6NKE 11, K6CL 10, WA6OCM 10. (Dec) W6INH 385.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM N6GW. SEC: W6INI. Asst SEC: N6RD. San Diego Rpt Assn officers for 1980: WD6EXN, pres.; WB6JTB, vice pres.; WA6SFS, secy., WA6LZG, treas. W6GIC saw tha W6QR got prompt medical aid when he developed a medical problem while calling the roll on 04/64. W6IDS now operating from KC4AAA. The Amateur Radio News Service has judged the Poway ARS "Call Letter" as outstanding. Congrats to editor WB6BOD. Clubs' plann ing for Field Day should be well underway by now. Plz provide your SCM with Field Day locations. The 22[illegible] Club's Feb program on OSCAR was well presented by W6KBD. W6HUJ has joined the 2-mtr ranks and is now mobile. WB7SUA is the proud owner of a TEMPO S-1 W6KBD and W6INI attended an emergency medica disaster response seminar in L.A. County. KA6ATR has upgraded to Advanced, and KA6ILV up to General TELCO ARC has acquired permanent club quarters a 4569 College Ave. RACES and ARES were active during Feb floods. Red Cross Mass Care Centers were tied in to the county EOC and Red Cross Service Centers. WA6COE was one of the NCS operators at the EOC Palomar ARC's 13/73, SANDRA's 04/64, and Oceanside's 37/97 repeaters played a major part. Traffic: (Feb WB6PVH 643, N6GW 212, W6HUJ 127, N6AT 89 WB6MLB 83, K6HAP 77, N6RD 62, WA6UFY 20, WA6COE 8, WB7SUA 4. (Jan) WA6COE 34.

SANTA BARBARA: SCM, D. Paul Gagnon, N6MA — W6ZRR and K6SZS sent over 100 bulletins each on six repeaters. K6SZS is recovering from a broken foot and WA6BJF broke her foot too. Satellite ARC held a dinne for outgoing and incoming officers. Conejo Valley ARC Novice classes graduated KA6s JGU JGV and JGZ N6BPF is doing super job as editor for Pionsettia ARC newsletter and WD6ADG is likewise for Santa Barbara Key Klix. Professor Sylvester spoke at Santa Barbara on earthquakes. WB6BAV WD6ADG WB6OBB WB6LHU VE7BNE WB6FZU WD6BNH KA6FSI went to SAROC from Santa Barbara Club. W6GON has taken over reins as EC for Santa Barbara; thanks to N6AJA for his dedication in the position. Santa Barbara ARES helped find two lost girls using WR6AOC. Santa Barbara Sec tion Net (10 A.M. Sunday 7235) averaged 14 QNI Manager K6DZT had excellent article in his local paper Over 50 amateurs activated with the Ventura County ARES to provide comms to shelters for the Red Cross during the floods. W6KPS linked WR6ASW to repeater in Pennsylvania for the Santa Maria crowd. W6POE is the new OBS on WR6AOX. KA6ENP passed his General and is now N6CJL. PSHR: K6YD 65, N6MA 22, K6DZT 35 Traffic: (Feb) K6YD 89, WB6TRP 60, K6DZT 45, N6YH 42 N6MA 23. (Jan) K6SZS 4. (Dec) K6SZS 16.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — Ass SCM: AE5C. SEC: W5WB. STM: W5VMP. NMs: AA5, AE5I. Our feature club of the month is the Key City Amateur Club out in the fair city of Abilene. The FE newsletter, the KCARC NEWS, covers the gauntlet from all the local happenings, projects, and ac complishments, as well as fine tech articles and a classified section. The club meets the second Monday of each month @ 7:30 P.M. @ United Savings and Loan 12th and Mockingbird. The club operates the 146.16/.76 repeater, WR5AFQ, and many activities both public ser vice and social in nature utilize the machine. The Big Country Net happens each Thurs @ 2000L, followed by a "Nacho Run" at a local restuarant; and a Sat. morning breakfast each week. At the helm for 1980 is pres. N5XU This is a very well-rounded organization, with "all the bases covered", including NTS by WA5INJ, ARES by WB5SVS, contesting, Field Day, and public service events. For more info on the club, write to: KCARC, P. O Box 2722, Abilene, TX 79604. N5ABR got a fine writeup in the Amarillo Globe-News about his Message Service during the Holidays for the patients of area hospitals and nursing homes. 194 messages were originated dur ing the period, and many folks' holidays were made jus a little nicer thru Amateur Radio! OOs rpting this month WA5OOH K2SCU/5 K9MX/5 W5TI WB5QWI. The ap pointee files have been cleaned out. If you are an ap pointee and have not reported to your SCM since January 1, 1979, your appointment has been cancelled as of March 15, 1980. If you get active again, an applica tion will be rushed your way to reapply. Texas Slow Net (TSN) in Feb had QNI/246 QTC/45 in 29 sess. NM is AA5J W5YK received his QCWA Golden Ann Award for 50 years in Amateur Radio. Congrats! D/FW Metro Ttc. Net has QNI/389 QTC/155/145 in 29 sess. NM is N5AWG Traffic: W5TI 423, N5BT 226, AA5J 198, AJ5F 167 WD5EUE 147, WD5IVD 124, W5VMP 85, WD5JYI 72 WA5QFD 70, W5CTZ 50, WA5INJ 46, W5ERT 45, W5AXC 42, WD4SIH 35, WB5BKM 32, AE5I 32, W5IAR 24 W5HMR 23, WA5KCZ 21, WD5JDA 20. K5PC 13, W5YK 12, K5SOR 10, W5TAH 6, WB5YYK 6, WA5ZNZ 6 WD5EPC 4.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Asst SCM: W5REC. SEC: WA5MLT. Oklahoma Nets.

Net	Freq.	Time/Day
OFON	39000 kHz	2300Z M-F
Sooner	3850	2330Z M-S
OTWN	3900	2345Z M-S
OAN	3705	0030Z Dy
OLZ	3682	0100 Dy

W5UYH active in cw nets. Many new 'fists' showing up on the cw nets, and they always welcome more. OAN suggests that the class instructors encourage using their net for practice. Excellent report from Altus, a FE group. WD5ETB hosted ECs from SW OK at Cement. Plans made for liaison and relay work in emergencies. Also discussed repeater linking. How many active radio clubs do we have in Oklahoma? I would like to hear from each of them. This information will help me to serve you

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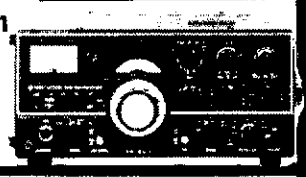

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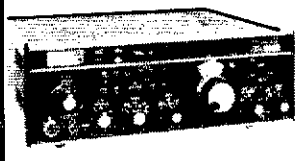

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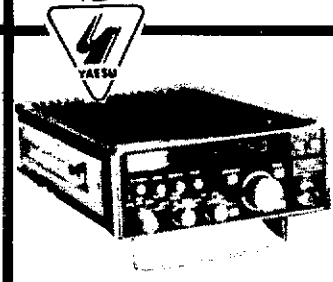

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1. 4:1 zoom lens with special macro focus for close-ups to within 4 inches
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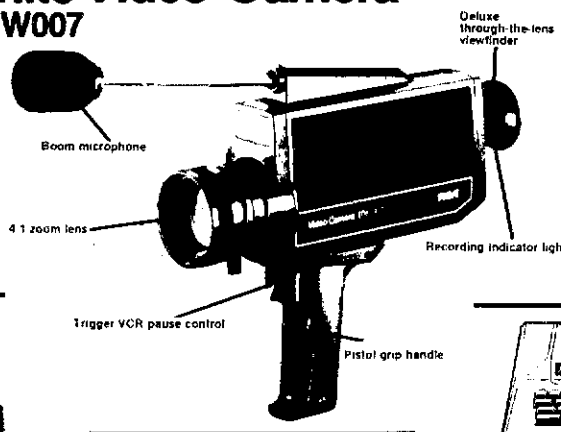
9. Compact power supply features a convenient built-in 500-watt AC outlet for VCR hook-up



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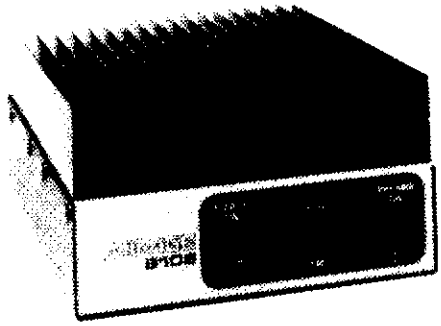

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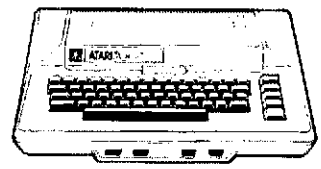

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66B	6 el. 6M beam	119.95	99.95
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better. Did hear from a new one on campus at ORU, Tulsa. Plans going ahead for Ham Holiday July 25-28th in Oklahoma City. W5JJ sporting a new RFI proof pacemaker. Glad to hear that W5JJ and W5FKL are both doing FB. On the other side, K5JUW & K5TEX are in the Silent Key list this month. An Explorer Post is being organized in Okla. City to work with ARES and Red Cross. An excellent pool of emergency help. Traffic: K5OWK 361, W5REC 360, WB5NKC 284, WB5NKD 262, K5JGZ 216, W5RB 184, K5CXP 182, W5UYH 55, WA5OUV 50, WA5FSN 47, W5SUC 38, K5CAY 33, WD5IFB 30, W5VOR 30, WB5ELG 29, WD5GLO 25, WD5AXH 19, K5MGD 13, KB5EK 12, W5FKL 10, W5VXU 7, W5JJ 6, KA5DRD 5.

SOUTHERN TEXAS: SCM, Roger Goday, N5FN — Asst SCM/STM: N5TC. SEC: AK5N. In the event of an emergency, it's too late to start forming an ARES organization. Plan ahead. For information contact me or AK5N. Congrats to new appointees: WD5FGY WB5YRV WB5TAY WD5GKH as OTS and WA5KRI as OES. WD5JJS has moved to Houston. WA5QCP reports his 100 watt amplifier for 10 GHz is dead — tube failure. W5SPD, OES, actively involved in formulating emergency plans for Harris County. WB5CIT preparing for Extra exam. KA5BUA KA5CWB upgraded to Advanced. KC5M has completed 75 M WAS. WA5RVT now NCS on TEX. WA5VBM was awarded PSA for her activity during Hurricanes David and Frederick. WD5JLA reports that 220 MHz activity in the Rio Grande Valley going great guns. He reminds us that an apparent threat to 220 MHz has surfaced in the FCC's consideration of a new inland waterways communications system — let's use it, not lose it. WB5UVI upgraded to Advanced and has his DX wrked total up to 150. Notice that the Board of Directors is addressing the problem of malicious interference. Send any thoughts you might have on the subject to me for a report that I will forward to League Hq. Hurricane season is just around the corner. It's time to check your emergency equipment and sharpen you communicating skills. Traffic: W5KLV 626, WB5YDD 501, W5SBE 269, WD5FGY 242, N5TC 239, KA5CDX 177, K5HZR 136, W5SHN 94, WB5YRV 79, WB5MMI 67, WA5RVT 46, WD5GKH 42, AK5M 42, N5FN 40, KC5M 39, W5BGE 33, WD5KBK 33, WB5CIT 28, KB5NX 19, WD5DQR 10, WB5EFJ 8, WB5UYV 8, WD5JJS 3.

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Full 7 line of accessories!

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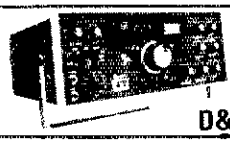

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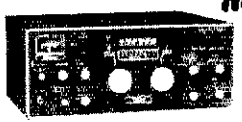
Dual PTO's SYNTHESIZED 1 8–30 MHZ 235 Watts PEP



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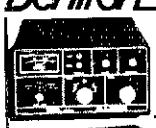

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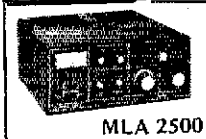

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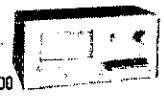
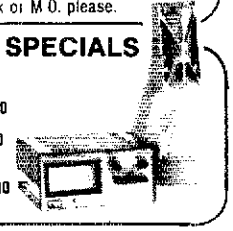


HD73 with 100 feet rotor cable and 100 feet RG8U $150.00
Cashiers check or M.O. please.

CDE ROTOR SPECIALS



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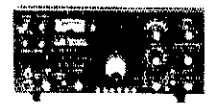

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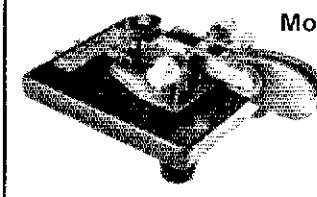

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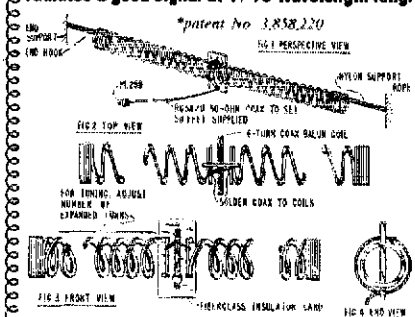

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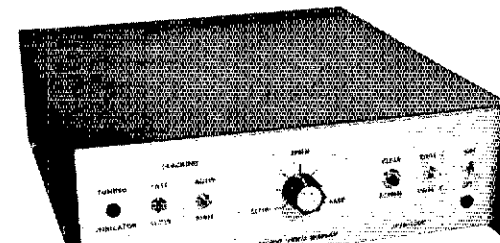

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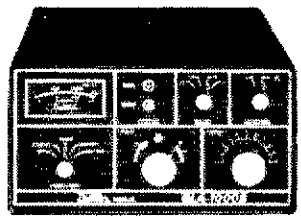

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Note: These amplifiers may be modified to cover 10 meters by licensed amateur.

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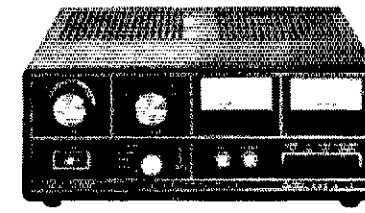

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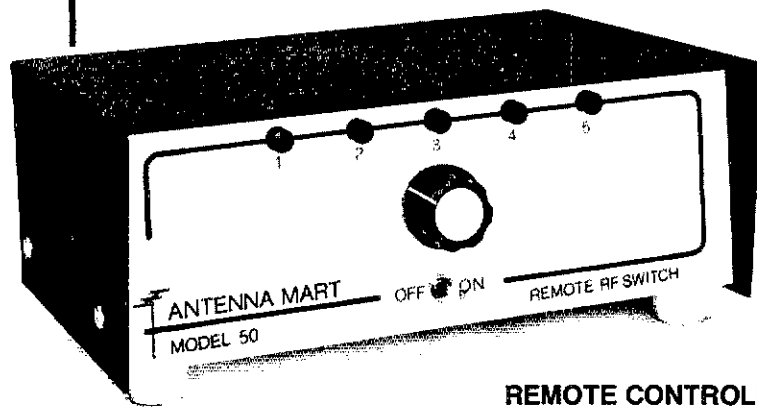

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(1) Advertising must pertain to products and services which are related to Amateur Radio.

(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 name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted 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 to frame and proven achievements added on request. S.a.s.e. brings TAD data sheet from W6LS, 2814 Empire, Burbank, CA 91504.

ROCHESTER Hamfest & NY State ARRL Convention. May 16-17. Add your name to mailing list. Send QSL to Rochester Hamfest, Box 1388, Rochester, NY, 14603. Phone 716-424-1100.

RADIO EXPO '80 Sept. 6 & 7 Lake County Fairgrounds, Rt. 45 & 120 between Chicago and Milwaukee. Commercial exhibits, huge flea market, seminars, ladies programs. Advanced tickets $2, $3 at gate. Send $2. for each and s.a.s.e. to P. O. Box 1532, Evanston, IL 60204 Call for information 312-B-S-T-E-X-P-O.

THE Wabash County ARC will hold its 12th Annual Hamfest on Sunday, May 18, 1980 from 6:00 AM until 3:00 PM at the Wabash County 4H Fair Grounds, Wabash, IN. Admission will be $3 at gate or $2.50 advance. There will be plenty of food and parking. Also will have camping spaces available for Saturday night. Talkin on 7.63/.03 or .52 simplex. For tickets or more info send an s.a.s.e. to Dave Spangler N9ADO, 45 Grant St., Wabash, IN 46992.

SIXTH Annual Northwestern Pennsylvania Hamfest. May 3, 1980, Crawford County Fairgrounds, Meadville, PA. Note date change. Gates open 8 AM. Bring your own tables. $5 per table to display inside, $2 per car space outside. $3 admission, children under 12 free. Refreshments. Commercial displays welcome. Talk in 04/64, 81/21, 63/03. Details G.A.R.S. P. O. Box 653 Meadville, PA 16335. Attn: Hamfest Committee.

DELTA Convention, Tri-State Hamfest. Senatobia, MS. June 7-8. Flea mkt, dealers, distributors. Write P. O. Box 2, Hernando, MS. 38632 Phone 601-368-9531. Ray W5VBY.

GOOD times at the Pines. 1980 Hudson Division Convention. The Pines Hotel, South Fallsburg, NY, November 7, 8 & 9. Full program, exhibits, flea market, free entertainment and dancing at night. Advance registration $5. with s.a.s.e. to Mike Troy, WA2TYV, 70 Ridge Street, Rye, NY 10580, $6.50 at the door. Ask for hotel registration info. Room rates including all meals, banquets, per person double occupancy per night from $38.50 to $49.50.

MUSEUM for radio historians and collectors now open. Free admission. Old time amateur (W2AN) and commercial station exhibits, 1925 store and telegraph displays,

A NEW GENERATION
from ICOM and MADISON ELECTRONICS

The 1980's bring exciting new models and new capabilities to the VHF bands. Four new rigs, each designed with maximum versatility in mind.

IC-260A
$489 LIST
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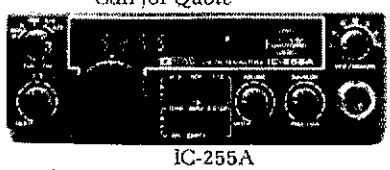
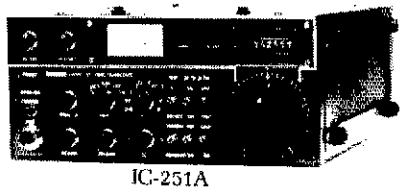
Talk about versatility! This IC-260A has FM, USB, LSB, CW, & Dual VFO's all in a mobile unit that mounts easily, and features full digital readout to 100 Hz.



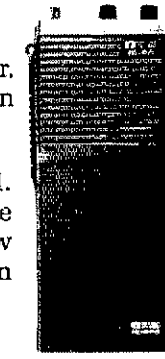
IC-255A
$389 LIST *Call for Quote*

For the FM only crowd, the IC-255A provides 25 watts of clear, clean FM 5 memories with scan, and duplex/simplex operation with dual VFO's in a mobile!



IC-251A
$699 LIST *Call for Quote*

For fixed station or mobile use, the new IC-251A does it all. Newly added features are an easy to read digital readout and three memory channels with scan. And for real excitement, the new IC-2A handheld provides 800 frequencies in a size no bigger than a 1 dollar bill!



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$279
SUGG. RET.
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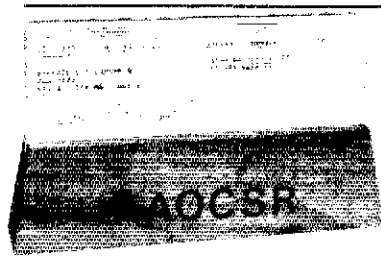

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Protect and display your amateur radio license. This custom designed **solid walnut base** and holder protects your license. The license fits between two sheets of plexiglass for easy viewing from either side. Call letters imprinted on base.

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2, 3 or 4 elements, pre-tuned and ready to assemble. Three types of spreaders to choose from: bamboo, one-piece fiberglass, and telescoping fiberglass. 10-15-20 & 40 meters. Easily adaptable to the new WARC frequencies as well. Prices start at $110.00 and parts are also sold separately.

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Phone 1-813-988-4213 or send 30c in stamps for complete details on quads, towers, or both.

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15,000 items. Write for details. Antique Wireless Assn., Holcomb, N.Y. 14469.

JUNE 1 — SRRC Hamfest. See Hamfest Calendar in May QST or furnish s.a.s.e. for complete info. Starved Rock Radio Club, W9MKS, RFD 1, Box 171, Oglesby, Il. 61348 Fone 815-667-4614.

INDIANA: Muncie Area Amateur Radio Club's Amateur Spectacular. Sunday, June 1, 1980, on Ball State University Campus. Over one acre of columnless, ground level, indoor space. Food prices of the 1960's. Thousands in awards. Forums: Computers, Traffic and Nets, the ARRL, etc. Talk in on 13/73, 223.30/224.90, 52/52. Advanced tickets $2., $3. at the door. Children under twelve free. For registration please contact, M.A.A.R.C., P. O. Box 3111, Muncie, Indiana 47302.

COLORADO's Superfest II June 7, 1980, Weld County Exhibition Building, Greeley, Colorado. Satellite TV demonstration, Commercial exhibits, State-of-the-art amateur exhibits, Auction, talks, code contest. Free swap table with entry fee. Contact Gus Fox, WØEE, Box 895, Greeley, Colorado 80632.

LYNCHBURG, VA Swapfest, May 4, Brookville High School, Lynchburg. Information: McClenon, 712 Riverside, Lynchburg, 24503.

VACATION in the beautiful Pacific Northwest and enjoy the 26th National ARRL Convention, SEANARC'80, in Seattle, Wa., July 25-27, 1980. The theme 'World Friendship Through Amateur Radio' headlines a featured program of seminars, tours, ladies programs, displays, forums and major equipment exhibits. Roy Neal, K6DUE, is the featured banquet speaker. Not enough room to list everything so get program and registration details from — 1980 ARRL National Convention, P.O. Box 68534, Seattle, WA. 98168.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill NY 12198.

DELUXE QSLs, Samples 25c. Petty, W2HAZ, P. O. Box 5237, Trenton NJ 08638.

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DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps apreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

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QSLs with class! Unbeatable quality, reasonable price. Samples, 50c refundable. QSLs Unlimited, P. O. Box 27553, Atlanta, Georgia 30327

QSLs Second to none. Same day service. Samples 50 cents. Include your call for free decal. Ray, K7HLR, Box 331, Clearfield, UT 84015.

QSLS — Variety, value, quality, custom, samples and catalog 45c. Alkanprint, Box 3494, Scottsdale AZ 85257.

QSLs — The KØAAB collection plus many new custom designs. Send No. 10, 28c, s.a.s.e. for free samples and prices. Marv WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109.

CREATIVE QSL Cards — Personal attention. Imaginative new designs. Send 50c. Receive catalog, samples. Wilkins Creative Printing, P. O. Box 787-1, Atascadero, CA 93422.

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QSLs by W7HUL. Samples 50c. 8511 19th Ave. N.W., Seattle, WA 98117.

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FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

RUBBER stamps $3.50 includes postage. NJ residents add tax. Clinton Hoar, W2UDO, 32 Cumberland Ave., Verona NJ 07044.

QSL cards — Eyeball cards — Rubber stamps — Name tags — Emblems — gift items — free catalog — Rusprint, Box 7575, Kansas City, MO 64116.

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QSLs — Finest Quality. Many colors and cards to choose from. Samples 50c. Specialty Printing, Box 361, Duquesne, PA 15110.

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Registration: $3 per person IN ADVANCE, $4 at the door
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If you do not receive a Preregistration Packet by May 15th, write:

Atlanta Hamfestival 1980
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Hotel Rates: $36 per day single OR double!
Write for Hotel Reservations to:
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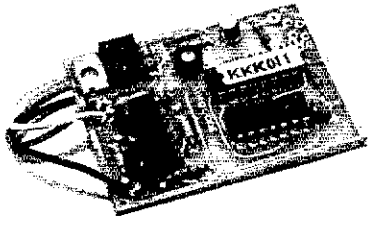

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Perfect means of RTTY code ID

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Full feature repeater IDer with timer **$79.50** Ppd. +$4.77 for Calif. address.

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Model 422-2 Two Meter TVI, Harmonic Filter.

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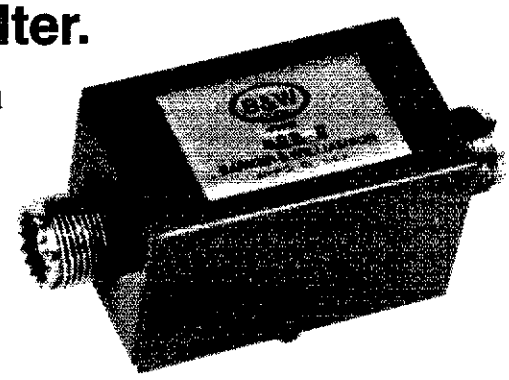

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PICTURE QSL cards of your shack, etc. from your photograph or black ink art work, 500 $17.; 1000 $24.50. Also unusual non-picture designs. Generous sample pack 75c, half pound of samples $1.25. Customized cards, send specifications for estimate. Raum's, 4154 Fifth Street, Philadelphia, Pa. 19140. Phone, 1-215-BA 8-5460. Closed July 15th to August 15th.

DESK plates 2 x 8, gold anodized stand. Large call letters; ARRL emblems, first name. Black, blue, red, walnut. $7.50 Frey's Engraving, 275 85th, Stone Harbor, NJ 08247.

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General

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WANTED: A good, used HP97 calculator. Will pay $350. to $400 cash. David Sloan, VE7CVE, 218 West 20th Avenue, Vancouver, B.C., V5Y 2C6 Phone number: 604 874-2171.

MICROWAVE Modules MMT 220/28 transverter 10 watts, 2dB NF, $249 postpaid. MMK 1296/28 converter, 3dB NF, $149 postpaid. MMA 1296 preamp, 3dB NF, $74 postpaid. VE3CRU, Hans Peters, Box 6286 Stn. A, Toronto, Ontario CANADA, M5W.1P3. 416-759-5562 after 1700 EST.

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VERY interesting! Next 7 issues $2. Ham Trader Yellow Sheets, Wheaton, IL 60187.

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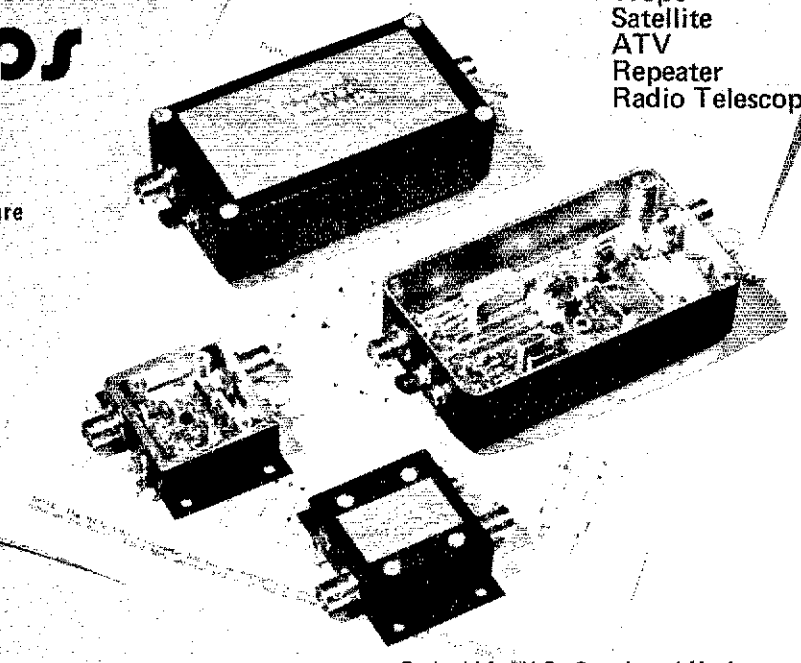

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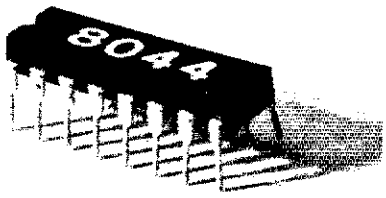

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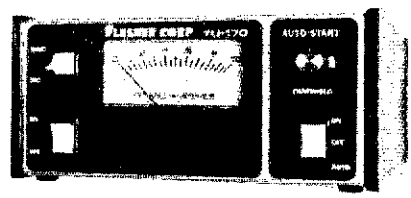
$159.95 buys a terminal unit kit with capabilities beyond your expectations for the price. And the Flesher Corp TU-170 won't devour your precious space. Wired units are available at $234.95. Call or write today for our free 1980 catalog of affordable kits, wired units and accessories.



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HAM Radio Repair, alignment. New location near Chattanooga for fast service by UPS, or visit our modern mountaintop lab. "Grid" Gridley, W4GJO, Route 2, Box 138-B, Rising Fawn, Georgia 30738. 404-657-7841.

DRAKE R-4/T-4X Solid Tubes replace vacuum tubes to give better performance! Pre-mixer and mixers 6EJ7/6HS6/6BE6-C plus T-4X 12BA6 $17.50 each, ppd. R-4 B/C Improvement kits, $20.60, ppd. Sartori Associates, W5DA, Box 2085, Richardson, TX 75080. 214-494-3093.

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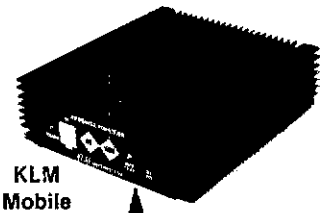

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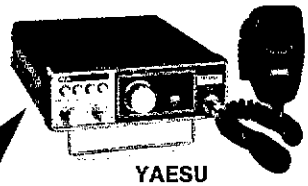

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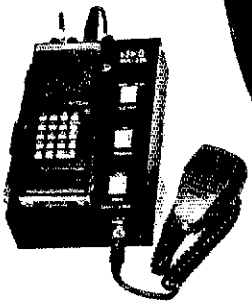

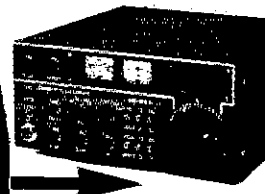

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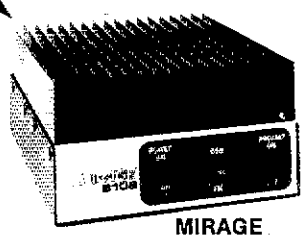

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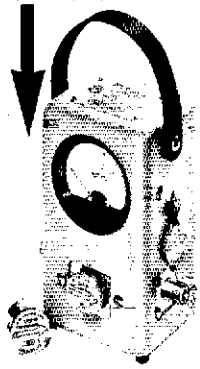

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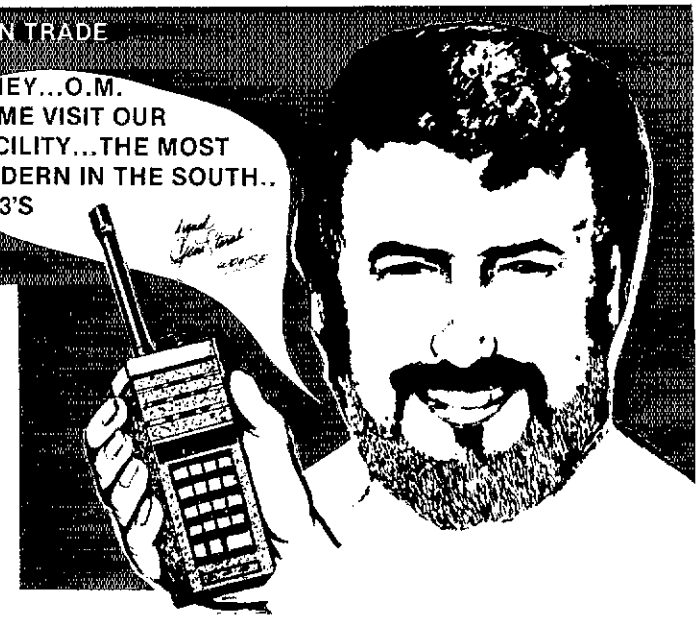

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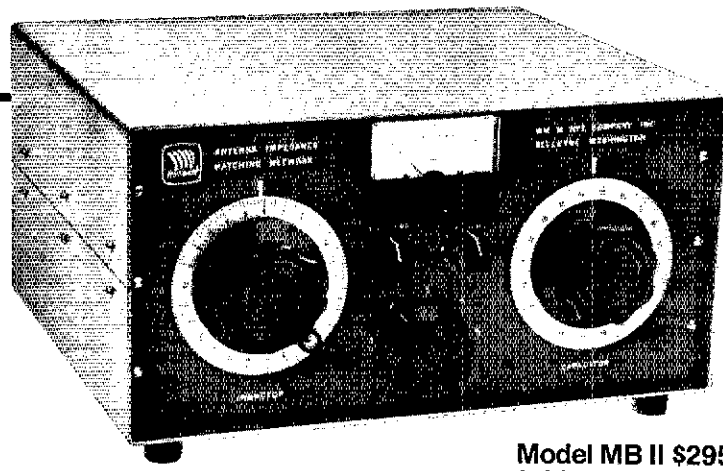

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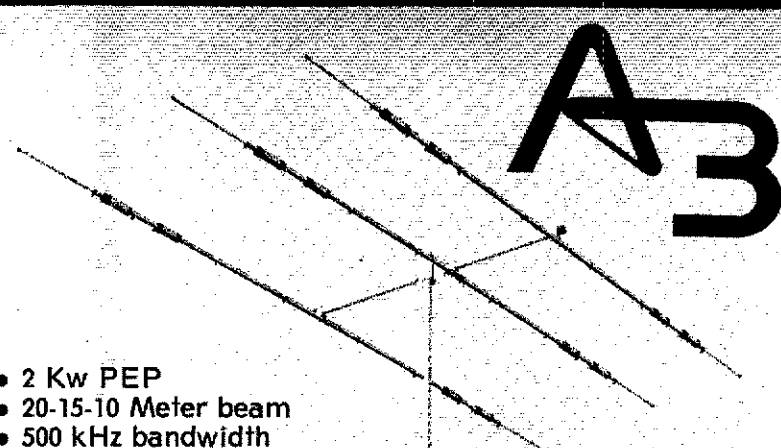

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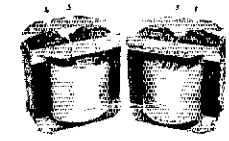

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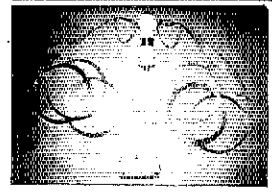

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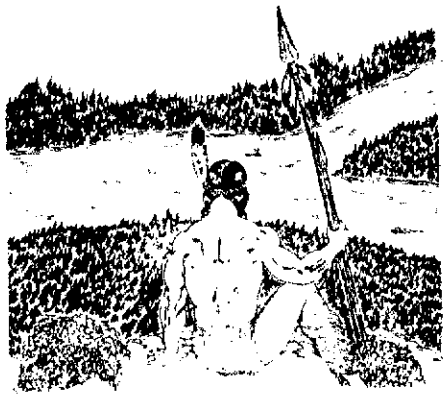

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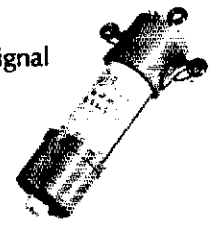

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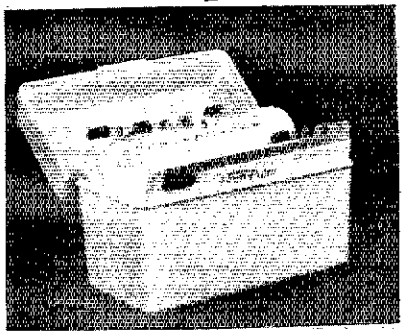

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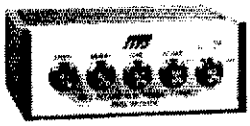

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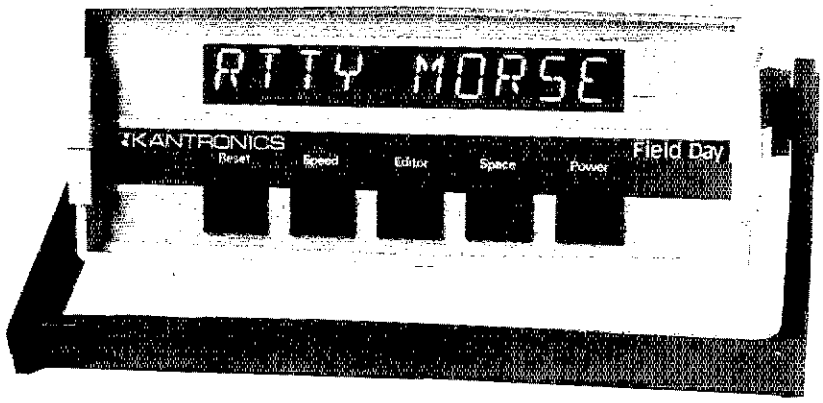

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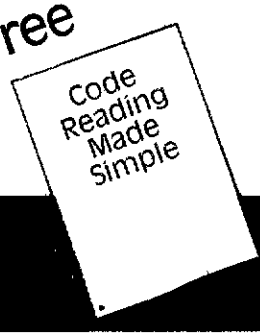

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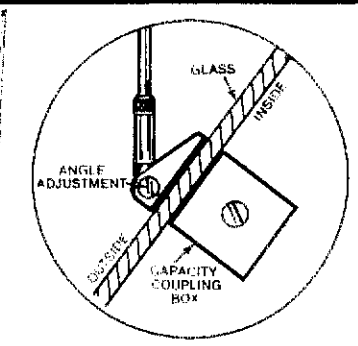

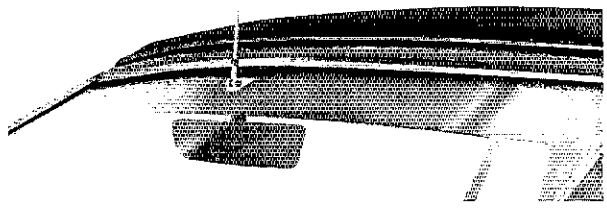

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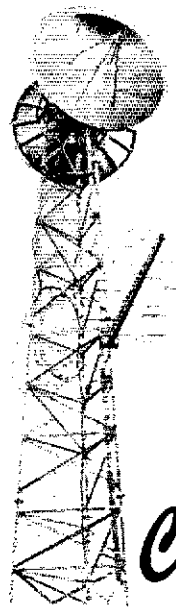

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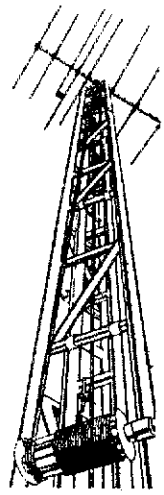

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CLIPPERTON Island DXpedition movies and slides, two hour live narrated show, for hamfests, conventions, banquets. Revised new show plus slide prelude/introduction of the ten greatest DXpeditions of the past two decades. Vandegrift, 2308 Zinnia Court, Killeen, TX 76541. No phone calls.

COMPLETE station! Heath DX-60B with Knight VFO -$85. Realistic DX-160 receiver (1979) $125. All for $195. Ron Kocher, WD4ICJ, 904-252-3861.

KWM-2, PM-2 $595, 312B-5, $395, winged, perfect condition, both for $895. WB7BKU, 509-529-4350, 525-0297.

KENWOOD TV502S transverter and manual, $215. Mint condition. L.M. Schendera, 219-923-4873.

FOR sale: Yaesu FT101B like new, $500. Ronald Davis, 1006 N. Division, Creston, Iowa 50801, 515-782-5274.

SALE - Kenwood TS-120S, $540. MFJ 16010 tuner, $35, WB5TJT, 505-623-3820.

TWO ASR-33 TTY's. $200 each. Need Heath SB 640 VFO. K8SL, 756 Glenn, Delaware, OH, 43015.

DRAKE T4XC - AC4 (mint) $450, Heath DX60B novice transmitter (mint) $75, Johnson Thunderbolt 2kW linear (pickup only northern Iowa - central Illinois) $400. W9ODL/WØEYA, 319 Oxford, Springfield, IL 62704.

FOR sale - you ship. Gertsch FM-7 w/deviation meter $275. Davis CTR-2 $90. UHF HT-220 $150. Conrac Moniter CNB8 $75. Bird SWR meter $30. Beckman 7360RU Counter $25. Charles Wall WB4MYA Route No. 3 Wingate, Clarksville, TN 615- 552-2199.

CENTURY 21, $225. HQ-170, $140. WA2DNQ, 914-834-3490.

COLLEGE expenses: Yaesu FT-101B, Heath: DX-60B, SB-610, HD-15, HD-16, Ameco: CB-6, PS-1, Vibroplex Presentation, Unimetrics Sandpiper-25, Kenwood R-820. Pearson, 291 Concord, Oceanside, NY

KWM-2A $1200. 312B-5 $550. Round Dx-Pro $75. Bill, K9BI, 317-478-3131.

WANTED: Racal RA-17 or equivalent receiver. John Reika, WA6OWU, 5224 Lafayette Street, Ventura, CA 93003, 805-684-3957.

WANTED 40 small Johnny Ball insulators (2 1/2 x 1 1/4 approx.) 216-876-6105, Fred Mott 8299 State Street, Kinsman, OH, 44428.

ALPHA 76CA amplifier, 3-8874 tubes; one year old. Excellent condition. $1500 or best offer. WD8LPI, 313-592-7287 days 313-227-3493 nights and weekends.

WANTED: Marantz 8B or 9 audio amp or equal. WB8IZV Bob Savage, 18860-A S.W. Butternut, Aloha, OR 97007, 503-642-6085.

SELL: Heathkit TX-1 80-10 meter cw/am transmitter 120 watts, VFO, $65. Model 15 TTY with stand, $75 ARC-5 transmitters, $12 each. Local delivery only on first two. R. Schultz 4717 Wainwright Lansing MI, 48910. 517-393-9438.

QSTs — 1947 up $5 year plus UPS — s.a.s.e. — W2APD, 32 Eleventh Haddon Heights, NJ 08035.

HEATHKIT station SB301, SB401, SB600, microphone, HD15 phone patch, HD10 keyer, all manuals — $475. WA1MIV 94 Gillies Lane, Norwalk, CT, 06854. 203-853-7867.

COLLINS S-line 32S-1, 75S-3, 516F excellent condition. $750 (collectors note! serial no. on 32S-1 is #71.) Daiwa RF-440 speach processor. $100. Jack Bly, KA8D 216-669-3698.

DRAKE R4C - nb - filter, crystals, T4XC - MS4 - AC4 $995 WB5OGL 713-438-0194.

WANTED: Hammarlund SPC-10 ssb converter. R. Holzapfel, 7249 Old National Road East, Richmond, IN 47374.

SALE: Ham literature, QST, RADIO, R-9, etc. Charles Williams 400 Broadway - Cincinnati, OH 45202 W8AXQ.

ICOM-701S, p/s, mike, EX-1, mint, $900. W2GVK, 516-499-7958.

BEST offer takes SX100, HG100, DX100, BC348, Ameco R5A, Johnson Challenger, RCA888LF, RCA8506B, DX60, HG10, Bendix bridge, K4FCR Box 8352 Savannah, GA 31412.

COLLINS 75S3 $375; Swan 700CX with 117XC power supply $400; 508 VFO $125; 510X crystal band extender $50; Drake TR-4C with AC-4 power supply $450; RV-4C VFO $100; PNB 34 $85; DX Eng. speech processor for TR-4C $85; Arthur Fenster, 3360 Parkway Drive, Baldwin, NY 11510.

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YAESU FRG-7 synthesized gen cov rcvr $225. W6RQZ 1330 Curtis Berkeley CA 94702. 415-526-7345.

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HALLICRAFTERS SR 400 Cyclone II with a.c. power supply $300, FPM 300 $275, SX 100 $75. W6EHI, 213-347-8809.

WANTED. Swan 350C and Swan 117XC matching ac

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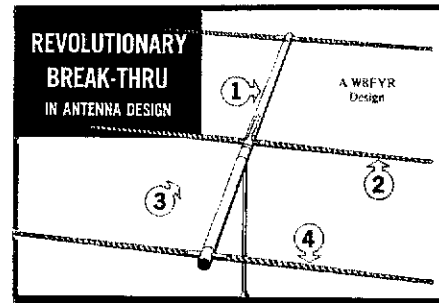

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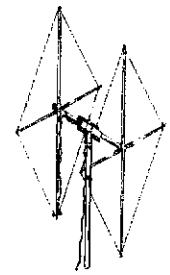

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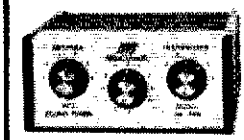

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KENWOOD T-599D, R-599D, S-599 $560.; TR7625 $275.; Heath SB200 $230. NØAJZ, 314-838-7285.

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YAESU FT101ZD, fan, YD-148 mic. $675. John, KA6EWX, 408-379-6875.

HEATH HW-101, cw filter, HP23B pwr supply, mint condx $285 W6CXI 707-485-7809.

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BOUND volumes QST 1923 through 1930 $8. each, 1931 through 1945, $5. each. Also bound volumes 1920 through 1922, not complete, 1946 through 1975 complete. Make offer. Wm. B. Smith, W1LRM.

HEATH Semiconductor Devices and trainer $60, Digital Techniques and trainer $100, K4GXY, John Gallagher, 411 S. Elm, Lakeland, FL 33801.

HEATHKIT SB-301, SB-401 with cw filter, xtal pack $400. HR-10B, HG-10B, DX-60B $200. Both complete stations. 408-724-9618 leave message for Kevin Cornwell.

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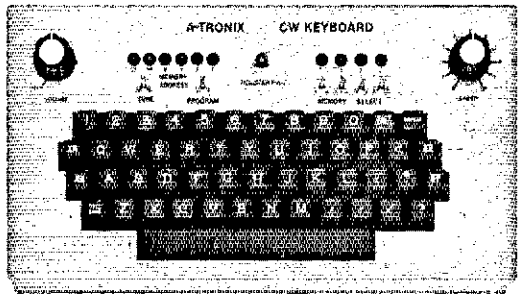

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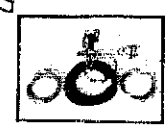

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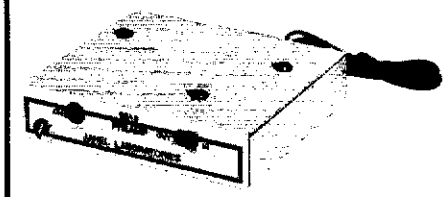

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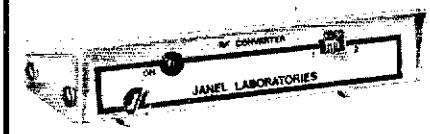

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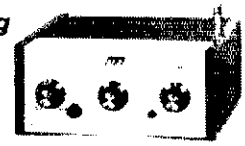

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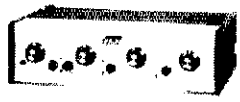

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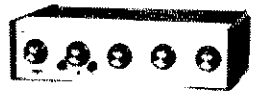

MFJ-959 RECEIVER ANTENNA TUNER has low noise 20 db preamp for weak stations. Match antenna to receiver for maximum signal 1.6 to 30 MHz. Can use 2 ant., and 2 rcvrs. Select tuner, tuner with preamp, tuner with 20 db attenuator, bypass. Gain control. Coax, phono jacks. 110 VAC or 9-18 VDC, 9x2x6 in. **MFJ-950, $59.95.** Same as MFJ-959, less preamp, attenuator, bypass. 6x2x6 in.

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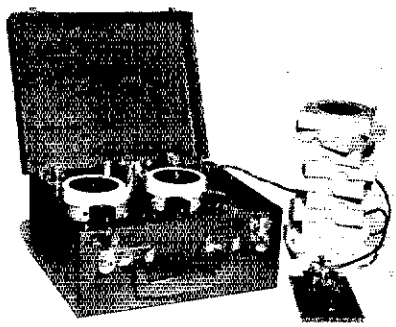

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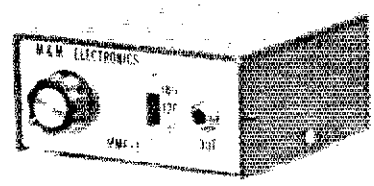

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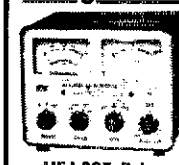

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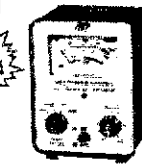

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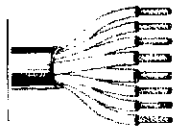
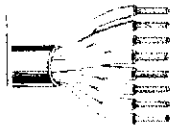
		300	3.3	10.8
		400	3.8	12.5
RG8/u Foam .81VF	8214 26¢/ft.	50	1.2	3.9
		100	1.8	5.9
		200	2.6	8.5
		300	3.3	10.8
		400	3.8	12.5
RG8/u Regular .77 VF	8237 23¢/ft.	100	2.0	6.6
		200	3.0	9.8
		400	4.7	15.4
		900	7.8	25.6
RG8/u Non-contaminating	8267 30¢/ft.	100	2.0	6.6
		200	3.0	9.8
		400	4.7	15.4
		900	7.8	25.6



8448 20¢/ft.

No. of Cond. — 8
AWG (in mm) —
6-22, (7×30),
2-18, (16×30), (1.19)



9405 32¢/ft.

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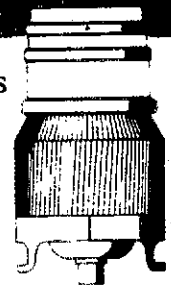

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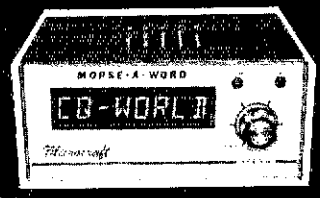

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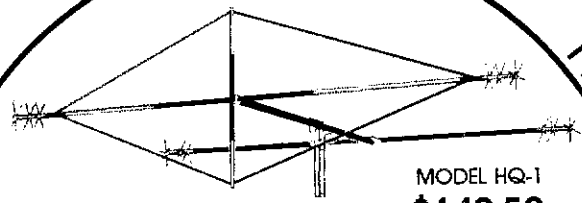

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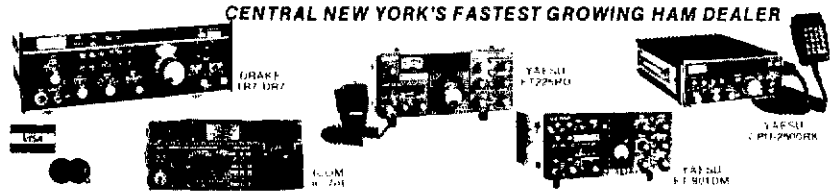

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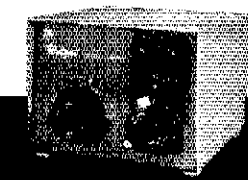

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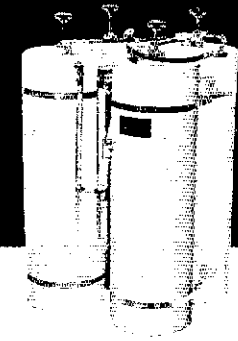

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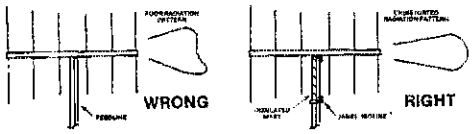

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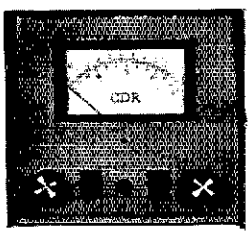

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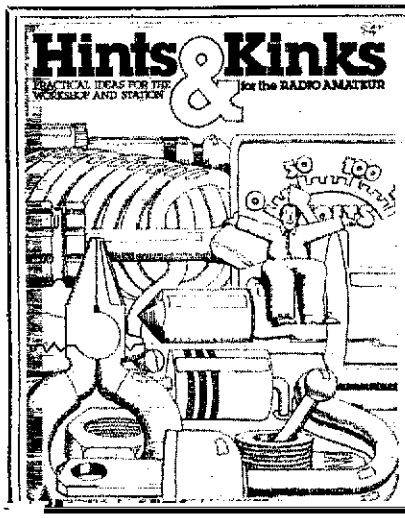

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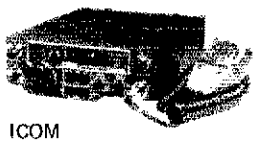

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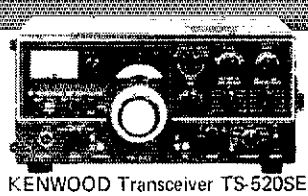

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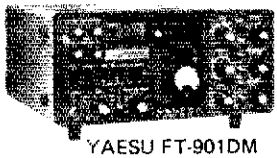

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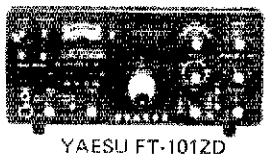

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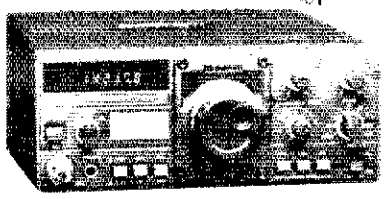

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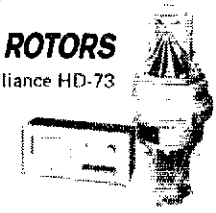

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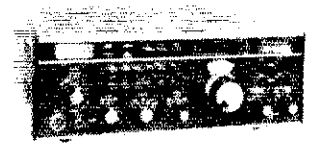
DRAKE



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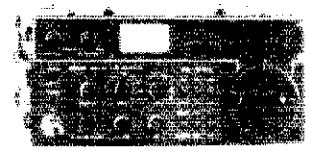

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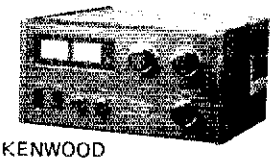
List **$449.** *Dial for your discount!*



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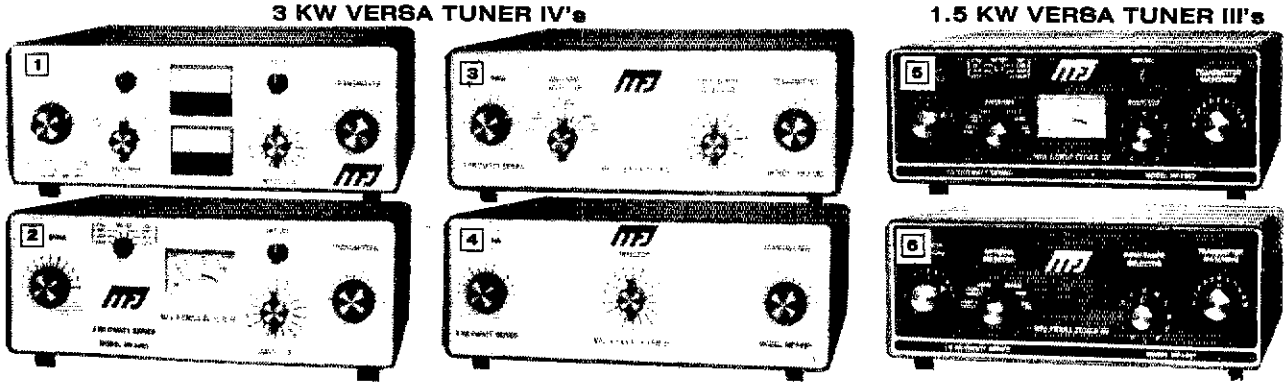

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3 KW VERSA TUNER IV's

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$299.95 ***EXCLUSIVE RF AMMETER insures maximum power to antenna at minimum SWR. Built-in dummy load.***

This is MFJ's best 3 KW Versa Tuner IV. The MFJ-984 Deluxe 3 KW Versa Tuner IV gives you a combination of quality, performance, and features that others can't touch at this price.

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Versatile antenna switch lets you select 2 coax lines thru tuner and 1 thru or direct, or random wire, balanced line or dummy load.

A 200 watt 50 ohm dummy load lets you tune your exciter off air for peak performance. Efficient, encapsulated 4:1 ferrite balun.

2 MFJ-981 3 KW VERSA TUNER IV

$199.95 ***Accurate meter gives SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. 4:1 ferrite balun.***

The MFJ-981 3 KW Versa Tuner IV is one of MFJ's most popular Versa Tuners. An accurate meter gives you SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. Encapsulated 4:1 ferrite balun.

3 MFJ-982 3 KW VERSA TUNER IV

$199.95 ***Antenna switch lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line.***

The MFJ-982 3 KW Versa Tuner IV gives you a versatile 7 position antenna switch that lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

If you already have a SWR/wattmeter, the MFJ-982 is for you.

4 MFJ-980 3 KW VERSA TUNER IV

$169.95 ***Heavy duty encapsulated 4:1 ferrite balun for balanced lines.***

The MFJ-980 is MFJ's lowest priced 3 KW Versa Tuner IV but has the same matching capabilities as the other 3 KW Versa Tuner IV's.

Features an efficient, encapsulated 4:1 ferrite balun for balanced lines.

1.5 KW VERSA TUNER III's

5 MFJ-962 1.5 KW VERSA TUNER III

$169.95 ***SWR, dual range forward and reflected power meter, 6 position antenna switch, encapsulated 4:1 ferrite balun.***

The MFJ-962 1.5 KW Versa Tuner III is an exceptional value.

An accurate meter gives SWR, forward and reflected power in 2 ranges (2000 and 200 watts).

A versatile six position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

Black front panel has reverse lettering.

6 MFJ-961 1.5 KW Versa Tuner III

$149.95 ***6 position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.***

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- **240 watts DC SSB/CW**
- **160-10 meters, WWV**
(2 auxiliary band positions are available for future expansion)
- **RF Speech Processor**
- **SSB, CW, AM, FSK**
- **Built-in SWR Meter**
- **Excellent Dynamic Range**
- **Audio Peak/Notch Filter**
- **Variable Bandwidth**
- **Full Line of Accessories**

The FT-107 has been created as a result of a blending of technologies — computer, solid state and RF design. By careful utilization of these disciplines and the experience gained from our FT-301 series, YAESU has achieved an HF transceiver which offers unique features (e. g. "Digital Memory Shift"), efficient operation and a level of performance that has been previously unattainable.

FT-107 TRANSCEIVER SPECIFICATIONS

(Receiver Section)

Sensitivity: 0.25 uV for 10dB S/N, CW/SSB, FSK
1.0 uV for 10dB S/N, AM
Image Rejection: 60dB except 10 meters (50dB)
IF Rejection: 70dB
Selectivity: SSB 2.4 kHz at −6dB, 4.0 kHz at −60dB.
CW 0.6 kHz at −6dB, 1.2 kHz at −60dB.
AM 6 kHz at −6dB, 12 kHz at −60dB
Variable IF Bandwidth
20dB RF Attenuator
Peak/Notch Audio Filter
Audio Output: 3 watts (4-16 ohms)
Accessories: FV-107 VFO (standard not synthesized)
FTV-107 VHF (UHF Transverter)
FC-107 Antenna Tuner
SP-107 Matching Speaker
FP-107 AC Power Supply

(Transmitter Section)

Power Input: 240 watts DC SSB/CW
80 watts DC AM/FSK
Opposite Sideband Suppression: Better than 50dB
Spurious Radiation: −50dB.
Transmitter Bandwidth 350-2700 hz (−6dB)
Transmitter: 3rd IMD −31dB neg feedback 6dB
Transmitter Stability: 30 hz after 10 min. warmup
less than 100 hz after 30 min.
Antenna Input Impedance: 50 ohms
Microphone Impedance: 500 ohms
Power Required: 13.5V DC at 20 amps
100/110/117/200/220/234V AC at 650 VA

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The radio.

Price And Specifications Subject To Change Without Notice Or Obligation

1179R

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