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March 13-15, 1981

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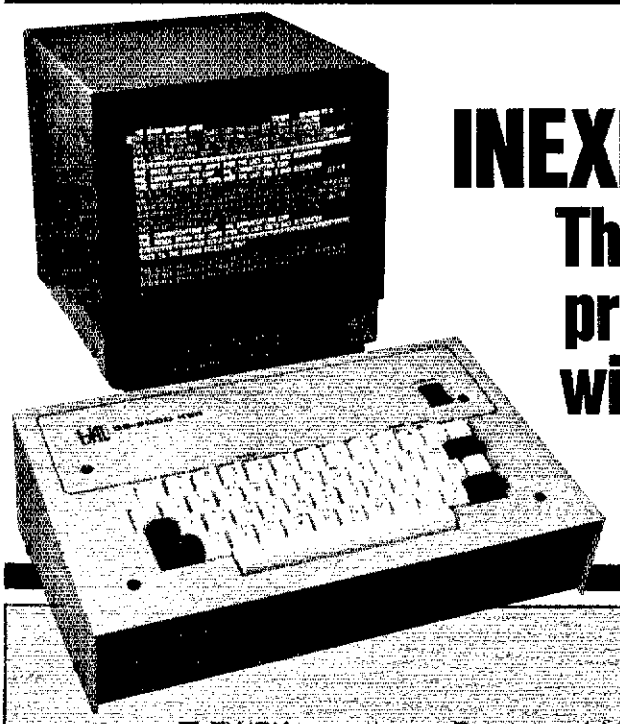

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- TX/RX operation on Baudot and ASCII RTTY plus Morse Code (Morse RX optional)
- Integrated keyboard and video generator allows editing of transmit text
- Full 24 line by 72 characters per line display
- Bright/dim display of characters differentiates between TX and RX display
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Transmit on all 9 HF bands...

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Dual built-in VFO's.

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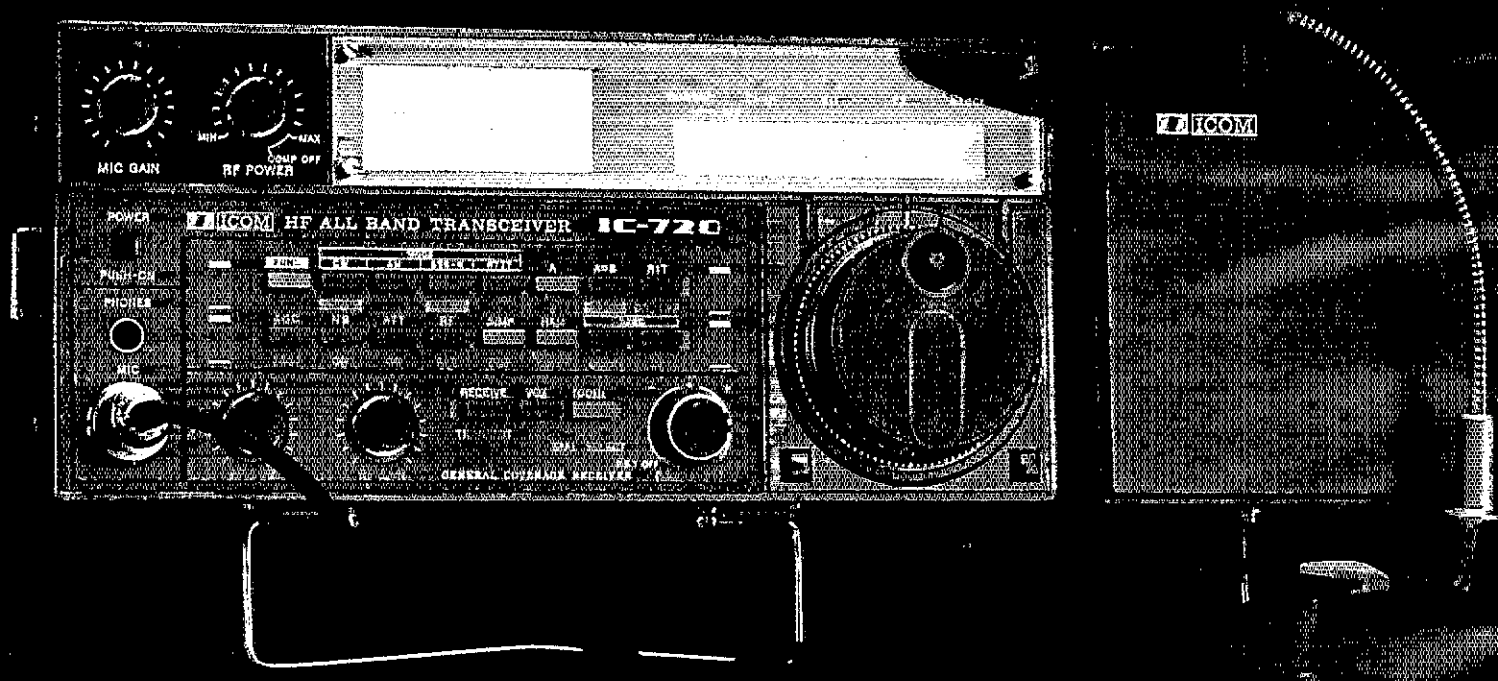

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THE COVER

Tired of winter's chill? The 1981 ARRL National Convention/Orlando Hamcation, to be held March 13 to 15, should have enough activity to thaw out all who make their way to Orlando. Details appear in January 1981 *QST*, page 54.

Contents

The best amplifier value just got better....

Clipperton-L, now with tuned input.

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

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

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

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- A3X-2B 144-174 MHz
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Universal Conversion Kit includes decoupling with matching transformer, waterproofed cable, and stainless steel hardware plus built-in lightning arrester to convert any Ringo Ranger.

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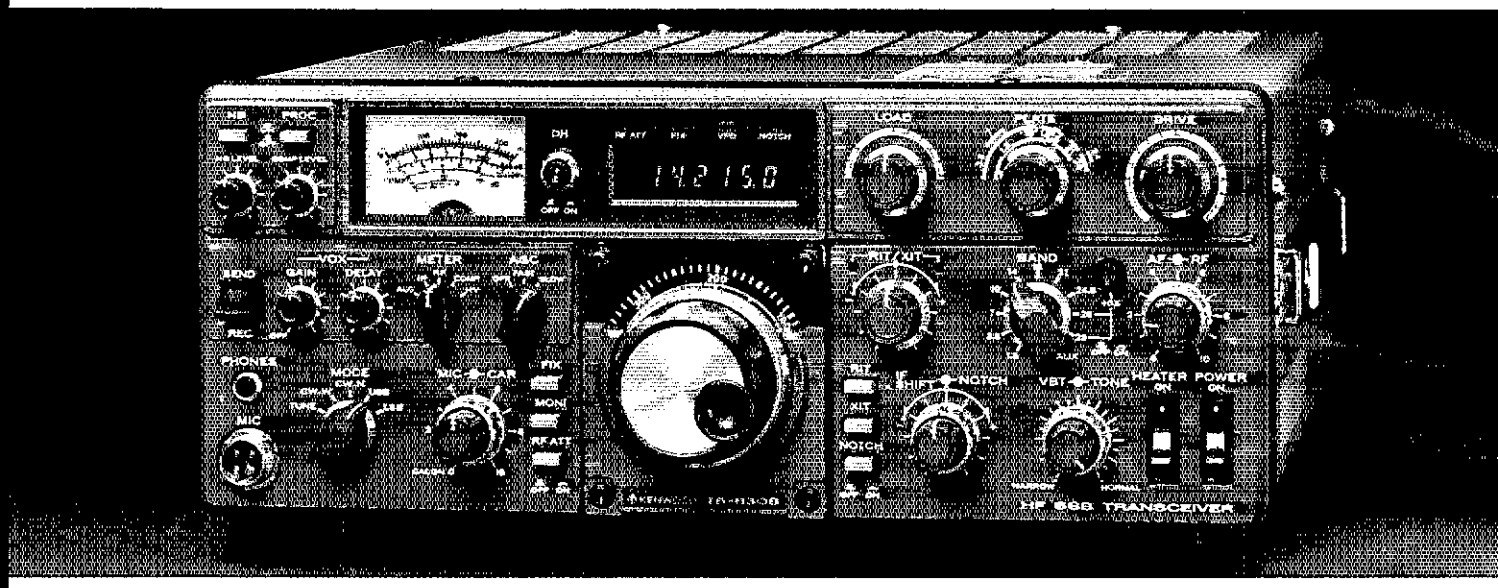


VBT, notch, IF shift, wide dynamic range

TS-830S

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

TS-830S FEATURES:

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

Ask your Authorized Kenwood Dealer about the many operating features offered by the TS-830S...at a very reasonable price!

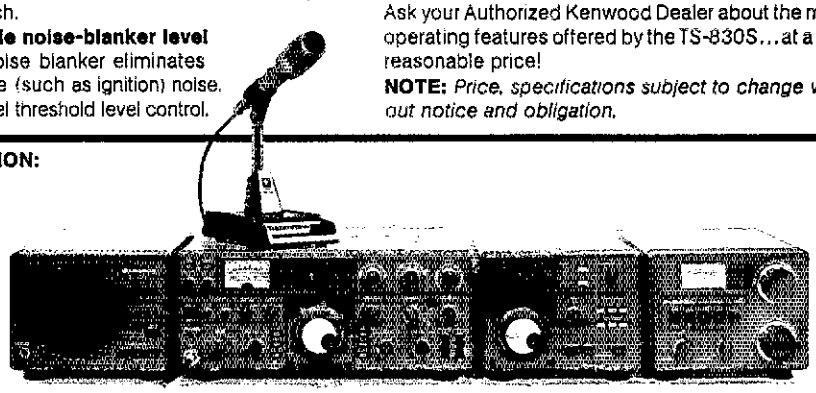
NOTE: *Price, specifications subject to change without notice and obligation.*

MATCHING ACCESSORIES FOR FIXED-STATION OPERATION:

- SP-230 external speaker with selectable audio filters
- VFO-230 external digital VFO with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/SWR and power meter
- MC-50 desk microphone

Other accessories not shown:

- TL-922A linear amplifier
- SM-220 Station Monitor
- PC-1 phone patch
- YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF
- YK-88C (500-Hz) and YK-88CN (270-Hz) CW filters for 8.83-MHz IF
- HC-10 digital world clock
- HS-5 and HS-4 headphones
- MC-30S and MC-35S noise-cancelling hand microphones



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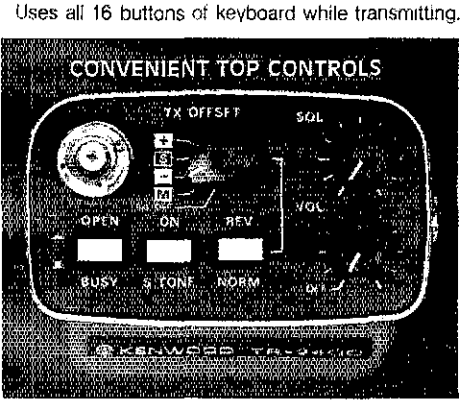
TR-2400 FEATURES:

- **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 2.0 mA). "M0" 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 frequency +600 kHz or -600 kHz or to the frequency stored in "MO" memory.
- **Reverse operation**
  Push-button switch shifts receiver to transmit frequency and transmitter to receive frequency.
- **Extended operating time**
  With LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output), for longer operating time between charges.
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR," "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connectors**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

Microphone PTT and audio terminals

Charger terminal

Earphone Jack

STANDARD ACCESSORIES INCLUDED:

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

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

OPTIONAL ACCESSORIES:

- ST-1 base stand (shown) which provides 1.5-hour quick charge, 4-pin connector for dynamic microphone, and SO-239 antenna connector.
- BC-5 DC quick charger (1.5 to 2.0 hours)
- SMC-24 speaker/microphone
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
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Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland, CA 95695 (916-666-1465)
San Francisco — Arthur P. Samuelson, W6VV, 440 Davis Ct. #811, San Francisco, CA 94111 (415-986-3129)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Jettie B. Hill, W6RFF, 22410 Janice Ave., Cupertino, CA 95014 (408-255-6714)

Roanoke Division

North Carolina — Ed Stephenson, AB4S, 700 Madison Ave., Cary 27511 (919-467-6832)
South Carolina — Richard McAbee, W4MTK, 205 Jewel St. N.W., New Ellenton 29809 (803-652-2596)
Virginia — Byron C. "Luck" Hurder, WA4STO, Box 167, Seven Fountains 22653
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr., Charleston 25312 (304-776-4352)

Rocky Mountain Division

Colorado — Lawrence E. Steimel, WØACD, 1750 Roslyn St., Denver 80220
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd., N.E., Albuquerque 87112
Utah — Royce Henningson, K7QEQ, P. O. Box 1267, Moab 84532 (801-259-5018)
Wyoming — Chester C. Stanwaity, W7SDA, 353 S. Ferris St., Powell 82435 (307-754-3624)

Southeastern Division

Alabama — James M. Bonner, K4UMD, Rte. 15 — Box 246, Birmingham 35224 (205-788-2003)
Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave., Columbus 31904 (404-322-2856)
Northern Florida — Billy F. Williams, Jr., N4UF, 911 Rio St. Johns Dr., Jacksonville 32211 (904-744-9501)
Southern Florida — Woodrow Huddleston, K4SCL, 219 Driftwood Ln., Largo 33540 (813-584-0984)
West Indies — Julio Negroni, KP4CV, Georgetown, No. 269, Rio Piedras, PR 00927

Southwestern Division

Arizona — Willard L. Haskell, AC7D, 3915 N. Campbell Ave. Sp. 102, Tucson 85719 (602-327-3960)
Los Angeles — Stanley S. Broki, N2YQ, 2645 North Marengo Ave., Altadena, CA 91001 (213-798-8827)
Orange — Fred Heyn, WA6WZO, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (714-273-1120)
Santa Barbara — Robert N. Dyruff, W6POU, 1188 Summit Rd., Santa Barbara, CA 93108 (805-969-3073)

West Gulf Division

Northern Texas — Phil Clements, K5PC, 1313 Applegate Ln., Lewisville 75067 (214-221-2222)
Oklahoma — Leonard R. Hollar, WA5FSN, RFD 1, 710 South Tenth St., Kingfisher 73750 (405-375-4411)
Southern Texas — Roger D. Coday, N5FN, 213 Ave. G, RFD 4, Brazoria 77422 (713-798-7970)

THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in Amateur Radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worthwhile amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in Amateur Radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

Your Help is Needed!

1981 signals the 20th birthday of OSCAR. The last two decades have recorded several launch success stories, as thousands of enthusiasts who have participated in the thrill of tracking and exchanging signals with space can attest. One notable failure has certainly gained attention. Amateur Radio's inspiring history will not soon forget the unfortunate loss of the first Phase III satellite in May of last year.

But the Amateur Satellite Service has emerged from its incubator and infantile setbacks with new and renewed vigor and enthusiasm. As in any innovative effort, there are those few dedicated and determined individuals whose persistence is generally rewarded with few thanks until the ultimate goal is achieved. Those handsful of satellite groups throughout the world who mourned the loss of the Ariane launch last spring have not been undone by it. The amateur satellite program is alive and growing. And it needs the nourishment and support that only total commitment of the amateur community can give it if it is to mature to sophisticated, technological adulthood.

The ARRL has recognized this need and is energetically endorsing the growth and development of the satellite program with a pledge of $10,000 in matching funds in support of the space effort. The ARRL Foundation presents to you, the membership of ARRL, its concentrated efforts to solicit monies in support of the same overall space program.

The Officers and Directors of the ARRL Foundation have channeled their energies, in the few short years of the Foundation's existence, to collecting and allocating funding on behalf of programs which they deem worthy of support within the promotion and advancement of the radio art. We are convinced that experimentation and progress within the Amateur Satellite Service unquestionably merits the attention of the entire Amateur Radio community.

The Phase III-B project has targeted a launch date of one year hence and estimates needs of a quarter of a million dollars to liftoff. The ARRL Foundation's 20th Anniversary Amateur Satellite Fund Drive can help meet those targets only with your active participation.

Why are we seeking support of the whole Amateur Radio fraternity on the behalf of an innovative small group of communicators? We, of the Foundation, can very well remember when single sideband interests comprised only a small group of innovative communicators.

Won't you become a part of tomorrow's communications by sending your satellite contribution today? Please make your tax-deductible check payable to the ARRL Foundation, Inc. and send it to 225 Main St., Newington, CT 06111.

Not only will your gift to the satellite fund be matched dollar for dollar, but your generosity will be recognized according to the following levels of participation: for gifts of $25 or more a distinctive lapel pin; for gifts of $100, the donor's name and call will be listed in *QST*; the donor of $250 will be awarded a specially designed certificate; the donor of $1000 will be pictured in *QST* and will receive a personal telephone communication of thanks from the ARRL Foundation President.

Your contribution in any amount is more than welcome . . . it is critical to the successful completion of this phase of the satellite program. Thank you for your help. — *Robert York Chapman, W1QV, President, ARRL Foundation*

League Lines...

U.S. Coast Guard LORAN-A (Long Range Aid to Radio Navigation) went off 160 meters as of the first of the year, and ARRL is trying to secure an early release of the restrictions on amateur operations on that band. (See October 1980 QST, page 57, for details on the League's petition.) However, the matter is complicated by the fact that Canada will continue to operate its Newfoundland LORAN Chain for a couple of years. Nonetheless, League officials and members of the U.S. Interdepartment Radio Advisory Committee are investigating possibilities for protecting Canada's LORAN while deregulating the amateur 160-meter band.

FCC's "plain-language" proposal for the Amateur Rules is the subject of a special article on pages 49-51 of this issue. Approximately 2100 ARRL-affiliated Amateur Radio clubs in the U.S. will be receiving a complete copy of the proposal from League Hq. We hope your club will file its comments with the FCC. If you would like your own personal copy of the nearly 50-page document, write to ARRL Hq., Plain Language Rules, 225 Main St., Newington, CT 06111. Please enclose $1 to partially defray the cost of printing and mailing this weighty material.

Because of increases in Canadian and foreign postage which took effect the beginning of the year, it is unfortunately necessary to increase the surcharge for mailing QST to non-U.S. members. Effective March 1, 1981, for new memberships, the annual dues will be $26 for members outside the United States.

As you will have noted from the editorial on the previous page, the League's Foundation is engaged in a fund-raising campaign to support the amateur satellite program. So is AMSAT, The Radio Amateur Satellite Corporation, and to induce additional donations they are going to offer a special T-shirt. They're looking for a good design, and if you have some ideas, and/or if you consider yourself a T-shirt designer par excellence, please contact K9LF, who's in charge of fund raising for AMSAT.

Four Washington, DC-area radio amateurs have received special temporary authority from the FCC to experiment with a teleprinter code similar to the commercially used "Moore ARQ Code." K4PA, K3FLS, W3KET and KB6BT, who are members of AMRAD, the Amateur Radio Research and Development Corporation, will be trying to develop an error-free mode of amateur teleprinter communications. The authority to experiment with the code, which is described in International Telecommunication Union's CCIR Recommendation 476 (Rev. 74), will continue for one year, at which time the amateurs will report their findings to the Commission.

Ten-meter amplifier ban now permanent. The FCC has decided to make permanent the rule requiring commercially made, high-frequency Amateur Radio amplifiers to be type-accepted by the Commission. This has the effect of banning 10-meter amplifiers because amplifiers capable of operation from 24 to 35 MHz will not be type-accepted. However, the Commission is looking into the possibility of allowing manufacturers to supply licensed amateurs with instructions on how to modify their amplifiers to operate on 10-meters. This proposal will be a formal notice of proposed rulemaking in Docket 21117. QST will carry details in a future issue. The FCC banned amplifiers capable of operation from 24 to 35 MHz in 1978 in the hopes that interference problems caused by illegal, high-powered citizens band stations would be reduced. This ban has no effect on Amateur Radio home-built amplifiers unless an individual builds more than one per year.

RFI from false teeth? Hams know radio frequency interference can be caused by a lot of strange things, but . . . ? Actually, the Clairol Corporation has filed for a waiver of the FCC rules so it can market an ultrasonic denture cleaner without having to comply with standards dealing with radio frequency interference. ARRL has opposed the petition.

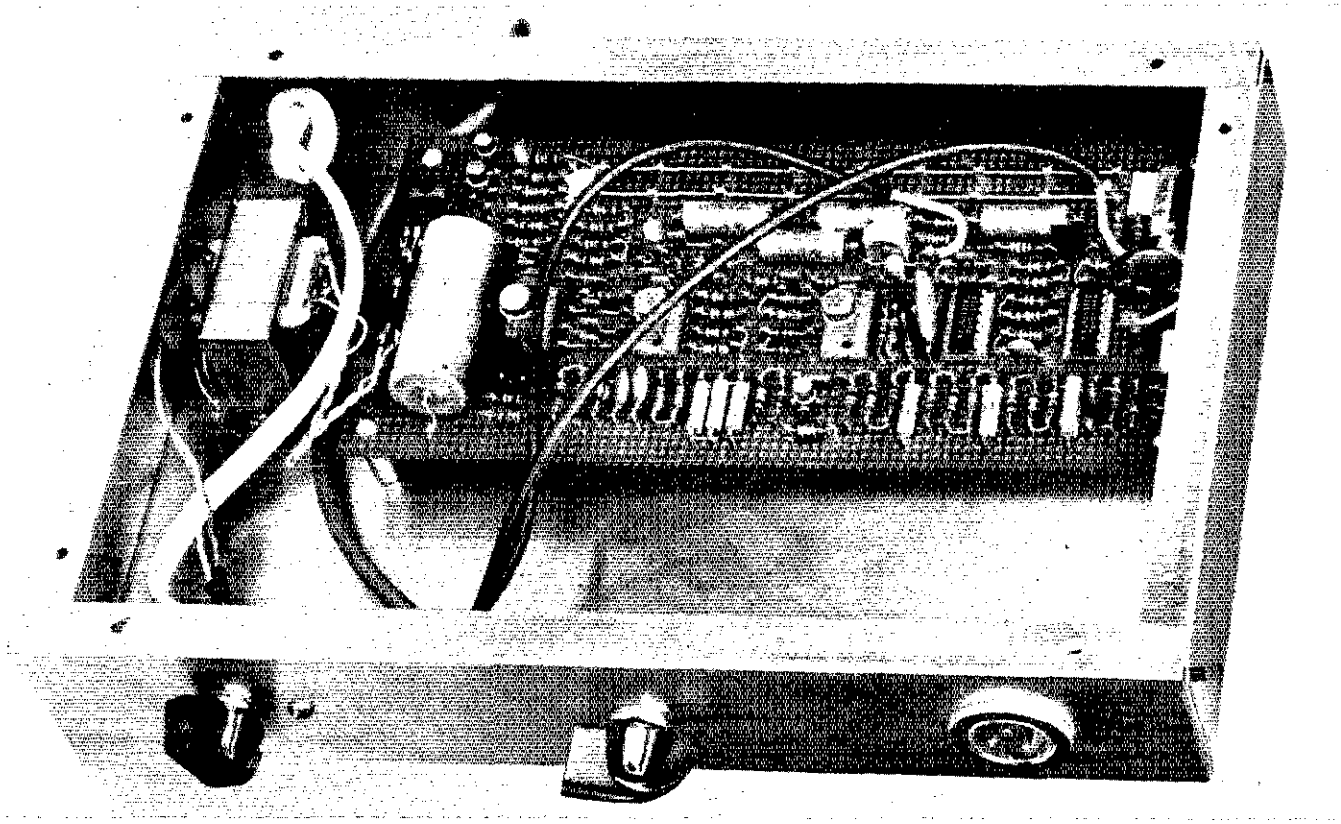
Space WARC, Mobile WARC and General WARC! And you thought you had heard that WARC (the World Administrative Radio Conference) was over. Actually, the General WARC was held in 1979; however, the Conference left some matters to be decided by more-specialized conferences. See "Happenings" in this issue for information about these upcoming conferences.

1981 is the International Year of Disabled Persons. The ARRL Blind and Physically Handicapped Program offers information on obtaining materials pertaining to Amateur Radio in other-than-printed forms. Does your club or class have a sightless member? Send an s.a.s.e. to ARRL, 225 Main St., Newington, CT 06111.

Audio Processor Using RF Clipping

For extra clout to break through QRM or catch that rare DX, add this state-of-the art speech processor to your station lineup. It can make the difference!

By William A. Stein,* KC6T



Many of the new hf transceivers are equipped with speech processors using an rf clipper. When properly applied, this method provides excellent "talk power" with low distortion. In addition to giving that extra punch for getting through DX pileups, the processors do much to iron out speech variations. As a result, copying at the other end of a QSO is easier. The numerous fine pieces of equipment in use today which lack this feature would benefit from an outboard speech processor.

The objective of any homemade speech-processor project should include a unit that can be constructed and adjusted without the requirement for exotic test equipment, since this equipment is generally beyond the reach of most amateurs. The design described in this article has one internal adjustment, one external gain control and one ON/OFF switch. Although other internal adjustments could be added to improve sideband generation, they have been eliminated in the interest of simplicity. This has been done without degrading the overall performance of the processor.

A Processor That Generates an SSB Signal

The rf clipper, shown schematically in Fig. 1, generates a single-sideband signal at approximately 500 kHz. Single sideband is generated by a phasing technique[1] employing two quad operational amplifiers[2] and two doubly balanced modulator/demodulator units.[3] After generation, the sideband signal is buffered and clipped by means of a pair of transistors. The output from the clipper is the input to the doubly balanced modulator/demodulator mixer that serves as a product detector. A section of the quad op-amp buffers the signal that emanates from the detector. Processed audio is then fed to the transceiver through the microphone jack.

The signal from the microphone input is amplified by U1A, which drives two

*10823 Bismarck Ave., Northridge, CA 91326

[1]Notes appear on page 14.

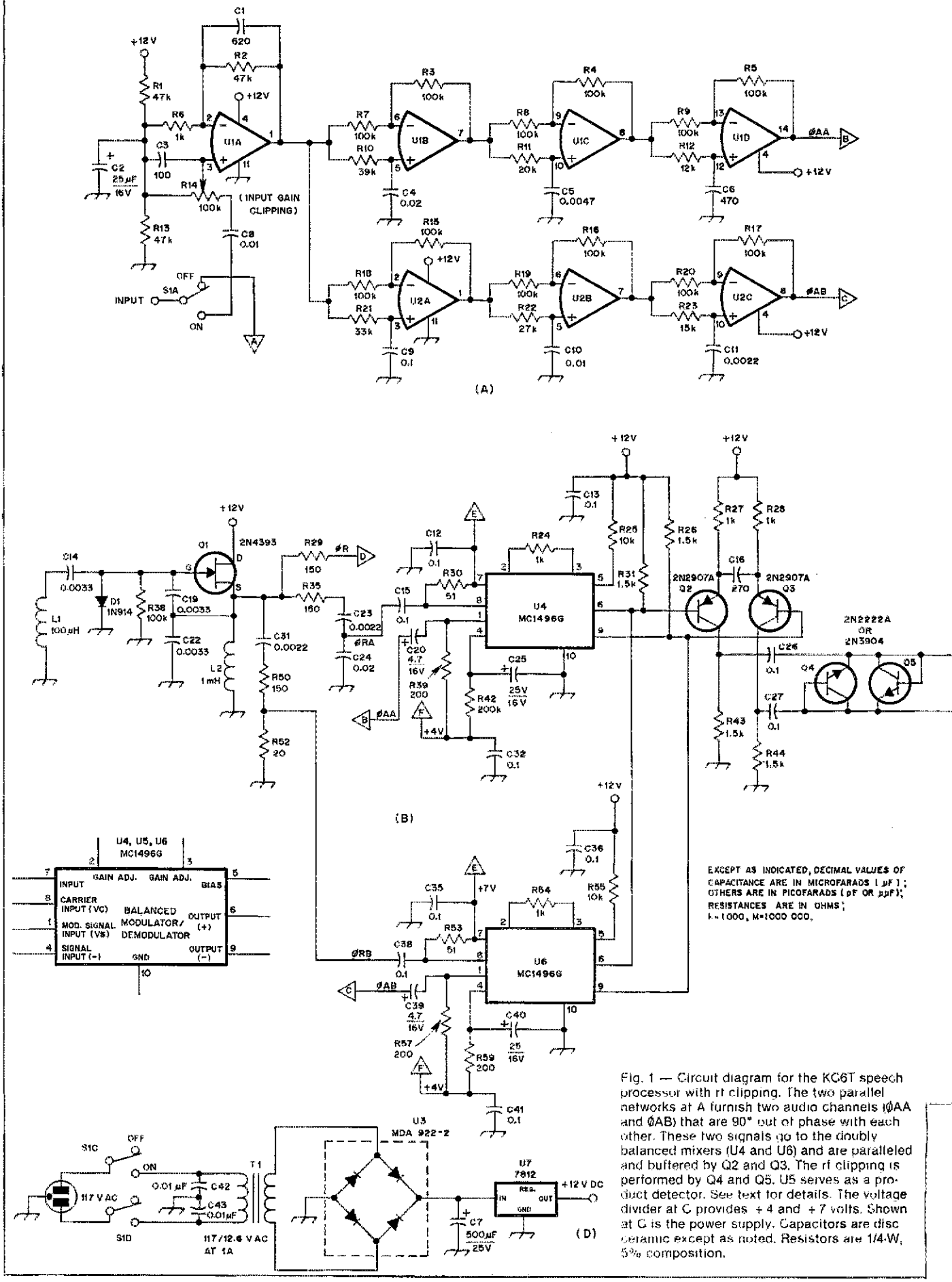
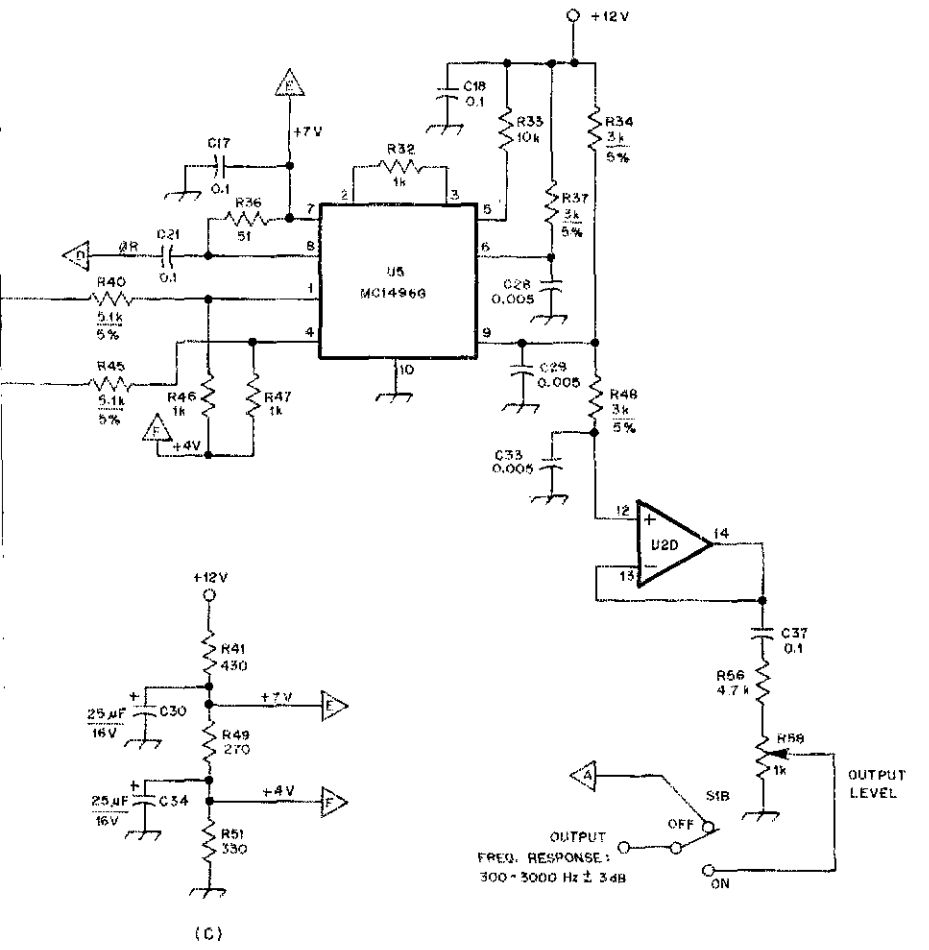


Fig. 1 — Circuit diagram for the KC6T speech processor with rf clipping. The two parallel networks at A furnish two audio channels (ØAA and ØAB) that are 90° out of phase with each other. These two signals go to the doubly balanced mixers (U4 and U6) and are paralleled and buffered by Q2 and Q3. The rf clipping is performed by Q4 and Q5. U5 serves as a product detector. See text for details. The voltage divider at C provides +4 and +7 volts. Shown at C is the power supply. Capacitors are disc ceramic except as noted. Resistors are 1/4-W, 5% composition.

C1 — 620 pF.
C2, C25, C30, C34, C40 — 25-μF, 16-V electrolytic.
C3 — 100 pF.
C4, C24 — 0.02 μF.
C5 — 0.0047 μF.
C6 — 470 pF.
C7 — 500-μF, 25-V electrolytic.
C8, C10, C42, C43 — 0.01 μF.
C9, C12, C13, C15, C17, C18, C21, C26, C27, C32, C35-C38 incl., C41 — 0.1 μF.
C11, C23, C31 — 0.0022 μF.
C14, C19, C22 — 0.0033 μF.
C16 — 270 pF.
C20, C39 — 4.7-μF, 16-V electrolytic.
C28, C29, C33 — 0.005 μF.
D1 — Silicon fast switching diode, 4 nanosec., 100 PRV, 1N914 or equiv.
L1 — 100-μH inductor (Nytronics Wee-100 or equiv.).
L2 — 1-mH inductor (J. W. Miller no. 4652 or equiv.).
Q1 — Silicon n-channel junction field-effect transistor, 2N4393 or equiv.
Q2, Q3 — Silicon pnp annular hermetic transistor, 2N2907A or equiv.
Q4, Q5 — Silicon npn annular hermetic transistor, 2N2222A, 2N3904 or equiv.
R1, R2, R13 — 47 kΩ.
R3-R5, incl., R7-R9, incl., R15-R20, incl., R38 — 100 kΩ.
R6, R24, R27, R28, R32, R46, R47, R54 — 1 kΩ.
R10 — 39 kΩ.
R11 — 20 kΩ.
R12 — 12 kΩ.
R14 — 100-kΩ linear-taper potentiometer.
R21 — 33 kΩ.
R22 — 27 kΩ.
R23 — 15 kΩ.
R25, R33, R55 — 10 kΩ.
R26, R31, R34, R44 — 1.5 kΩ.
R29, R35, R50 — 150 Ω.
R30, R36, R53 — 51 Ω.
R34, R37, R48 — 3 kΩ.
R39, R57, R59 — 200 Ω.
R40, R45 — 5.1 kΩ.
R41 — 430 Ω.
R42 — 200 kΩ.
R49 — 270 Ω.
R51 — 330 Ω.
R52 — 20 Ω.
R56 — 4.7 kΩ.
R58 — 1 kΩ Trimpot.
S1 — 4pst rotary.
T1 — 117/12.6 V, 1 A (Triad F-70X or equiv.).
U1, U2 — Quad operational amplifier, 3403P Fairchild or equiv.
U3 — Rectifier assembly MDA 922-2, Motorola or equiv.
U4, U5, U6 — Balanced modulator-demodulator, Motorola MC1496G or equiv.



parallel networks composed of U1B through U1D and U2A through U2C. These two parallel networks provide two audio channels (ØAA and ØAB) 90° out of phase with one another over the audio range of interest. A Clapp oscillator (Q1) provides an rf carrier at approximately 500 kHz. The output of this oscillator is phase shifted by two R-C networks to produce a pair of rf signals that are out of phase by 90° (ØRA and ØRB). The oscillator also provides a carrier signal for use in the product detector (ØR). The two audio signals and two rf signals go to a pair of integrated doubly balanced mixers (U4 and U6) to generate an ssb signal. The outputs of U4 and U6 are paralleled and buffered by a pair of transistors (Q2 and Q3).

These transistors drive an rf clipper composed of "super-diodes," transistors and Q4 and Q5.[4] A super diode is formed when the base and collector of a transistor are connected so that the device exhibits a steep knee in the forward transfer characteristics. As a result, the clipped ssb signal is then passed to a product detector (U5) along with the rf carrier from oscillator Q1 (ØR). The output of this product detector is filtered and buffered by one section of the quad op-amp (U2D) and output at potentiometer R58. The frequency response of the unit, as shown, is 300 Hz to 3 kHz. If desired, some of the low-frequency response can be eliminated by changing C8 to 0.005 μF and C37 to 0.033 μF. With these modifications, the frequency response is approximately 600 Hz to 3 kHz.

Layout Care Required

Construction of this processor required layout care since radio frequencies (although they are quite low) are involved. I constructed the first model on a perforated board with push-in terminals and had no stability problems. The bypass capacitors shown at U3, U4 and U5 (C12, C13, C25, C32, C36, C40 and C41) should all be placed physically close to these integrated circuits. When the circuit board is completed, it should be packaged in a relatively rf-tight box. I used a 7 × 11 × 2-inch (178 × 279 × 51-mm) chassis box with a bottom cover. To eliminate rf feedback to the processor when the station is on the air, C42 and C43 are required.

Adjusting the Processor

In adjusting and using this processor, as with all electronic devices, the rule to apply is "if a little works great, don't use a lot." With this advice in mind and a few basic instruments on hand, adjustment of the processor should be completed without difficulty. Those instruments include your transceiver, a dummy load and some method of observing the alc action when setting the microphone gain control. Most transceivers have a metering position for observing alc performance.

The procedure I've outlined in this article refers to the steps I took in adjusting the processor and my Yaesu FT-101B. After normal tune-up into a dummy load adjust the microphone gain control for comfortable audio. Set the gain so that the alc meter will barely move off the pin with a steady input signal such as the sound "OHHHH" or with a steady whistle. Current in the plate circuit will approach its key-down value, so this portion of the adjustment should be done rapidly. Turn on the processor (which disconnects the microphone from the

transceiver input jack and connects the processor). Turn the internal adjustment (R58) to approximately midposition. Turn the input gain control (R14) to maximum clockwise position. Use the same microphone-input technique and adjust the output level (R58) until the alc meter barely moves off the peg. Do not change the microphone gain-control setting on the transceiver. This completes the adjustment procedure. Reinstall the bottom of the chassis box.

Although the unit is capable of a considerable amount of compression (rf clipping), use of the device in this manner produces a very harsh-sounding received signal which is not necessary. In fact that is not desirable. Operation of the unit with the gain control fully clockwise, for example, will cause all background noise in the shack to drive the transmitter excessively, detracting from the legibility of the received signal. With the processor switch off and the microphone connected normally, speech levels that cause the alc meter to bounce slightly off the peg will cause an average indicated plate current that is 30% to 40% of the key-down plate current. If it were possible to hold your audio input to the microphone relatively constant at this level, any further increase in microphone gain would not produce an increase in S-meter reading at the distant receiver.

The processor will assist in maintaining this even level. When used properly, it can be left in the microphone circuit even for local QSOs under ideal conditions. The input gain-control setting should be readjusted such that the average value of plate current increases from its normal 30% to 40% of the key-down flow to about 60% of the key-down level.

I found that the proper input gain-control setting for my microphone and voice is at the 10:30 position. On-the-air checks with the transmitter and processor gain controls adjusted as described have produced very satisfactory reports. This processor, as with others, allows the operator to set the microphone gain control for minimum drive (minimum grid current) and yet attain a considerable increase in talk power without increasing bandwidth and splatter.

If you're a dedicated DXer but have yet to include processing at your station, this device may give your signals longer arms. Good luck with the rare ones! 73

Notes

[1] Dickey, *Electronics Designers Casebook, 1979*, catalog 14-D (prepared by editors of *Electronics* Magazine), p. 129. See "Outputs of Op-Amp Networks Have Fixed Phase Difference."

[2] *Linear Integrated Circuits, 1976*, Fairchild Semiconductors, p. 12-166.

[3] *Linear Integrated Circuits Data Book, Third Edition*, Motorola Semiconductor Products, Inc., p. 8-416.

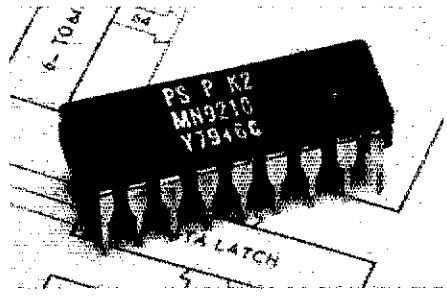
[4] Any bipolar transistor with base and collector connected exhibits diode characteristics between the base/collector and emitter terminals, but the "knee" in the forward direction is much sharper than the forward knee of most small signal diodes, i.e., the forward resistance during conduction is reduced.

New Products

PLESSEY SEMICONDUCTORS EAROM

☐ A TTL/CMOS-compatible, 256-bit (64 × 4) nonvolatile EAROM is now available from Plessey Semiconductors. The MN9210 is a member of the family of NOVOL logic products, which guarantee data retention of one year in the absence of applied power if the temperature is maintained within the range of −40 to +70° C.

The device is housed in an 18-pin DIP package and has latching data and address inputs and three-state outputs on the data lines. It features six address inputs, four data I/O lines, a read/write control line, a strobe control line, two chip-select control lines, three power-supply pins and an external capacitor connection. According to the manufacturer, any word may be programmed independently without disturbing the rest of the stored data. Further information may be obtained from Plessey Semiconductors, 1641 Kaiser Ave., Irvine, CA 92714. — *Paul K. Pagel, N1FB*



NEW ZENITH HIGH-PASS FILTER

☐ Zenith Radio Corporation has announced the availability of a new TV high-pass filter. According to the manufacturer, this filter is designed to suppress TV interference caused by paging systems and commercial, CB, police and Amateur Radio transmitters operating at 52 MHz and below. The filter (part no. A-8477) has TV F-type connectors and is installed directly at the rear of any 75-ohm-input Zenith receiver without the use of adapters or the need for soldering. It is 2 × 2 × 1 inches (51 × 51 × 25.4 mm) in size and provides up to 80 dB of attenuation below 52 MHz with an insertion loss of less than 1.5 dB. It is available through Zenith distributors and sold to consumers at Zenith dealers. — *Paul K. Pagel, N1FB*

MOTOR-SPEED REGULATOR IC

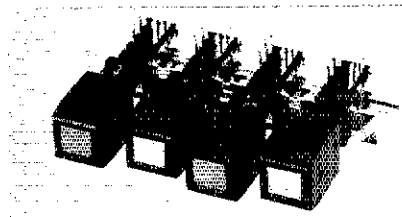
☐ National Semiconductor Corporation has announced a low-cost motor-speed regulator for low-voltage dc motors. The LM1014 is a monolithic IC which has remote stop (pause) and output short-circuit protection. The user may program the IC for variations in temperature by means of four externally set temperature coefficients. Designed primarily for use with cassette tape recorders, the LM1014 is sure to find use in other categories. According to the manufacturer, the LM1014 can operate from a wide power-supply voltage range (+5 to +20 volts) and achieves excellent speed regulation under a variety of torque and temperature environments.

Requiring four external resistors and a pnp pass transistor for motor connection, the circuit can accommodate a wide range of motor conditions. Motor speed is controlled with a negative-output impedance voltage regulator, whose impedance is a function of the four external resistors. Should the output current exceed a preset limit, the base drive to the external pnp transistor is switched off automatically, requiring the supply voltage to be reconnected to start up the motor. — *Paul K. Pagel, N1FB*

SWITCHCRAFT "FLIP-FLOP" PUSH BUTTONS

☐ Switchcraft has announced the TDW-F "Flip-Flop" series of push buttons designed for use with the Switchcraft Tini DW Multi-Switch switches. These push buttons provide an unusual lighted effect even though no electrical energy is used. There are no lamps to replace, no heat is generated and no extra internal switching is required.

According to the manufacturer, an internal flip-flop mechanism is used in conjunction with colored indicator panels (with or without legends), which makes the push buttons appear to change color. With the switch in the IN position, one color background shows through the clear front window; in the OUT position, another color display appears. Any of six bright colors — red, black, green, blue, yellow or white — may be selected. There's also a wide variety of both standard and special letters and symbols available for use with the push buttons. Further information may be obtained from Switchcraft, Inc., 5555 No. Elston Ave., Chicago, IL 60630. — *Paul K. Pagel, N1FB*



Antenna Modeling Program for the TRS-80

With this information and a Level II TRS-80 you can model hundreds of different antenna arrays. Enter data at the keyboard, then sit back and watch the computer plot the pattern.

By Larry D. May,* KE6H

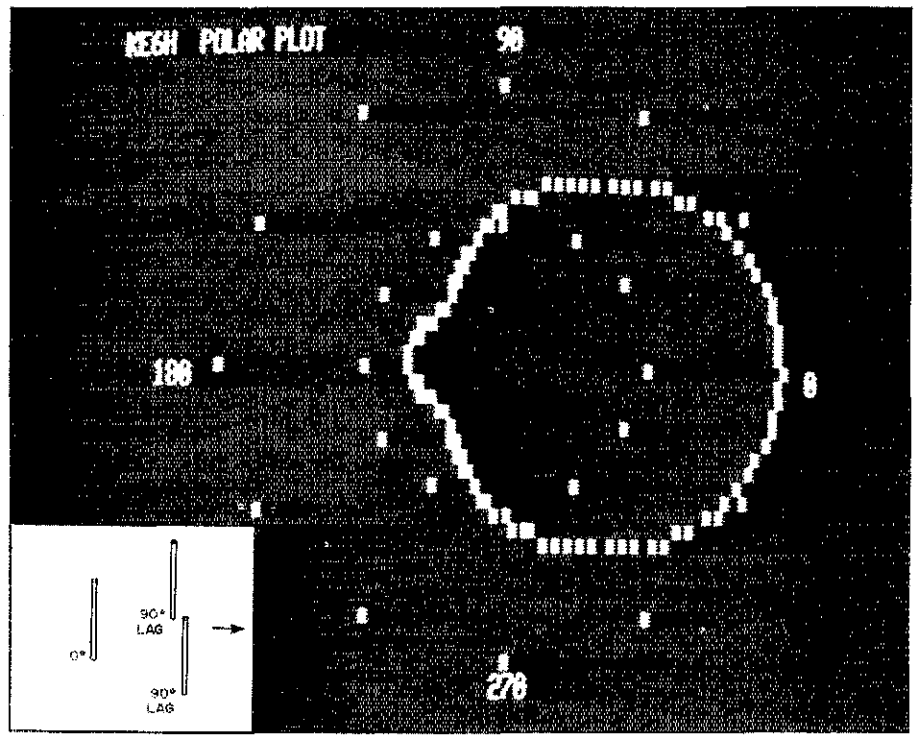
Antenna design seems to capture the interest and wonder of most hams at some time in their involvement in Amateur Radio. I had wondered for many years about the effects of modifying the spacing and phasing of antennas. This finally led me to read through *The Radio Amateur's Handbook*, *The ARRL Antenna Book*, and all the antenna engineering books I could find in the technical library at one of the universities nearby. While reading I came to a hazy conclusion: It should be possible to determine the relative field strength at any set of points equidistant from the array model, just by knowing the amplitude and phase of excitation of each dipole in the array and the orientation of the elements.

Determining this relative field strength should be simply to sum the instantaneous amplitudes of the rays of rf arriving at any given point from each element. The sum would conceivably be affected by the phase difference of arrival of each ray and their initial amplitudes relative to the other elements.

The phase would be affected conceivably by the physical spacing in wavelengths of the elements, and it would be modified by the simple angle effect to the summation point. The phase would also be affected by any radiation phase differences such as those caused by transmission-line delay time in the driven case or reactance delays in the parasitic case.

The amplitudes would be affected conceivably by the power delivered to each dipole element as well as by the radiation response: omnidirectional perpendicular to the axis of each element, and sinusoidal around the plane slicing lengthwise through the axis of the element. All arrays would conceivably be broken up into an arbitrary reference dipole and secondary discrete dipoles.

I then set out to develop a program that would perform these calculations. When the program was completed I compared the results to standard known simple radiation patterns and was happy to find an excellent fit. I then checked some very complex arrays and was amazed at the fit. I went on to try all the various antenna configurations I had been curious about and came out with an understanding of antennas that I had never thought possible. The program had given me a quantum jump in my understanding of the effects of changing parameters of an antenna array; I could make changes in the computer model in seconds and see the effect it produced on the CRT. I could freely experiment with the number of



TRS-80 pattern plot for the "Atchley" array.[1] This is a triangular arrangement of vertical elements spaced 0.288 λ and phased as indicated in the inset. *(All computer-screen photos courtesy of Jerry Hall, K1TD)*

*8466 Abilene Ter., La Mesa, CA 92041

[1]Notes appear on page 19.

elements, spacing, boom length, phasing, transmission-line effects, polarization, stacking effects, collinear effects, and effects of nonstandard complex array configurations.

I developed two versions of the program, one for 4 K Level II systems, which allowed synthesis of 10-element arrays, and another, more complete, version that requires at least 16 K. That version permits synthesis of up to 128-element arrays and provides greater ease in modifying the array model and more options. The 4 K program, written in BASIC language, is presented in Table 1. Because of page-space limitations, the larger, more flexible 16 K program cannot be presented here. Information is available from the author, however.

Running the Program

The program of Table 1 is based on the phase-vector summation of ideal half-wave dipoles as seen from a great distance. The factors that affect real antennas are very complex but this program allows you to see a good representation of the approximate field pattern that you would see from a real antenna. You can experiment with various combinations of elements — changing the number, the position, the spacing, the excitation level and the phase of the elements.

I hope you will gain insight into what is at play in antenna arrays from your use of these programs and, additionally, that you will enjoy the fascination of seeing displayed before you the unique field pattern of a whimsically conceived array. You can play with a simulation of your nearby 50 kW radio station towers, try an interferometer cross array for radio astronomy, or you can consider trade-offs in how you should stack your Long Johns for satellite tracking.

The half-wave dipole plays a very important role in most antenna designs. The

Table 1

Listing for the KE6H Polar Plot Modeling Program

```
 10 CLS:PRINT" KE6H POLAR PLOT MODELING PROGRAM 4K": PRINT
 15 INPUT"POLARIZATION = V OR H";P$: IFP$="V"ORP$="H"THEN2ØELSEGOTO15
 20 INPUT"% FULL SCALE OF REF ELEMENT = ";A1:A1=A1*.4:N=1:GOTO9Ø
 25 PRINT
 30 N=N+1:PRINT"ELEMENT NO = ";N:N2=N
 4Ø INPUT"% FULL SCALE";A(N,1):B(N,1)=A(N,1)*.4
 50 INPUT"SPACING IN WAVELENGTHS";A(N,2):B(N,2)=A(N,2)*6.28319
 60 INPUT"ANGLE TO ELEM FROM REF (DEGREES)";A(N,3):B(N,3)=A(N,3)*.Ø174533
 70 INPUT"PHASE DELAY (WAVELENGTHS)";A(N,4):A(N,4)=A(N,4):B(N,4)=A(N,4)*6.28319
 90 INPUT"MORE ELEMENTS (Y OR N)";T$
100 IFT$="Y"THEN25
105 IFT$="N"THEN14Ø
110 PRINT"TRY AGAIN":GOTO9Ø
140 INPUT"VERIFY DATA (Y OR N)";T$
145 N=2
150 IFT$="Y"THENGOSUB5Ø5:GOTO165
160 IFT$="N"THEN165ELSEPRINT"TRY AGAIN":GOTO14Ø
165 CLS
200 FORI=1TO2:FORO=ØTO11:W=O*3Ø
210 X=(4Ø/I)*COS(W*.Ø174533)+62
220 Y=(-2Ø/I)*SIN(W*.Ø174533)+24
230 SET(X,Y):NEXTO:NEXTI
260 PRINT@517," 180 ";:PRINT@564," Ø ";
265 PRINT@99Ø,"270";:PRINT@30,"90";
270 PRINT@Ø,"KE6H POLAR PLOT";
300 FORQ=1TO108:Z=Q*.0581777:GS=0:G2=A1:G3=Ø
305 FORN=2TON2
310 G1=B(N,2)*COS(B(N,3)-Z)-B(N,4):IFP$="H"THEN34Ø
320 G2=G2+B(N,1)*COS(G1):G3=G3+B(N,1)*SIN(G1)
330 NEXTN:GT=(G2↑2+G3↑2)↑.5:GOTO37Ø
340 G2=B(N,1)*SIN(Z):G3=G2*COS(G1)
350 GS=GS+G3:NEXTN:GT=ABS(GS+A1*SIN(Z))
370 X=GT*COS(Z)+62:Y=.5*(-GT)*SIN(Z)+24
380 PRINT@40,"";:PRINTUSING"######.#";Q*3.33333;GT*2.5;
385 IFY<2ORY>46THEN4ØØ
390 IFX<2ORX>126THEN4ØØ
395 SET(X,Y)
400 NEXTQ
405 PRINT@4Ø,"";:INPUT"VERIFY DATA (Y OR N)";T$
410 IFT$="Y"THENGOSUB5ØØ
420 RUN
500 N=2
505 CLS:PRINT"A1 = ";A1*2.5;"% FULL SCALE"
510 GOSUB7ØØ:PRINT"A";N$" = ";A(N,1);"% FULL SCALE"
520 PRINT"S";N$;" = ";A(N,2);"WAVELENGTH OR ";B(N,2);"RADIANS"
530 PRINT"P";N$;" = ";A(N,3);"DEGREES OR ";B(N,3);"RADIANS"
540 PRINT"D";N$;" = ";A(N,4);"WAVELENGTH OR ";B(N,4);"RADIANS"
560 GOSUB6ØØ
562 INPUT"CONTINUE (Y OR N)";T$
565 IFT$="Y"THEN57Ø
567 RETURN
570 N=N+1:IFN>N2THENRETURNELSECLS:GOTO51Ø
600 PRINT"WHERE":PRINT"A = SCALE":PRINT"S = SPACING"
610 PRINT"P = ANGLE TO ELEM FROM REF":PRINT"D=DELAY"
620 RETURN
700 N$=STR$(N):IFLEN(N$)=2THENN$=RIGHT$(N$,1)ELSEN$=RIGHT$(N$,2)
710 RETURN
```

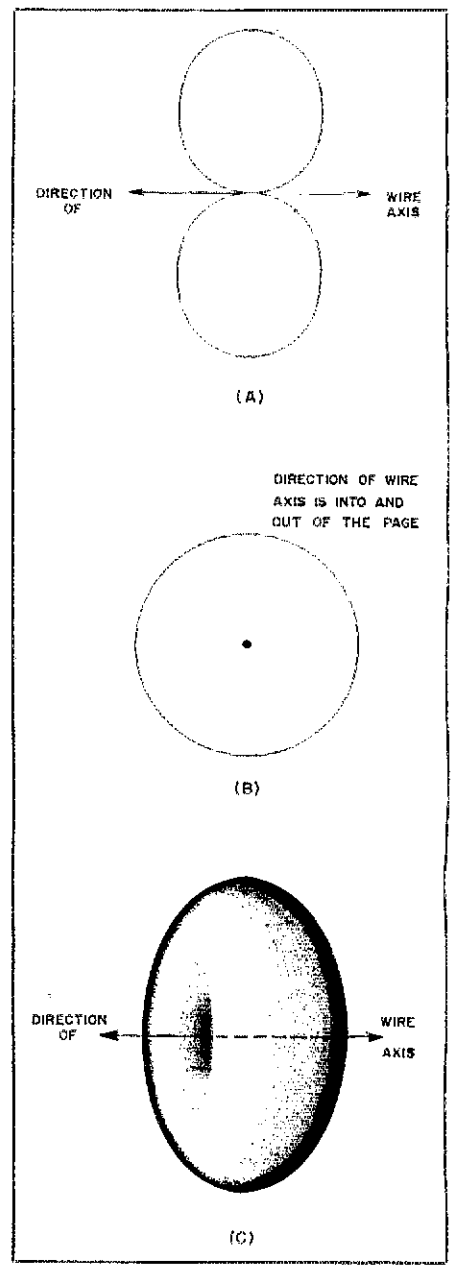


Fig. 1 — Radiation patterns for a dipole antenna. At A is the horizontal case, from a broadside view of the conductor. Visualize a horizontal slice removed from the center of the solid or three-dimensional pattern at C. At B is the vertical case, as if a vertical slice were removed from the center of the solid pattern at C.

dipole radiates a field such that if all points of equal intensity were graphed you would see a shape similar to a doughnut surrounding the dipole. See Fig. 1. The following exercises will allow you to see vertical and horizontal slices of this doughnut-shaped field. Later you will see vertical and horizontal slices of the field patterns of some of the elementary combinations of dipoles, to give you a base from which to expand your experimentation.

When you run the program of Table 1, the display should read KE6H POLAR PLOT MODELING PROGRAM 4K on the top line and then POLARIZATION = V OR H? With this program, type the data on the keyboard and then press the ENTER key, so the computer will act on the entry. Be sure to key data in carefully, as some machines are subject to key bounce.

Vertical Dipole

For our first exercise let's examine the pattern of a vertical dipole. Enter the information shown in small capital letters below in response to questions from the computer.

POLARIZATION (V OR H)?	V (vertical)
FULL SCALE OF REF ELEMENT = ?	100 (for % base current)
MORE ELEMENTS (Y OR N)?	N (for no more elements)
VERIFY DATA (Y OR N)?	N (no desire to double check)

The computer will then display two concentric rings of dots, spaced 30 degrees around the circles. These circles represent 50% and 100% of full scale. Major angles are displayed in conventional polar-coordinate form, with 0 degrees at the right side of your screen and increasing values in a counterclockwise direction.

Your computer will then proceed to calculate field intensities at 3.3° intervals around your hypothetical dipole. The dipole is not visible, but is theoretically located at the center of your screen, as if you were looking down at the vertical antenna on your roof from many miles up. What you see in the plot are points of equal field intensity about a vertical dipole, e.g., the slice normal to the wire. See Fig. 1B. The pattern is circular.[3] As the computer is plotting the values, they are also displayed in the upper-right corner of the screen — the angle in degrees and the percent of full scale. When the plot is completed, VERIFY DATA (Y OR N)? will appear in this area. Entering Y will display the parameters you entered on the keyboard, and entering N will clear the computer for a new pattern.

Horizontal Dipole

Now let's take a look at the field about a horizontal dipole.

POLARIZATION (V OR H)?	H (horizontal)
FULL SCALE OF REF ELEMENT = ?	100
MORE ELEMENTS (Y OR N)?	N
VERIFY DATA (Y OR N)?	N

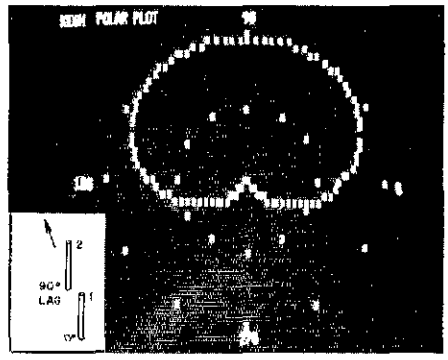


Fig. 2 — The cardioid pattern for a pair of vertical elements spaced 0.25 λ and phased as indicated in the inset.

Again the concentric circles and major angles appear. And you are now observing the field pattern around a horizontally polarized dipole at the center of your screen. It's as if you were looking down on it from many miles up, or like standing a doughnut on its edge, slicing it in half and looking down at the cross section. See Fig. 1A and the photo directly below.

Two-Element Vertical

The first requirement of a communications antenna is to capture and radiate energy, but an often equally important feature is to be able to null out unwanted signals that are on the frequency during reception. The dipole and many other antennas have deep null points that can be used by aiming them at the unwanted station — provided it is at a different angle from you than the desired station. The signal strength of the desired station may fall off somewhat but we hope not nearly as much as the undesired station. Now let's try two elements. See Fig. 2.

POLARIZATION (V OR H)?	V
FULL SCALE OF REF ELEMENT = ?	50 (for % base current for element 1)

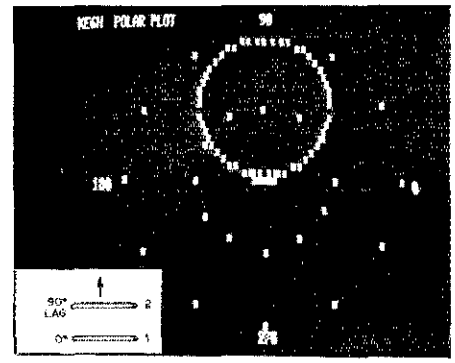


Fig. 3 — Horizontal pattern for a pair of dipoles spaced 0.25 λ and phased as shown in the inset.

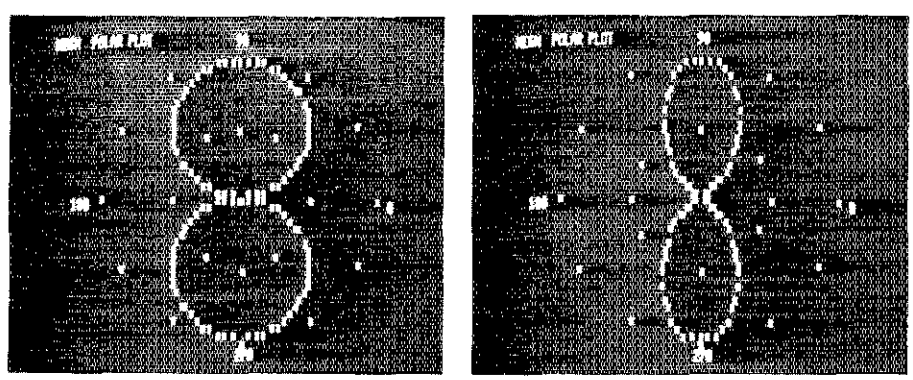
MORE ELEMENTS (Y OR N)?	Y

And for element no. 2:

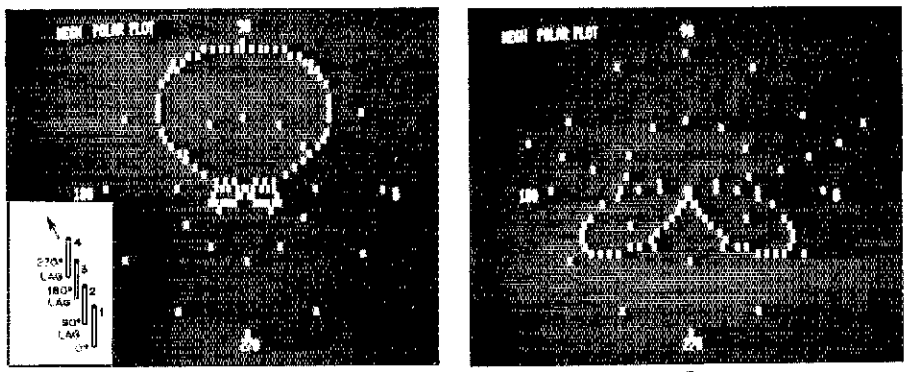
% FULL SCALE?	50 (% base current for element 2)
SPACING IN WAVELENGTHS?	.25 (for 1/4 λ)
ANGLE TO ELEM FROM REF (DEGREES)?	90 (position of elem 2 relative to elem. 1)
PHASE DELAY (WAVELENGTHS)?	.25 (for 90° phase lag at elem. 2)
MORE ELEMENTS (Y OR N)?	N
VERIFY DATA (Y OR NO)?	N

This configuration produces a pattern with a large single lobe and a deep null 180° from the main lobe. This is called a cardioid pattern. The display you should have is pictured in Fig. 2.

I suggest you try playing a little at this point with various spacing and phasing arrangements. Note that this program uses a positive number to indicate a phase lag in the drive to element 2, referenced to element 1. For a phase lead, enter a negative value into the computer. You will have to start afresh each time and reenter all parameters as you have just done. Sketch the pattern you get from each case and



The TRS-80 representation of the pattern of a horizontal dipole, left, and the bobtail curtain, right. (The bobtail curtain is described on page 300 of *The ARRL Antenna Book, 13th Edition.*) In plotting the bobtail curtain pattern, it was assumed the current in the center element was twice that in each end element. Numerous other current distributions can be simulated with ease.



(A) (B)

Fig. 4 — At A, the pattern of the vertical end-fire array shown in the inset. Adjacent elements are spaced 1/4 λ apart. By entering larger "full-scale" values for the elements, the magnified pattern at B results, giving better definition of the minor lobes.

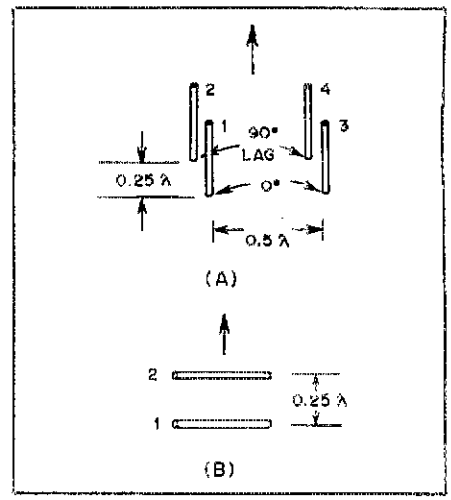


Fig. 5 — A 4-element broadside stacked array. At A is the configuration for the vertical case. At B, for the horizontal case, element 3 is hidden by element 1 and element 4 is hidden by element 2.

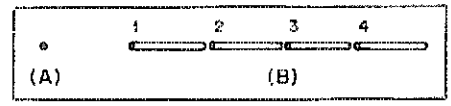


Fig. 6 — The vertical representation of four collinear vertical dipoles is shown at A. The pattern plot is the same as for a single vertical dipole — omnidirectional. The plot for the horizontal case at B, however, will show the "doughnut" of Fig. 1 is considerably flattened, and four minor lobes appear.

write the parameters next to each sketch. You may be exploring what to you are unknown waters. You are at the helm for this voyage, and what you learn is limited primarily by your desire to explore.

After you explore the 2-element driven phased array for a while you will probably come to the following generalities: (1) Increasing the phase up to 1/2 λ (180°) has the effect of squeezing out the forward lobe and increasing the size of the aft lobe, and (2) increasing the spacing has the general effect of increasing the number and size of the secondary lobes.[4]

Horizontal Patterns

The horizontal patterns of your 2-element arrays can be seen by selecting H instead of V and otherwise using all the same parameters. Note that the reference element, number 1, has been arbitrarily fixed in the horizontal mode in the 0-180° direction. If you want to place the next element in front of the reference element, it should be positioned at 90°. See Fig. 3, which shows the horizontal pattern when element 2 is spaced 0.25 λ and delayed 90° from element 1.

The pattern pictured in Fig. 3 may actually be considered as representing either of two antenna systems. First, if the two elements are vertical half-wave dipoles, this is a free-space pattern. To best understand the presentation for such an array, visualize that the screen is rotated 90° clockwise, so the major lobe goes to the right. For 1/4 λ vertical elements mounted on the ground or over a counterpoise, the pattern would be represented by the upper half only of the display on the screen (after 90° rotation).

Second, the display also represents the azimuthal pattern of a pair of horizontally polarized dipoles in a horizontal plane. It's as if the dipoles were parallel to the ground, no. 2 in front of no. 1, and you were viewing them from many miles up. These field patterns that you are seeing are not perfect, but will give you a good feeling for what happens for various arrangements and combinations of dipoles.

I hope you have now become aware of the basic entry schemes, so for simplicity all further parameter changes will be given in tabular format.

End-Fire Array

Try this end-fire array (vertical polarization), shown in Fig. 4.

Elem.	*%*	*Spacing*	*Pos. Angle*	*Phase*
1	25	—	—	—
2	25	.25	90	.25
3	25	.5	90	.5
4	25	.75	90	.75

Notice that the phase delay is set to equal the spacing for the end-fire array. The pattern you should see for this array is pictured in Fig. 4A. You'll note that there are minor lobes at the rear of the array, but because of the lack of fine resolution in the display, their exact shape is not easy to discern. You can expand or magnify the pattern easily. Just enter a larger percentage for the "full-scale" values without changing any other information. Enter the information as above, but now use 80% instead of 25% of full scale for each element. The resulting pattern, Fig. 4B, is enlarged 3.2 times and behold, you have the resolution you wanted in the minor lobes. The off-scale values simply are not plotted, even though they are calculated and displayed during execution of the program. To examine the minor lobes of various arrays you can use different full-scale percentage values to give the degree of magnification you desire.

Broadside Stacked Array

All the elements of the array do not have to lie in the same plane. The program will handle stacked arrays with the same ease. To illustrate this point, plot the pattern for the broadside stacked array of Fig. 5A (vertical polarization).

Elem.	*%*	*Spacing*	*Pos. Angle*	*Phase*
1	25	—	—	—
2	25	.25	90	.25
3	25	.5	0	0
4	25	.559	26.565	.25

In this array the spacing between elements 1 and 2 is 0.25 wavelength, as is the spacing between elements 3 and 4. We are stacking them 0.5 wavelength apart and feeding them in phase with each other. We can determine the spacing and position of elements 2 and 3 easily, but element 4 must be found by using a calculator:

$$S = \sqrt{X^2 + Y^2} = \sqrt{0.5^2 + 0.25^2}$$
$$= 0.559 \text{ wavelength}$$

$$P = \arctan (X/Y) = \arctan (0.25/0.5)$$
$$= 26.565°$$

where

S is the spacing in wavelengths

P is the position angle in degrees

This antenna yields a pair of cardioid patterns added together or summed. The horizontal equivalent for this antenna can be entered as follows (horizontal polarization). See Fig. 5B.

Elem.	*%*	*Spacing*	*Pos. Angle*	*Phase*
1	25	—	—	—
2	25	.25	90	.25
3	25	0	0	0
4	25	.25	90	.25

Notice that in the horizontal case, elements 3 and 4 superimpose and appear to be at the same location as elements 1

and 2 when looking down on the array. This is portrayed in Fig. 5B.

Collinear Stacked Array

The vertical collinear array of Fig. 6A is simply a vertical stacking of vertical dipoles end on end and all fed in phase. As in the case above, all the elements superimpose and appear to be at the same location. In this case the field geometry would appear to be the same as that of a single dipole, but the horizontal case (Fig. 6B) will show that the doughnut has been flattened considerably.

Elem.	*%*	*Spacing*	*Pos. Angle*	*Phase*
1	25	—	—	—
2	25	.5	0	0
3	25	1	0	0
4	25	1.5	0	0

Parasitic Arrays

Yagi antennas are similar to driven endfire arrays in that the moving wavefronts must reinforce each other in the forward direction. In the driven case this can be accomplished by delaying the drive to the elements by the same amount as the spatial delay. In the case of the Yagi, however, you have no transmission line that you can adjust. Instead, the wavefront strikes and excites each parasitic element. The phase of the reradiated energy depends on the tuning of the parasitic element; if it is tuned to the excitation frequency, the radiation is in phase with the excitation wave. The energy is delayed if the parasitic element is tuned below the excitation frequency, and advanced if tuned above. [If there are more than two elements in the parasitic array, the situation is complicated by interaction. Radiation from other parasitic elements combines with that from the driven element, and the resultant provides overall excitation for a given parasitic element. — Ed.] It was not possible to make provisions for treating parasitic arrays in the 4 K program, but provisions are included in the 16 K version mentioned earlier.

You should now be able to construct any configuration of driven dipoles on your TRS-80-II in either vertical or horizontal polarization and see the resultant field pattern on your screen. This places you in a unique position, as you now have the means for true exploration in an area that has previously been enjoyed by only a select group of antenna specialists. Consider trying to duplicate all the possible plots with real antennas on your roof or in your backyard. In the next few hours you may very well try out an entire antenna farm by computer simulation.

If you want to build and test a real antenna from your computer model you will need to know something about transmission lines, wavelength conversion, impedance matching and construction techniques. I would recommend *The Radio Amateur's Handbook* or *The ARRL Antenna Book* as references.

Notes

[1]Atchley, "Updating Phased-Array Technology," *QST*, August 1978. See Fig. 3, p. 24.
The author offers recordings of both the 4 K and the 16 K program versions, along with a "short course" explaining use of the programs. To help cover costs for materials, handling and shipping, send $6 for both programs on cassette tape, $10 for both programs on mini-disc, and $5 for the short course if you live in the U.S. [The ARRL and *QST* in no way warrant this offer. — Ed.]

[2]If the pattern is an ellipse rather than a circle, you can correct this situation either in hardware or in software. Size adjustments may be touched up in the monitor, and it may also be necessary to adjust sweep linearity. For software adjustment, modify the following statement numbers as necessary: 210 and 220, to modify the value of I; 260 and 265, to modify the PRINT@ positions; and 370, to modify the values of either or both X and Y.

[3]Editor's Note: A direct comparison of the *sizes* of different patterns cannot be used for determining the gain of one antenna system over another, even though both patterns were derived by using the same base-current values. Through mutual coupling, current flowing in one element will induce a current (and therefore a voltage) in the other element, and vice versa, affecting the total radiation from a given element. Although the program does not take this factor into account, the *shapes* of the patterns are reliable. The gain, however, is related to directivity; i.e., an antenna with a very broad major lobe will have less gain than one with a thin or narrow major lobe.]

Combined Vertical Directivity

You need a low radiation angle for DX and a high angle for short skip. Most of us shoot for maximum antenna height and hope for good results, but you may have more control over the angle than you think!

By W. B. Bachelor,* AC3K

The angle of radiation in the vertical or elevation plane from an antenna is of extreme importance in hf radio communications because it profoundly affects the signal strength at various skip distances. Height above ground is the dominant influence on the radiation angle from a horizontal antenna. The height of most amateur installations is severely limited, but the general rule has always been "the higher the better." This article shows how to calculate the vertical radiation patterns for antennas at various heights. A mathematical derivation of the method is included for completeness, but the resulting patterns should interest anyone who must operate with a height-restricted antenna.

Setting it Up

The ARRL Antenna Book shows the combined vertical plane radiation patterns for two antenna situations and states that the actual patterns in the presence of ground may be found for other cases by multiplying the free-space pattern by the given ground reflection factors.[1] If the free-space radiation patterns can be expressed mathematically, the vector summation of the direct and reflected rays can be readily calculated.

The free-space patterns are assumed to be of the form

$$p = k \cos^{\lambda} \theta \qquad \text{(Eq. 1)}$$

where p is the field-strength magnitude, θ

*P. O. Box 10393, Oxon Hill, MD 20021

[1]*The ARRL Antenna Book*, thirteenth edition, pp. 55, 144 ($5 postpaid from ARRL).

BASIC Programs for Calculating Vertical Radiation Patterns

Although the author's radiation patterns were of very high quality, they weren't in a format suitable for direct reproduction. To obtain smooth, accurate curves required plotting field-strength values in one-degree increments — a task not relished by the editor and his modest TI-30 calculator. A TRS-80 microcomputer system came to the rescue in producing the graphs in this article. While not nearly as sophisticated or flexible as May's program elsewhere in this issue, the short special-purpose routines listed here served their intended function very well. If the listings appear somewhat inefficient, it's because the information had to fit on the narrow surplus TTY paper that was in the line printer. Computer enthusiasts can easily modify the programs to accommodate antennas and heights not treated in the article, or simply to optimize paper usage.

```
10 CLS:LPRINT"FREE-SPACE VERTICAL
 RADIATION PATTERNS"
20 LPRINT" "
30 LPRINT" "
40 LPRINT" "
50 LPRINT"ELEVATION ANGLE,   COS↑0.5",
 "COS","COS↑1.5","COS↑2","COS↑3",
 "COS↑5"
52 LPRINT"   DEGREES"
54 LPRINT" "
56 LPRINT" "
60 FORA = 0TO89:Z = COS(A*.0174533)
70 B = Z↑.5:C = Z↑1.5:D = Z↑2:E = Z↑3:F = Z↑5
80 LPRINTA,B,Z,C,D,E,F:NEXTA
```

```
10 CLS:LPRINT"VERTICAL RADIATION
 PATTERNS FOR ANTENNAS HAVING"
13 LPRINT"VERTICAL DIRECTIVITY OVER A
 PERFECT REFLECTOR"
14 LPRINT" "
16 FORL = .25TO.75STEP.125
18 LPRINT"ANTENNA HEIGHT ABOVE
 REFLECTOR:_"L" WAVELENGTH"
20 LPRINT " "
22 LPRINT" "
24 LPRINT" "
30 LPRINT" "," ","FREE-SPACE
 DIRECTIVITY FACTOR"
40 LPRINT" "
50 LPRINT"ELEVATION ANGLE,   COS↑0.5",
 "COS","COS↑1.5","COS↑2","COS↑3",
 "COS↑5"
55 LPRINT"   DEGREES"
57 LPRINT" "
60 FORA = 0TO89:Z = COS(A*.0174533):
 M = SIN(A*.0174533)
80 B = Z↑.5C = Z↑1.5:D = Z↑2:E = Z↑3:F = Z↑5
90 G = ABS(COS((3.14159)*(.5 – (2*L*M))))
100 K = B*G:N = Z*G:O = C*G:P = D*G:Q = E*G:
 R = F*G
110LPRINTA,K,N,O,P,Q,R:NEXTA
120 LPRINT" "
122 LPRINT" "
124 LPRINT" "
126 LPRINT" "
130 LPRINT"VERTICAL RADIATION PATTERN
 FOR ANTENNA HAVING NO FREE-SPACE
 VERTICAL DIRECTIVITY"
135 LPRINT" "
140 LPRINT"ELEVATION ANGLE,"," ",
 "NORMALIZED FIELD STRENGTH"
142 LPRINT"   DEGREES"
144 LPRINT" "
150 FORA = 0TO89:M = SIN(A*.0174533):
 G = ABS(COS((3.14159)*(.5 – (2*L*M))))
160 LPRINTA," ","  ",G:NEXTA
162 LPRINT" "
164 LPRINT" "
166 LPRINT" "
170 LPRINT" ":NEXTL
```

— George Woodward, W1RN

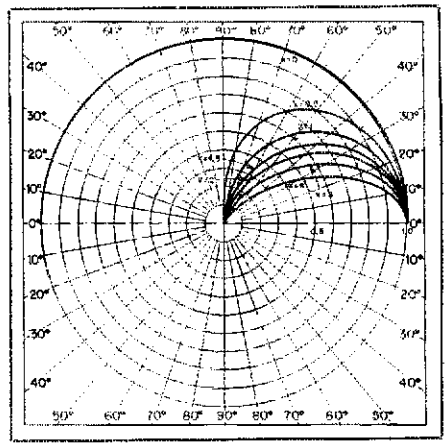


Fig. 1 — Free-space vertical radiation patterns for antennas having various degrees of vertical directivity. These curves are generated by the equation $p = \cos^x \theta$. Only one quadrant is plotted because the graphs are symmetric about the horizontal axis. An antenna with no free-space directivity has a pattern that coincides with the outer edge of the graph.

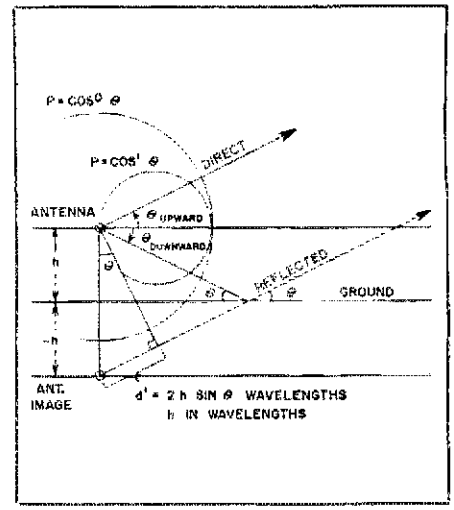


Fig. 2 — This drawing shows how the ground-reflected ray is delayed with respect to the direct wave.

is an angle with respect to the horizontal, x is an assigned exponent corresponding to the vertical directivity, and k is a constant coefficient related to the gain owing to beam formation. The patterns are horizontally directed and are symmetrical about the horizontal axis in both magnitude and phase.

Six $\cos^x \theta$ free-space vertical radiation patterns are graphed in Fig. 1. The antenna is at the origin, or pole, of the coordinate system, radiating at zero degrees to the right. When $x = 0$, the pattern is a circle centered at the antenna. A dipole exhibits this type of pattern. As x increases, the pattern narrows. These patterns are significant for illustrating the effect of free-space vertical directivity on the combined (direct and reflected) radiation pattern. The gain coefficient, k, has been set to one for each case to normalize the patterns to full-scale on the graph. This procedure ensures clarity by preventing the plots from intersecting. The maximum signals of real antennas, however, would be increased by the gain realized as the beamwidth is decreased.

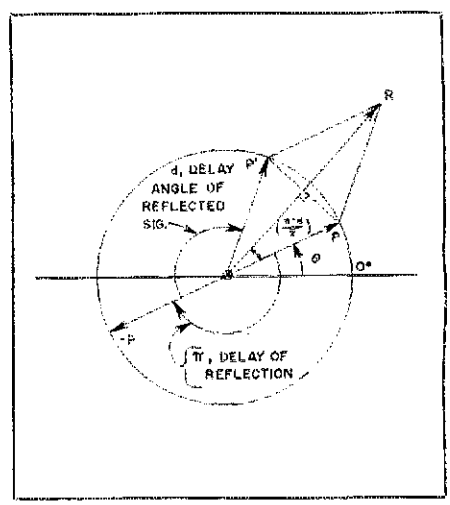


Fig. 3 — The magnitude of the radiated signal at some distant point is the vector sum of the direct and reflected waves. The mathematics are developed in the text.

Ground Reflections

Fig. 2, depicting the delay, d, of reflected signals is a detailed version of Fig. 2-21 in *The ARRL Antenna Book*. The reflected ray travels farther than the direct ray by the distance d'. θ is the radiation angle under consideration. If the antenna height, h, is expressed in wavelengths above ground (and below ground for the image antenna), by geometry, the angles marked θ are equal, and $\sin \theta = d'/2h$, or

$d' = 2h \sin \theta$ in wavelengths, or (Eq. 2)

$d = 4\pi h \sin \theta$ in radians (Eq. 3)

The quantity d, therefore represents the angle of delay in radians.

Fig. 3 is a diagram of the vector addition of the direct and reflected rays. The phases of each pair of plus and minus θ-angle signals are equal in this symmetrical pattern. However, the reflected wave suffers two additional delays: d, resulting from its extra travel distance, and 180° or π radians caused by the reflection.

In Fig. 3 a direct ray is labeled p, and its opposite, which is delayed π radians is labeled $-p$. The space delay angle d added to reflection reversal fixes the phase of the reflected signal p' with respect to the direct ray. Since lossless reflection is

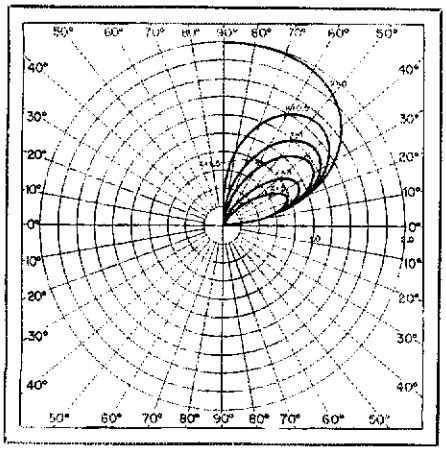


Fig. 4 — Vertical radiation patterns of antennas having various degrees of directivity installed 1/4 wavelength above perfect ground. These patterns have been scaled so as not to overlap. In reality, an antenna having a free-space directivity factor of $\cos^5 \theta$ would show considerable gain over one having no directivity (x = 0). Full scale on the relative amplitude (radial) axis is normalized to 2.0 to emphasize the doubling of the maximum field strength when the ground reflections combine with the direct rays.

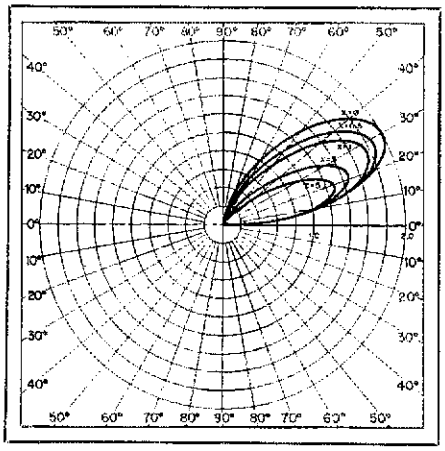


Fig. 6 — Radiation patterns for antennas 1/2 wavelength above ground. The low angles and lack of secondary lobes make this height desirable for DXing.

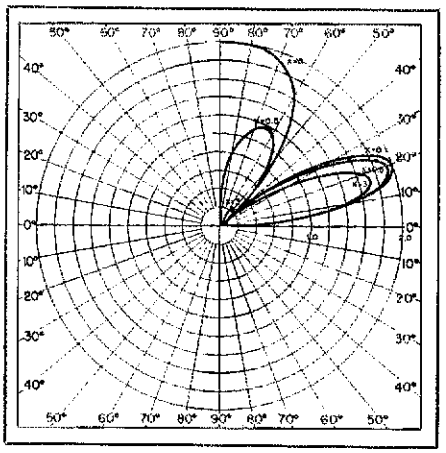


Fig. 8 — At 3/4 wavelength, the high-angle lobes are a nuisance to the DXer, who is likely to use an array having at least modest directivity. However, if one's operation is a casual combination of DXing and short skip, a dipole at this height might be the ideal antenna.

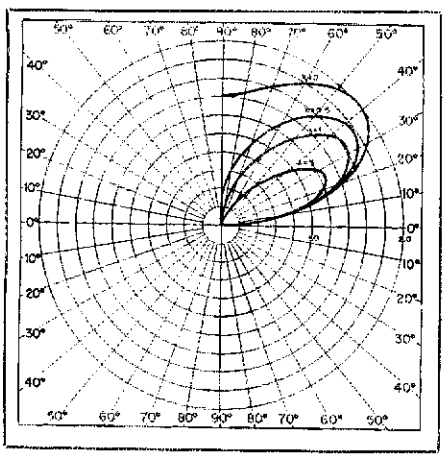


Fig. 5 — Some patterns for an installation height of 3/8 wavelength. Note that the dipole pattern (x = 0) no longer fires straight up, and all of the major lobes peak at lower angles than when installed at 1/4 wavelength.

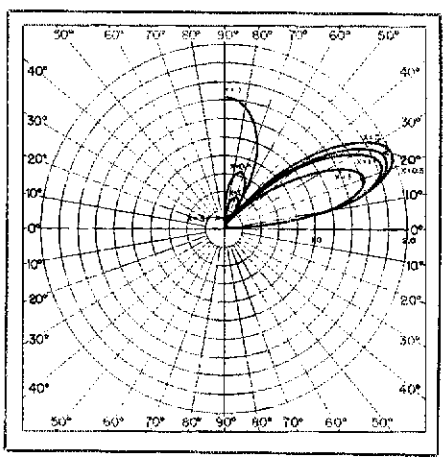


Fig. 7 — Raising the antenna to 5/8 wavelength further lowers the first lobe, but introduces a minor high-angle lobe. This secondary lobe is much less significant for a highly directive array than for a dipole.

assumed, the magnitudes of p' and p are equal, and the diagonal, R, of the parallelogram is the vector sum of p and p'. The magnitude of R may be calculated by drawing the other diagonal, forming four right triangles, and noting that

$$\cos \frac{\pi - d}{2} = \frac{R}{2p} \text{ or}$$

$$R = 2p \cos \left(\frac{\pi}{2} - \frac{d}{2}\right) \qquad \text{(Eq. 4)}$$

Substituting Eq. 3 into Eq. 4 gives

$$R = 2p \cos \pi \left(\frac{1}{2} - 2h \sin \theta\right) \qquad \text{(Eq. 5)}$$

Substituting Eq. 1 into Eq. 5, and setting k = 1 gives

$$R = 2 \cos^x \theta \left[\cos \pi \left(\frac{1}{2} - 2h \sin \theta\right)\right] \qquad \text{(Eq. 6)}$$

R, the magnitude of the combined direct and reflected signals at large distances from the antenna, is computed by assigning values for the antenna height h and the exponent x of the free-space directivity equation, then for these two conditions introducing values of θ starting at zero and solving for the corresponding values of R. An inexpensive trigonometric calculator will solve Eq. 6, but the author used a programmable TI-59 to plot his original graphs.

Calculated Patterns

Figs. 4 through 8 show the calculated plots of the vertical radiation patterns of Fig. 1 combined with their lossless reflections. The effect of imperfect ground is to broaden the lobes and fill in the nulls. Antenna heights range from 1/4 to 3/4 wavelength.

These plots show that as the free-space vertical beamwidth decreases (exponent x becomes larger) the maximum radiation occurs at lower angles. At the lower heights a little directivity produces a considerable lowering of the combined patterns. For example, with a height of 1/2 wavelength (Fig. 6) the maximum radiation would occur at about 30° for an antenna having a circular free-space pattern such as a dipole (p = 1), and approximately 23° for one having a p = $\cos^{2.4} \theta$ pattern. The 2.4 exponent value can be located in Fig. 6 by interpolating between the x = 1 and x = 3 curves. Such a pattern closely resembles that of a 2-element end-fire array in Fig. 4-23 of *The ARRL Antenna Book*. If this antenna were to radiate the same total power as would be radiated by the circular pattern (p = 1), then the combined radiation pattern would show not only lower angles, but also higher magnitudes. This results because the combined beamwidth decreases with vertical free-space beamwidth; thus, in a constant-power situation, gain shows in the major lobe.

It appears that, to some extent, antenna height can be traded for vertical directivity. At greater heights the effect is less pronounced. For example, at 3/4 wavelength the vertical pattern used above (p = $\cos^{2.4} \theta$) would lower the maximum radiation from 19.5° only to 17.4°.

Vertical Array Analysis

You can determine the radiation pattern of an experimental phased array before building it. A computer helps, but you can get the same results with a ruler and protractor.

By Walter J. Schulz, Jr.,* K3OQF

Many articles on vertical antenna array construction have appeared in the Amateur Radio literature. However, little information has been published on the formation and analysis of the radiation patterns for such arrays. The simple vector methods presented in this article will enable anyone to graphically construct radiation patterns using only a compass rose and a ruler. For faster, more precise plotting, an HP-33E calculator program is given in the appendix. A short BASIC computer program, listed in the sidebar, will generate a printout from which a pattern can be graphed.

Vector Foundations

The fundamental assumption used in evaluating radiation patterns is that a single vertical antenna element is an isotropic, or point source. When looking down on the element, this assumption is sufficiently valid for amateur purposes — a single vertical element produces an omnidirectional pattern in the horizontal or azimuthal plane. The field intensity in any direction from an antenna element can be represented by a vector.

Two systems of vector notation are illustrated in Fig. 1. In part A, the vector is identified by its rectangular coordinates or components (x, y), which are the lengths of the vector projections on the coordinate axes. Defining ϕ as the angle the vector makes with the positive y axis, and R as the length (magnitude), the x and y coordinates can also be expressed as Rsin ϕ and Rcosϕ, respectively. By the Pythagorean Theorum,

$$R = \sqrt{x^2 + y^2} = \sqrt{\sin^2\phi + \cos^2\phi}.$$

The vector is identified by its polar form

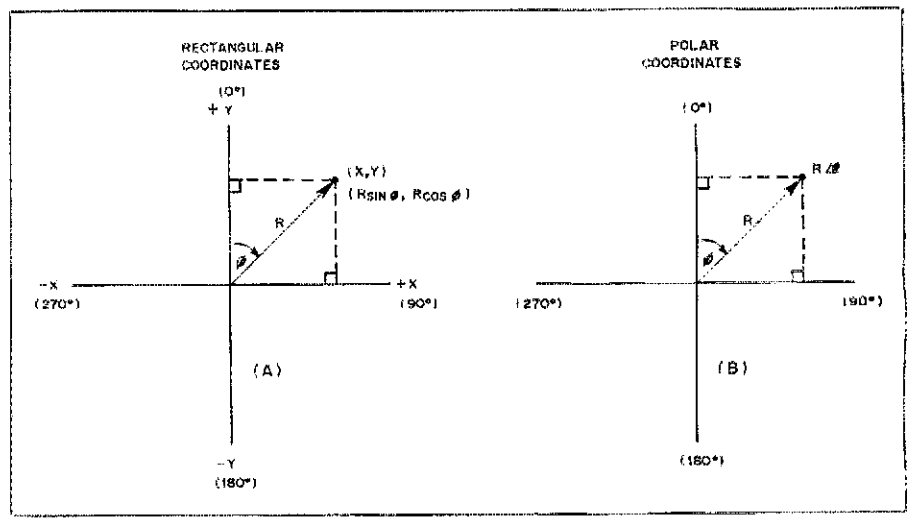


Fig. 1 — Two methods for identifying a vector. The rectangular or Cartesian coordinate system is given in A, and polar notation is illustrated in B.

R $\angle\phi$ in Fig. 1B. Note that ϕ is measured clockwise from the positive y axis. If the positive y axis points north, the angle ϕ corresponds to an azimuthal bearing on a compass. A more typical mathematical convention defines ϕ as the angle the vector makes with the positive x axis measured counterclockwise.

Forming the Pattern

When two or more vertical elements, each having an omnidirectional azimuthal pattern, are arranged in some physical pattern and excited from a common source, the combined radiation pattern shows some directivity. The lobes and nulls are a result of wave reinforcement in some directions and cancellation in others. The radiation pattern is directly dependent on the time delay caused by the physical separation between the elements. Further control can be exercised by delaying the electrical excitation of one element with respect to another. This phase delay can be introduced by means of a transmission line or a lumped-constant network.

To determine the directional characteristics of an array, construct a coordinate system and locate the element that leads in phase (is excited first or has no delay) at the origin. This is the reference element from which all distances and delays are measured. The other elements (represented as point sources) are then located in their physical configuration using any convenient scale. Staying within the first (upper right) quadrant and placing elements on the coordinate axes where possible will simplify the calculations.

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At any specific compass heading, each element will contribute a vector to the array pattern given by

$$E = S\cos(\theta - \phi) + \psi,$$

where

- S = spacing in degrees from reference element
- θ = azimuth angle (compass heading) in degrees
- ϕ = angular position of element with respect to positive y axis
- ψ = excitation phase with respect to reference element.[1*]

The reference element is assigned a field strength of unity, and, from the definition just given, an angular component of zero. The array vector magnitude (field strength) corresponding to a particular heading is found by summing the individual element vectors. To do this graphically, draw a set of coordinate axes and assign zero degrees to the positive y axis. Starting at the origin, draw a vector having length one (any convenient linear measurement unit) coincident with the positive y axis. At the tip of this reference vector establish a new set of coordinate axes. Using a compass rose (or protractor) and a ruler, start the vector for the next element at the new origin (head of the reference vector). Measure positive angles clockwise from the y (or new vertical) axis and negative angles counterclockwise. In the same way, construct each element vector in succession. It doesn't matter in which order you draw the vectors, but some orders may be more convenient than others.

To find the array field strength draw a vector from the tail of the reference vector to the head of the final vector and measure its length. This length is the field strength at a particular value of θ (azimuth heading); to graph the complete radiation pattern repeat the process for several values of θ, plot the points on polar paper and connect them. The process can be quite tedious if fine resolution is required.

A trigonometric table or slide rule can be used to obtain the cosine values, or they can be punched up on a modest calculator such as the TI-30. If you use the calculator, you can avoid most of the pencil work except plotting the actual pattern. Here's how: First, find the value of the angular component of the vector, take its sine and multiply by the magnitude. This is the x component of the vector. Repeat this process using the cosine function to find the y component. Find the rectangular components of each vector [don't forget the reference element — its components are (0,1)]. Total the x values and square the result. Do the same for the y values. Now add the two squares and take the square root of the sum to get the relative field strength of the array for that azimuth value. It's a fair amount of punching, but it's faster than drawing vectors.

A more sophisticated calculator can speed up the process considerably — see the simple program at the end of this article. The author has also published a more comprehensive program.[2]

Some Examples

To illustrate the technique, let's apply it to four antenna systems commonly used by radio amateurs. We'll begin with the classic two-element broadside and endfire arrays and progress to some more exotic multielement designs. The elements in these arrays are excited with equal power, so the magnitude components of the individual field-strength vectors can be normalized to unity. Keep in mind that this isn't always the case — the bobtail curtain is an example of an array having unequal power distribution.[3] Our calculations require the element spacing to be expressed in degrees. Construction articles for amateur arrays typically specify the spacing in wavelengths. To convert wavelengths to degrees, multiply by 360.

The radiation patterns constructed from the vector magnitudes have the proper shapes — that is, the amplitude relationship between any two points is correct. Therefore, one can measure front-to-back and front-to-side ratios directly from the pattern. Also, one might expect the array magnitude vector to be equal to the numerical gain over a single element. Unfortunately, it isn't that simple, because we've neglected the effect of mutual currents induced by the coupled elements. These currents can increase or decrease the array gain. To account for this effect would complicate the calculations beyond the usefulness of the simple technique used here. Therefore, we'll be content with exploring the directional characteristics without attempting to quantify the forward gain.

Two-Element Broadside Case

Illustrated in Fig. 2A, this system consists of two verticals spaced a half wavelength ($S = 180°$) and excited in phase ($\psi = 0$). The field-strength vector for each element is given in polar form. To investigate the combined field strength broadside to the array we set $\theta = 90°$. Since the cosine of 90° is zero, the angular component of vector 2 is zero. Therefore, the vectors have the same direction and their magnitudes can be added directly as shown in Fig. 2B. Since the resultant field intensity has a relative magnitude of 2 with respect to a single element, the array has an apparent gain of 2 at 90° azimuth. The cosine of 270° is also zero, so the array provides the same gain at that heading as well. Plugging successive values of θ into the formula will yield magnitude values to plot on a polar graph. The radiation pattern shown in Fig. 2C was plotted in one-degree increments using data generated by the computer program given in the sidebar.

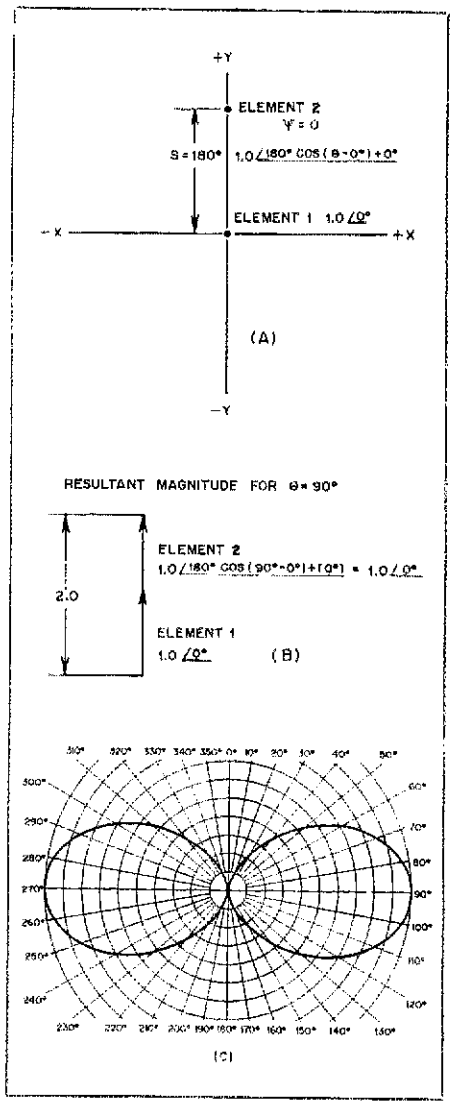

Fig. 2 — (A) Physical layout and element vector assignment for a 2-element broadside vertical array. (B) Summation of the element vectors for 90° azimuth heading. (C) Azimuthal radiation pattern of the broadside array.

Two-Element Endfire Case

Two elements spaced a quarter wavelength ($S = 90°$) and excited in phase quadrature ($\psi = -90°$) form the simplest unidirectional vertical array. The value for ψ is negative, indicating that the excitation of element 2 lags that of the reference element. Fig. 3A depicts the physical arrangement of the elements and identifies the vectors. Equal power distribution is assumed here, but this condition isn't realized in typical amateur installations because one element induces current in the other, making the radiation resistances unequal. The effect of this imbalance is to degrade the front-to-back ratio.[4] The vector addition for $\theta = 0°$ is

[1]References and Editor's Note appear on page 25.

Plotting Radiation Patterns

While the graphical vector method outlined by Schulz can be used to plot the pattern of any phased array, the procedure is rather time consuming (and paper consuming) when applied to large arrays or when fine resolution is required. The calculator program given in the appendix will greatly enhance the speed and accuracy of the exercise. A logical extension of the technique is to use a computer to calculate and print the azimuth and field-strength values. Mitchel and May have taken this idea one step further with programs written to plot patterns on a CRT terminal.[3,4]

Those programs are quite complete, but also quite long if one needs only to analyze the simple arrays used by most amateurs. Listed below are the programs used to generate the data for the antenna patterns printed in the accompanying article. The routine first calculates the relative field strength using the formulas already given and then divides all the values by the maximum field strength to normalize the major lobe to full scale on the polar graph. A complete listing is given for the two-element broadside program; for the other programs, only those lines that differ from the broadside program are listed.

The amplitude values plotted correspond to the field strength (voltage) some distance from the antenna, and the amplitude scale is linear. Many amateurs would be interested in seeing the amplitude plotted in decibels. To obtain the field strength in decibels (with respect to the major lobe) and any heading, take the common logarithm of the normalized field strength value and multiply by 20. This operation could be incorporated in the computer program using only one or two instructions. The data thus obtained is most useful to amateurs when plotted on the scale designed by Hall.[4]

```
1Ø CLS:LPRINT" ", "RADIATION PATTERN OF
   2-ELEMENT BROADSIDE VERTICAL ARRAY"
12 LPRINT" "
14 LPRINT" "
16 LPRINT" "
2Ø LPRINT"AZIMUTH, DEGREES","RELATIVE
   FIELD STRENGTH", "NORMALIZED FIELD
   STRENGTH"
22 LPRINT" "
24 LPRINT" "
3Ø FORX = ØTO359:Q = .Ø174533:L = X*Q
4Ø A = 18Ø*Q*COS(L)
5Ø B = COS(A):C = SIN(A)
6Ø D = ((B + 1) ↑2 + C ↑2) ↑.5
7Ø E = D/2:LPRINTX," ",D," ",E:NEXTX
```

```
1Ø CLS:LPRINT" ","RADIATION PATTERN OF
   2-ELEMENT ENDFIRE VERTICAL ARRAY"
4Ø A = 9Ø*Q*COS(L) – (9Ø*Q)
```

```
1Ø CLS:LPRINT" "," RADIATION PATTERN
   OF W1CF 3-ELEMENT ARRAY"
4Ø A = 1Ø4*Q*COS(L – (6Ø*Q)) – (9Ø*Q)
5Ø B = 1Ø4*Q*COS(L – (12Ø*Q)) – (90*Q):
   C = COS(A):D = COS(B)
6Ø E = SIN(A):F = SIN(B):G = ((C + D + 1) ↑2
   + (E + F) ↑2) ↑.5
7Ø H = G/3:LPRINTX," ",G," ",H:NEXTX
```

```
1Ø CLS:LPRINT" "," RADIATION PATTERN
   OF W1CF 4-ELEMENT ARRAY"
4Ø A = 9Ø*Q*COS(L – (9Ø*Q)) – (9Ø*Q)
5Ø B = 127*Q*COS(L – (45*Q)) – (18Ø*Q):
   C = 9Ø*Q*COS(L) – (9Ø*Q)
6Ø D = COS(A):E = COS(B):F = COS(C):
   G = SIN(A):H = SIN(B):I = SIN(C)
65 K = ((D + E + F + 1) ↑2 + (G + H + I) ↑2) ↑.5
7Ø P = K/3.78987:LPRINTX," ",K," ",P:NEXTX
```

— George Woodward, W1RN

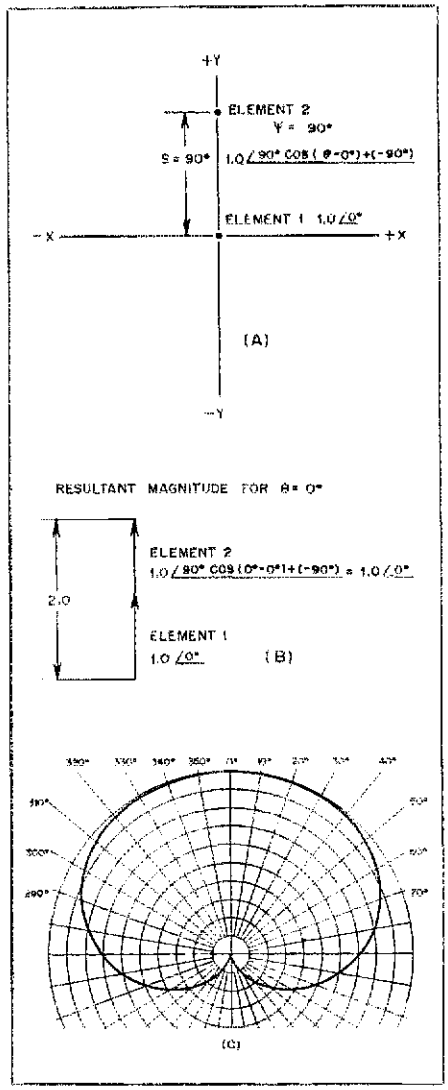

Fig. 3 — Two-element end-fire array. The array configuration and vector assignment are given in A. B is the vector summation for 0° azimuth heading. The array produces a cardioid radiation pattern, plotted in C.

shown in Fig. 3B. At this heading the array gives maximum gain over a single element. Setting $\theta = 180°$ yields an angular component of 180° for vector two, which exactly cancels (in the ideal case) the radiation from the reference element in that direction. The major lobe of any unidirectional array fires through the phase-lagging element. Fig. 3C is the radiation pattern of the ideal two-element unidirectional array.

W1CF Tri-Element Case

Increasing the number of elements allows greater flexibility in beam formation and steering as well as higher gain. Atchley proposed the systems in this example and the next for 80-meter DXing.[5] The array is composed of three elements arranged in an equilateral triangle as illustrated in Fig. 4A. The altitude of the triangle is placed along the x axis for convenience. Each leg is 0.288 wavelength long (S = 104°), and elements 2 and 3 lag the reference by 90° ($\psi = -90°$). Because this array uses nonzero values of ϕ, the vectors must be set up carefully and the calculations are somewhat more tedious. The radiation from all three elements is in phase when $\theta = 90°$. As shown in Fig. 4B, the apparent azimuthal gain at this angle is 3. The pattern is drawn in Fig. 4C. Notice that the array exhibits wide azimuthal coverage, but that the front-to-back ratio is only 9.6 dB and the best lobe-to-null ratio is only 11.6 dB.

W1CF Four-Element Case

This array consists of four elements arranged in a square one quarter wavelength per side as diagramed in Fig. 5A. For elements 2 and 4, S = 90°. The spacing for element 3 is the diagonal of the square. The phasing (ψ) is $-90°$ for elements 2 and 4, and $-180°$ for element 3. Element 2 has an angular position (ϕ) of 90°, and for element 3, $\phi = 45°$. Rusgrove has described a 40-meter version of this antenna system.[6] Equal element excitation is forced by means of Wilkinson power dividers, so the actual performance of this antenna will closely approximate the theoretical predictions. Maximum field intensity occurs at 45° azimuth, and the vector summation for this angle is performed in Fig. 5B. Note that the construction has been simplified by adding vectors 3 and 4 in reverse order. Fig. 5C gives the radiation pattern of the 4-element array. The half-power beamwidth (where the field-strength voltage drops to 0.707 of full scale) is about 97°. A front-to-back ratio of 25 dB is achieved, with deep nulls on either side of the back lobe.

Appendix

HP-33E Manual Program for 2-Element Vertical Array

1) Azimuth, element position, element spacing and element phasing are expressed in degrees.

2) After each azimuthal magnitude calculation the memory must be cleared. Turn the calculator off and on again to ready the unit for the next calculation.

3) Line 8 displays magnitude answer.

4) Key g Deg before beginning calculation.

Manual Key Sequence

Line	*Data*	*Operation*		
1	Azimuth	enter↑		
2	element position	minus	f cos	
3	spacing	S		
4	electrical phase	plus	enter↑	
5	magnitude	f→R	Σ+	
6	0	enter↑		
7	1.0	1→R	Σ+	RCL 5 enter↑ RCL 3
8		g→P	f√x	answer

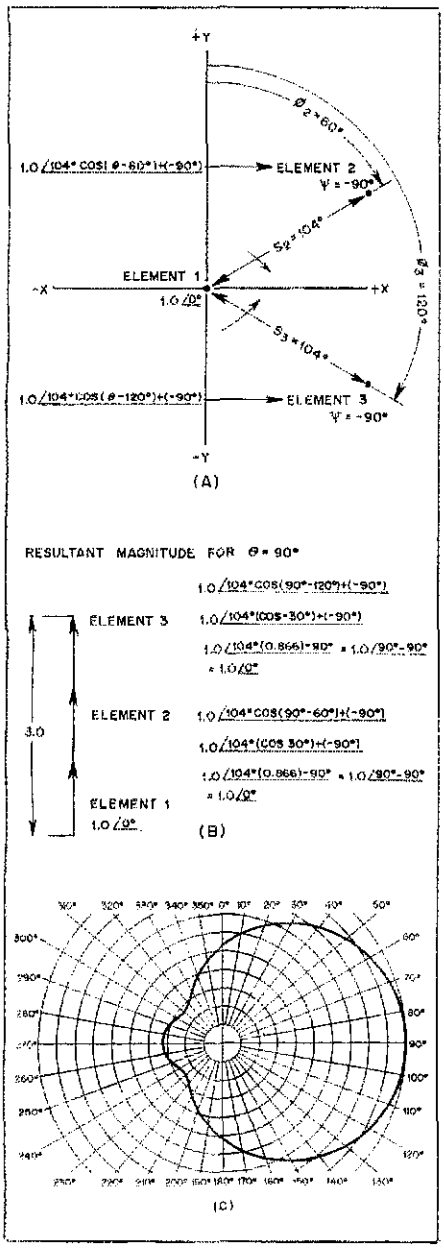

Fig. 4 — The 3-element W1CF array. A illustrates the triangular arrangement and vector specification. At $\theta = 90°$ the radiation from all elements is in phase, as diagramed in B. The pattern is given in C. As in all unidirectional phased arrays, the major lobe fires through the lagging elements.

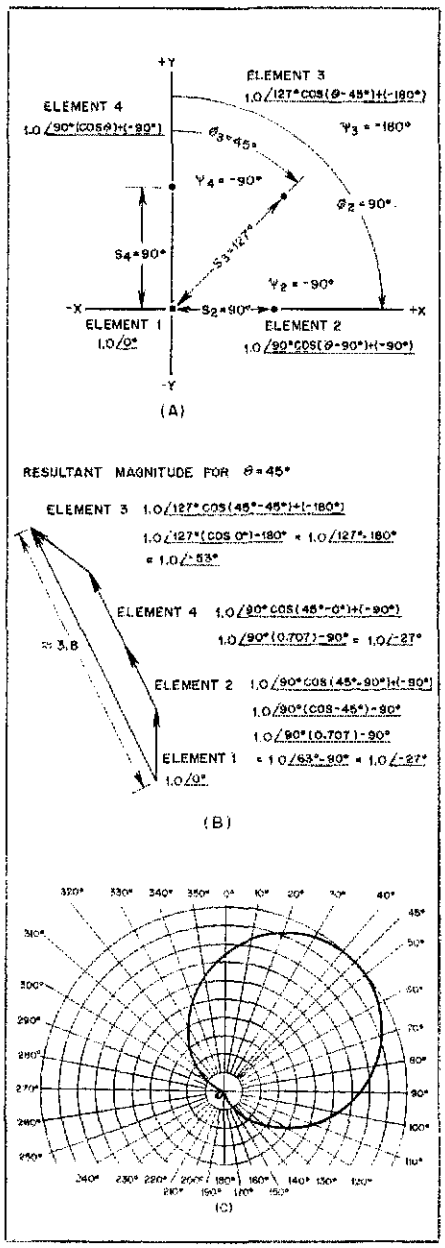

Fig. 5 — The square shape of the W1CF 4-element array allows the elements to be represented on the coordinate axes and in the first quadrant, shown in A. The radiation from all four elements is not phase-coincident for any azimuth heading, but the nearest approach to this condition occurs at $\theta = 45°$, as shown in B. The radiation pattern, plotted in C, shows good directivity.

*Editor's Note: The author's original manuscript (and reference 1) assign negative values to the spacing, S. The mathematical justification for this notation is that S really represents the time a space wave arrives at a secondary element with respect to the excitation of the reference element. Since the wave arrives *after* it has been radiated by the reference, the time can be rendered as a negative number. However, this definition causes the plotted patterns to have an apparent firing direction 180° from the true major lobe. To reconcile the formula with the real-world radiation patterns, the editor has used positive numbers for element spacings. The patterns given in Figs. 2 through 5 are correct. This can be verified intuitively by sketching a two-element system having quarter-wave spacing and quadrature phasing, and analyzing the response from each end.

References

[1]Smith, *Directional Antennas*, Smith Electronics, Inc., 1969, p. 2-1-23.
[2]Schulz, "HP41-C Tweaks Vertical Antenna Arrays," *Electronics*, January 17, 1980.
[3]Orr, *Radio Handbook*, twenty-first edition, Editors and Engineers, p. 28-13.
[4]Lewallen, "Notes on Phased Verticals," Technical Correspondence, *QST*, August 1979.
[5]Atchley, Stinchelfer and White, "360°-Steerable Vertical Phased Arrays," *QST*, April 1976.
[6]Rusgrove, "A 360° Steerable Vertical Phased Array for 7 MHz," *The Radio Amateur's Handbook*, fifty-eighth edition, ARRL, p. 20-15.
[7]Mitchel, "Antenna Engineer — Predict Performance of Phased Arrays with a TRS-80," *73*, May 1980.
[8]May, "TRS-80 Antenna Modeling Program," *QST*, February 1981.
[9]Hall, "The New Look for *QST*'s Antenna Patterns," *QST*, July 1980.

Strays

In all seriousness, the new ARRL flag is now available to members. Central Division Vice Director K9EN introduced it at a club meeting in Madison, Wisconsin. Details on how you can obtain one (or more) are in October 1980 *QST*, page 9. The sizes are slightly different than those mentioned in *QST*, though — the large flag ($21) is about 3 × 5 feet, while the small one ($15) is about 2 × 3 feet. (*photo courtesy K9ZZ*)

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Atlantic Division Director Jesse Bieberman, W3KT, appears pleased with events at the recent 25th Annual York County (Pennsylvania) hamfest. Left to right are Vice Director W3ABC, W3KT, W3AXC and W3AMQ.

I would like to get in touch with . . .

☐ amateurs who are or have been employees of CBS or CBS-owned stations. I am compiling a list of CBS hams. — Bob Oswald, WA2AIW, 524 W. 57th St., New York, NY 10019.

☐ Chicago-area amateurs who are interested in a 2-meter a-m calling/working channel on 144.4 MHz. Edgar Reihl, WA9ULU, 545 Ridge Rd., Wilmette, IL 60091 (s.a.s.e. appreciated).

What Your Wattmeter Really Reads

Your wattmeter's power readings most times are not a true indication of the power actually delivered to the load. Learn how to correctly interpret those readings.

By J. T. Kroenert,* WA1YTC

The reflectometer-type wattmeters are the only economical instruments available to the radio amateur for measuring rf power. As such, they are invaluable. The devices are not true power meters, however. The power reading is only true when the load is a pure resistance having a value the same as that used at the factory for calibration. The readings must be carefully interpreted when the load is anything other than this value.

A misconception often heard concerns the role of "reflected" power. Even equipment designers are guilty of perpetuating this misconception at times. Under key-down conditions, the source (transmitter) does not recognize the existence of such a quantity as reflected power. The source simply delivers some actual power, P_A, to some load impedance, Z_L, as shown in Fig. 1. If a true rf wattmeter were available, it would have only one scale — actual power. It could not provide a reflected power reading.

This discussion analyzes the Heathkit HM-102, which is functionally the same as the Drake wattmeters, the Swan WM-2000 and others using a current transformer to sample the load current. The Bird uses a different scheme to sample the transmission line, but the result is the same. The remarks, curves and formulas apply to all these meters.

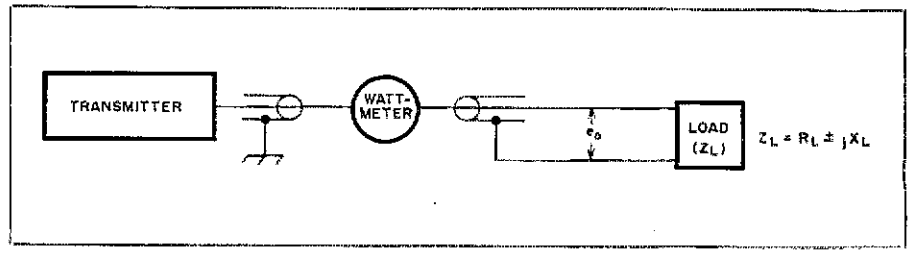

Fig. 1 — The transmitter supplies power via the wattmeter to a load impedance, Z_L. The voltage developed across the load impedance is e_o. The wattmeter reading is then obtained from the values of e_o and Z_L.

Actual Power

Actually none of the reflectometer types of wattmeters measure power; The meter scale is marked in watts, but the meter deflection is not truly dependent on the power delivered to the load. A true wattmeter would measure the power into the load regardless of the impedance of the load. Let's use an example, illustrated in Fig. 1. The transmitter supplies power through the wattmeter to the load impedance Z_L, which has both resistance, R_L, and reactance, $\pm jX_L$. Knowing the voltage across the load, e_o, and the impedance, Z_L, the actual power in the load, P_A, can be calculated. (This is Eq. 18 from the appendix.)

$$P_A = \frac{e_o^2 R_L}{|Z_L|^2} = \frac{e_o^2 R_L}{R_L^2 + X_L^2} \qquad \text{(Eq. 1)}$$

Let us compare this actual power, P_A, with the forward power reading, P_F, of your wattmeter. Eq. 16 from the appendix gives the forward power reading, P_F, as:

$$P_F = \frac{e_o^2}{4R_o}\left|1 + \frac{R_o}{Z_L}\right|^2$$

$$= \frac{e_o^2}{4R_o}\left(\frac{[R_o + R_L]^2 + X_L^2}{R_L^2 + X_L^2}\right) \qquad \text{(Eq. 2)}$$

The two formulas are not equal for all values of $R_L \pm jX_L$, so the forward power reading is not always an indication of the actual power. Note the presence of the new quantity, R_o, in the P_F formula. R_o is the value of pure resistance (usually 50 or 52 ohms) that the manufacturer uses as a load when the wattmeter is calibrated. If the load impedance is equal to R_o, then

$$P_A = \frac{e_o^2}{R_o} \qquad \text{(Eq. 3)}$$

and

$$P_F = \frac{e_o^2}{R_o} \qquad \text{(Eq. 4)}$$

Eqs. 3 and 4 show that your wattmeter reads actual power on its forward power scale only when the load impedance is a pure resistance equal to R_o.

There are two ways to obtain the value of actual power when the load impedance does not equal R_o. If your wattmeter reads both forward and reflected power, subtract the reflected power reading from

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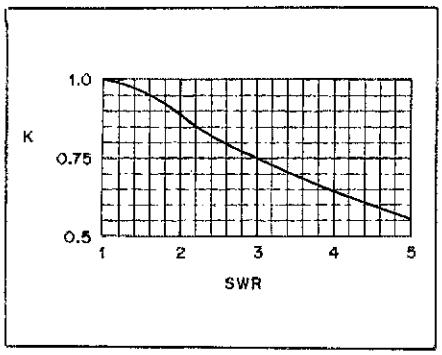


Fig. 2 — The actual load power is obtained by multiplying the forward power reading by the factor K from the curve. As the SWR reading increases from 1.0, the value of K decreases from 1.0.

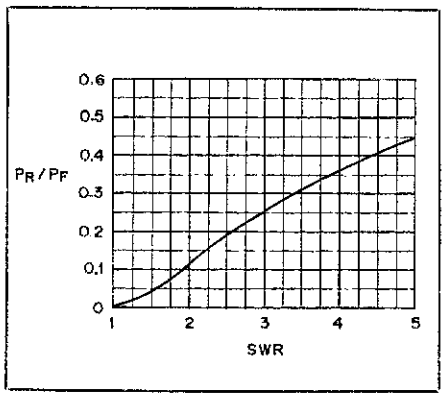


Fig. 3 — This curve shows the ratio of the reflected power reading to the forward power reading as the SWR increases from 1 to 5.

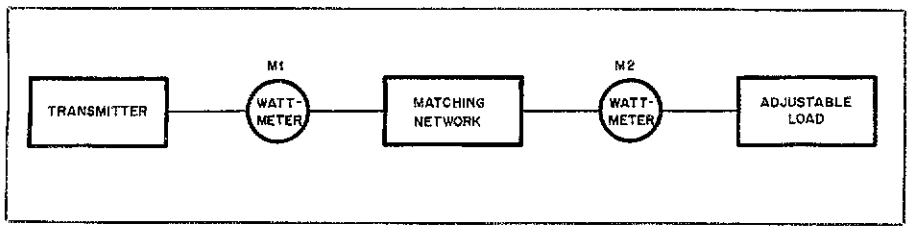


Fig. 4 — This test setup is used to illustrate the proper interpretation of the reflected power readings.

the forward power reading.

If your wattmeter reads forward power and SWR, multiply the forward power reading by a factor, K: Actual Power = K × "forward" power reading. Values of K for SWR readings from 1 to 5 are given in Fig. 2. For example, with an SWR of 3.0, K is 0.75. The actual power is only 75% of the "forward" power reading.

Forward and Reflected Power Readings

In the forward power position the meter reads a voltage which is the phasor sum of two voltage components. One component is a fraction of the load voltage and the other component is a voltage proportional to the load current. The circuitry is set up to make these two components equal when the load is R_0. The meter scale is then marked in watts delivered to R_0. The detailed formulas are contained in the appendix.

In the reflected power position the meter reads a voltage which is the phasor difference of two voltage components. One component is a fraction of the load voltage and the other component, proportional to the load current, is subtracted. These two components are equal when the load is R_0, and when they are subtracted the result is zero — no reflected power. When the load differs from R_0, the current component no longer cancels the voltage component, so some reflected power is indicated on the meter.

If the meter-circuit sensitivity is the same as for forward power, then the same scale markings are used. Some meters may increase the meter-circuit sensitivity to provide a more expanded scale for reflected power. Basically, the reflected power reading is a measure of how much the load impedance differs from R_0. The formula for the reflected power reading, Eq. 17 in the appendix, is difficult to interpret generally in any other way.

Some meters have an SWR scale instead of, or in addition to, a reflected-power scale. Such a meter measures SWR exactly the same way that it measures reflected power. The circuit is exactly the same — the voltage component proportional to load current is subtracted from the voltage component proportional to load voltage and rectified to give the meter reading. Only in this case the meter scale is marked in SWR instead of reflected power. To permit the use of low power for SWR measurement, practically all meters provide a higher sensitivity in this mode. Using the sensitivity adjustment, the forward power is set to full scale and the same sensitivity retained for the SWR measurement. Thus the SWR reading is obtained from the ratio of reflected to forward power. Fig. 3 is a plot of the ratio of reflected to forward power vs. SWR. Note on the curve that when the SWR is 3.0, the ratio of reflected to forward power is 0.25. Also note on your meter that 25% of full scale power is midscale and that the SWR = 3 mark is also midscale. The formula for the relationship is given in the appendix as Eq. 24.

The basic quantity measured is again a difference between the load impedance and R_0, not SWR. It is converted to SWR by the meter, which assumes that the load should have a characteristic impedance equal to R_0. No transmission line is even required to produce an SWR reading on such a meter. Put a capacitor or inductor in series with your dummy load and measure the SWR. An SWR reading greater than 1.0 will be obtained because the load is no longer R_0. The only true way to determine SWR is by measurements along the line, as discussed in Ref. 1. This is not possible with short lines and impractical with coaxial lines, so the meter provides the most practical way of estimating SWR. Ref. 1 is highly recommended for its discussion and illustrations of the readings that occur when a line having a characteristic impedance other than R_0 is used.

The Reality of Reflected Power

The reflected power reading is not true power. This can be illustrated by performing the experiment shown in Fig. 4. With the power into the load held constant at 100 watts, note the readings of M2 as the load impedance is changed. With each different impedance, the matching network is readjusted to make the readings of M1 constant. The transmitter does not require any adjustment since its load is a constant R_0 as indicated by the SWR = 1 (P_R = 0) reading of M1. Therefore, the transmitter constantly delivers 100 watts to the matching network. If there are no losses within the matching network, 100 watts is delivered to the load. Let the load assume various impedance values which result in SWR readings on M2 of 1, 2, 3, 4 and 5. The corresponding readings of forward and reflected powers for each SWR can be obtained using the curve of K vs. SWR in Fig. 2. The results are shown in Table 1. As the SWR reading increases, both P_F and P_R increase, but the difference always stays fixed at the value of *actual power*. The reflected power cannot be considered as power returned to the matching net-

Table 1

Wattmeter Power Readings Vs. Actual Power for SWR Values of 1 to 5.

SWR	K	P_F	P_R	P_A
1	1.0	100	0	100
2	0.89	112	12	100
3	0.75	133	33	100
4	0.64	156	56	100
5	0.55	182	82	100

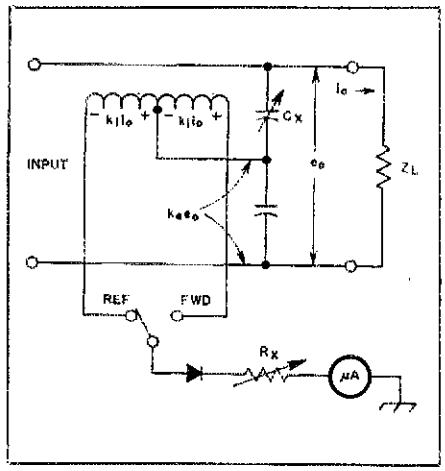


Fig. 5 — A functional representation of a typical rf wattmeter circuit. Only the components necessary for the discussion are shown. The center-tapped coil is on a toroid core.

work because the matching network has no losses. Just consider reflected power as the correction factor to convert the forward power reading to actual power.

If you have a long transmission line and transmit a short pulse, a distinct reflection pulse will be produced if the line is misterminated. If the load impedance does not equal the characteristic impedance of the line, a voltage pulse will be reflected at the load and travel back down to the sending end. In fact, this method is used to locate a failure (a gross mismatch) in transmission lines by measuring the travel time of the reflected pulse and converting the time to distance along the line.[2] In Amateur Radio communications, the key-down time is so long that all the reflections reach a continuous, or steady-state, condition. With a steady-state condition, the forward and reflected components cannot be separated. The load can be evaluated only as an impedance; this is basically what our wattmeters do. Reflections are real, but the concern some amateurs have about reflected power is unwarranted. Reflected power is not power rejected by the load which could otherwise be used, nor is it necessarily power which is returned to be dissipated in the transmitter.

I hope the preceding discussion has explained the readings of the reflectometer type of wattmeter and has led to the proper interpretation of the readings. I did not include the further expansion of a load impedance into a transmission line plus antenna. Consult Ref. 1 for a detailed discussion of how the load impedance is determined by the antenna and transmission line. QST

References

[1] Cebik, "The Imperfect Antenna System and How It Works," *QST*, July 1979.
[2] Buchem, "An Inexpensive Time-Domain Reflectometer," *QST*, March 1973.

Appendix

The functional circuit of the wattmeter is assumed to be as shown in Fig. 5. The current-sampling transformer develops a pair of voltages, $k_i i_o$, proportional to the load current, i_o. The capacitive voltage divider across the output provides an output voltage sample, $k_e e_o$, to the center tap of the current-sampling transformer. Assume instantaneous polarities are as marked in the figure. The sampled forward voltage, e_f, is the sum of two components.

$$e_f = k_e e_o + k_i i_o = e_o \left(k_e + \frac{k_i}{Z_L} \right) \qquad \text{(Eq. 5)}$$

and the sampled reflected voltage, e_R, is the difference of the two components.

$$e_R = k_e e_o - k_i i_o = e_o \left(k_e - \frac{k_i}{Z_L} \right) \qquad \text{(Eq. 6)}$$

The first step is the adjustment of the relative values of k_e and k_i to make the reflected voltage, e_R, equal to zero when the load, Z_L, is the design value, R_o. If $Z_L = R_o$, then

$$e_R = 0 = e_o \left(k_e - \frac{k_i}{R_o} \right) \qquad \text{(Eq. 7)}$$

Therefore, after adjusting C_X,

$$k_e = \frac{k_i}{R_o} \text{ or } k_i = k_e R_o \qquad \text{(Eq. 7a)}$$

Substituting $k_e R_o$ for k_i in Eqs. 5 an 6 yields

$$e_f = e_o k_e \left(1 + \frac{R_o}{Z_L} \right) \qquad \text{(Eq. 8)}$$

and

$$e_R = e_o k_e \left(1 - \frac{R_o}{Z_L} \right) \qquad \text{(Eq. 9)}$$

With the switch in the e_f position, adjust R_X to make e_f full scale on the meter, and then switch to e_R. The meter reading of e_R (as a fraction of full scale) is then the reflection coefficient, RC.

$$\frac{|e_R|}{|e_f|} = \frac{k_e e_o \left| 1 - \frac{R_o}{Z_L} \right|}{k_e e_o \left| 1 + \frac{R_o}{Z_L} \right|} = \frac{\left| 1 - \frac{R_o}{Z_L} \right|}{\left| 1 + \frac{R_o}{Z_L} \right|} \qquad \text{(Eq. 10)}$$

Since the reflection coefficient, RC, is related to the standing-wave ratio, SWR, as

$$|RC| = \frac{SWR - 1}{SWR + 1} = \frac{|e_R|}{|e_f|} \qquad \text{(Eq. 11)}$$

The meter scale is calibrated by assuming values for SWR and calculating the relative meter deflection, e_R/e_f, to determine the position of the scale marks.

For the calibration of the forward power scale, the meter will be calibrated using R_o as the load. Under this condition $Z_L = R_o$ and the forward voltage becomes

$$e_f Z_L = e_o k_e \left(1 + \frac{R_o}{R_o} \right) = 2 e_o k_e \qquad \text{(Eq. 12)}$$

Since the power is proportional to e_o^2 and thus e_f^2, let the forward-power meter reading, P_f, be e_f^2. Thus, the forward power reading is

$$P_f = e_f^2 = 4 e_o^2 k_e^2 \qquad \text{(Eq. 13)}$$

Equating the meter reading, P_f, to the actual power with $Z_L = R_o$ gives the value for k_e.

$$P_f = \frac{e_o^2}{R_o} = 4 e_o^2 k_e^2 \qquad \text{(Eq. 14)}$$

and

$$k_e^2 = \frac{1}{4R_o} \qquad \text{(Eq. 14a)}$$

Squaring Eq. 8 so that P_f can be obtained for all values of Z_L

$$P_f = e_f^2 = e_o^2 k_e^2 \left| 1 + \frac{R_o}{Z_L} \right|^2 \qquad \text{(Eq. 15)}$$

and substituting $1/4R_o$ (from Eq. 14a) for k_e^2

$$P_f = e_f^2 = \frac{e_o^2}{4R_o} \left| 1 + \frac{R_o}{Z_L} \right|^2 \qquad \text{(Eq. 16)}$$

Eq. 16 gives the forward power reading for all values of R_o and Z_L. Note that when $R_o = Z_L$, $P_L = e_o^2/R_o$, the correct value for the matched condition. Using the same procedure, the reflected power reading is

$$P_R = e_R^2 = \frac{e_o^2}{4R_o} \left| 1 - \frac{R_o}{Z_L} \right|^2 \qquad \text{(Eq. 17)}$$

Of primary interest is the actual power, P_A, which is delivered to the load. Assuming that the load impedance has both resistance and reactance, $R_L \pm jX_L$, the current, i_o, in the load impedance is $e_o/|Z_L|$. The power absorbed by the load is the square of i_o times the resistive portion of the load impedance, R_L.

$$P_A = i_o^2 R_L = \frac{e_o^2 R_L}{|Z|^2} = \frac{e_o^2 R_L}{R_L^2 + X_L^2} \qquad \text{(Eq. 18)}$$

If $R_L \pm jX_L$ is substituted for Z_L in Eqs. 16 and 17 (P_f and P_R), the following results are obtained:

$$P_f = \frac{e_o^2}{4R_o} \left| 1 + \frac{R_o}{Z_L} \right|^2 = \frac{e_o^2}{4R_o} \left| \frac{(R_L + R_o) \pm jX_L}{R_L \pm jX_L} \right|^2$$

$$= \frac{e_o^2}{4R_o} \left(\frac{R_L^2 + 2R_L R_o + R_o^2 + X_L^2}{R_L^2 + X_L^2} \right) \qquad \text{(Eq. 19)}$$

$$P_R = \frac{e_o^2}{4R_o} \left| 1 - \frac{R_o}{Z_L} \right|^2 = \frac{e_o^2}{4R_o} \left| \frac{(R_L + R_o) \pm jX_L}{R_L \pm jX_L} \right|^2$$

$$= \frac{e_o^2}{4R_o} \left(\frac{R_L^2 - 2R_L R_o + R_o^2 + X_L^2}{R_L^2 + X_L^2} \right) \qquad \text{(Eq. 20)}$$

If P_R (Eq. 20) is subtracted from P_f (Eq. 19), the result is the same expression for P_L that was obtained in Eq. 18.

$$P_f - P_R = \frac{e_o^2 R_L}{R_L^2 + X_L^2} = P_A \qquad \text{(Eq. 21)}$$

Thus, the actual power is always equal to the forward-power reading minus the reflected-power reading — for all values of load impedance.

If Eq. 11 is squared and substitutions made from Eq. 16, 17 and 19, the actual power can be obtained in terms of forward power and SWR readings.

$$P_A = kP_f \qquad \text{(Eq. 22)}$$

where

$$k = \frac{4(SWR)}{(SWR + 1)^2} \qquad \text{(Eq. 22a)}$$

Solving Eq. 11 for SWR,

$$SWR = \frac{|e_f| + |e_R|}{|e_f| - |e_R|} \qquad \text{(Eq. 23)}$$

$$= \frac{\sqrt{P_f} + \sqrt{P_R}}{\sqrt{P_f} - \sqrt{P_R}} \qquad \text{(Eq. 24)}$$

$$= \frac{1 + \frac{\sqrt{P_R}}{\sqrt{P_f}}}{1 - \frac{\sqrt{P_R}}{\sqrt{P_f}}} = \frac{1 + \sqrt{\frac{P_R}{P_f}}}{1 - \sqrt{\frac{P_R}{P_f}}} \qquad \text{(Eq. 25)}$$

Circuit Boards From Scratch

Want to add the "professional touch" to your next construction project? This article takes the neophyte step-by-step through the "positive" process for pc board fabrication.

By David R. Malley,* K1NYK

The recent increased interest in "rolling your own" construction projects has prompted many hams to start making their own printed-circuit boards. Although point-to-point wiring is sufficient for many circuits, the use of copper-clad circuit boards offers convenience, professional appearance, and ease of testing and repair, if necessary.

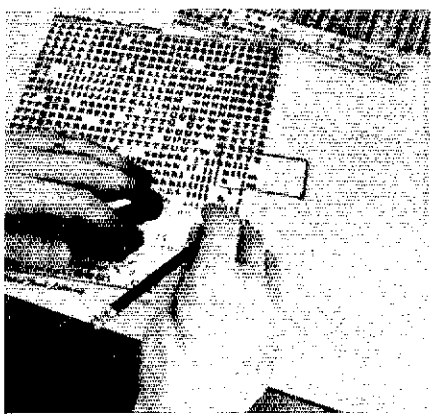
Recently, I needed to replace a diode in the rf output metering circuit of an older transceiver. After an hour or so of guessing where the wiring harness went, I found the diode quite a distance from the meter itself. This would have been a lot simpler with today's equipment that uses plug-in boards, of course. If you feel turned off to the idea of actually making these boards yourself, just read on for a while. You will probably find that it's really not difficult or beyond your ability. Remember how you felt about being able to learn Morse!

Picture Perfect

This article will deal with photo-etching and derivative methods, although you might be interested to know that silk-screening techniques are also available. There are several basic ways of making printed-circuit (pc) boards, and it turns out that printing has nothing to do with any of them! The differences between methods lie in how the acid resistant (resist) material is applied to the copper-plated board.

A simple circuit can be hand drawn on the pc board using dry transfers or resist pens. These methods allow direct etching to obtain the needed pattern without any exposing or developing steps. Many magazine construction articles offer a full-scale drawing of the copper side of the board with black representing the copper pattern that remains after etching is complete. This drawing makes the production of sophisticated layouts relatively straightforward, especially when several pc boards are necessary, as in a club project. A photographic positive or negative can be produced on a clear piece of thick plastic (transparency) from this artwork.

One positive method seems to be more popular because the transparency can be made several different ways. If you do not have access to photographic equipment and wish to avoid the expense of a commercial photographer, several companies offer products that transfer the magazine sketch directly to a clear plastic sheet. The transparency can also be made by passing the original page (preferably a quality copy) through a Thermofax machine. However, my limited experience with this machine indicates that the resulting positive often lets the ultraviolet (UV) exposure light through where it shouldn't, which ruins the final product. The negative transparency can only be made photographically.



Dry-transfer letters can be used to add a personal touch to the circuit board. Some circuit patterns are also available in this format.

It is easy to photoetch your call, magazine article date or whatever by applying dry transfer letters and numbers on the photographic *positive*. If your method involves direct application of the resist, the above information can be applied using run-on resist-type letters and numbers.

Positively Clad

A short explanation of the difference between positive and negative photoetching might be in order at this point. In the positive process, after applying the resist to the board to be etched, the transparency is placed on top of the board and the combination exposed to a UV source. The light chemically changes the resist coating wherever the clear areas of the plastic film are. This allows the liquid developer to dissolve the resist coating. When the pc board is then etched, the copper is removed in the areas where the resist was removed.

As you might guess, somewhat the opposite occurs with the negative process. Here, light hitting the resist-sensitized board makes the coating resistant to the developer and the etchant because of the different chemical character of the negative resist.

Copper-clad (one- or two-sided) boards are available from several sources including mail-order and industrial supply outlets. These hobby products are available bare or presensitized with either type of resist. The coated boards are packaged in a black opaque plastic bag since they are light sensitive. It's a good idea to store these where the bag won't accidentally be opened. The presensitized boards are naturally more expensive and also are more difficult to locate in larger

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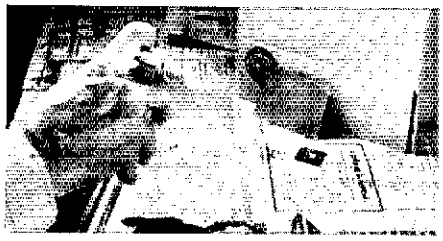
It is essential that the board be thoroughly cleaned before applying the photo-sensitive resist agent. After cleaning with a mild household abrasive cleanser, rinse under warm water for a few seconds to ensure that all traces of the cleaning agent have been removed.



Once the board is clean, handle it by the edges and immediately spray with the sensitizing agent. This is a rather messy process; use newspapers for a mat and take other precautions as you see fit.

sizes (over 6 × 6 inches or 150 × 150 mm). Consequently, I generally use the bare boards and apply a positive resist coating from a spray can sold under the GC Electronics label. Large, unetched pc board trimmings may often be obtained at low or no cost from local photoetching companies. This combination results in producing most circuit boards for under a dollar since the developer and etching chemicals are reusable many times. For those who prefer the negative method, presensitized boards and spray cans are available.

Tricky and Sticky

Taking advantage of these cost-saving techniques naturally involves being able to apply the resist correctly. This step is not as simple as using a can of spray paint. However, applying a few easy tricks should make your efforts successful.

Once you have obtained the positive, it is time to prepare the board itself. The easiest way to cut the circuit board to size seems to be with a hacksaw, assuming a large shear is unavailable. Glass epoxy boards are the better material from the end-use standpoint, although they are quite difficult to cut. Phenolic materials have a tendency to chip at the corners. These characteristics tend to discourage cutting with tools such as coping saws or paper cutters.

Proper cleaning is one of the essential steps in the process. You need a surface that water will roll off of rather than bead up on. You may have heard the term "water break-free" applied here. Some light abrasive cleaning goes a long way; I generally use a household silver-cleaning paste. Powdered household cleaners (e.g., Comet, Ajax, etc.) also work well. In either case, the pc board should be subsequently washed in soapy water and rinsed well. Now let it air dry while it stands up on a lint-free cloth (terry towel). Paper towels are bad news since they leave lint on the board. The presence of "enough" dust will cause the resist spray to bead up and form a poor coating just as if the board had not been cleaned at all. It's wise to handle the board by its edges or with rubber gloves to avoid fingerprints after cleaning. (I might suggest some discretion at this point to avoid any possibility of your spouse suggesting that you wash the dishes.)

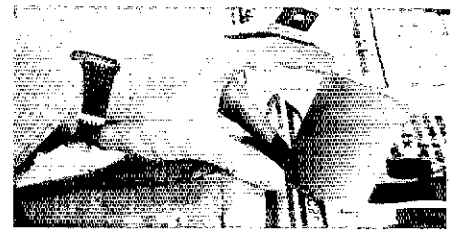
A few tricks in applying the spray resist make a large difference in the quality of the finished product. Concerns over the ozone content of our atmosphere have rightfully prompted discontinuing the use of fluorinated-hydrocarbon propellants. However, this seems to have caused some difficulties in getting resist cans to spray properly. In spite of this, it's easy to be at peace with nature and still apply the coating. This involves warming the bottle in hot water for half a minute or so, followed by a minute or more of shaking prior to spraying.

While you are spraying, the board should be in a near vertical position with the can about 12 inches away. Spray the work-piece with smooth horizontal strokes until it has been completely covered. Then lay it right down flat to keep the resist from flowing off the surface. It is important to put the board on a level surface to prevent uneven coating. A thin coating on one side might not stand up against the developer or etching solutions. I find it is important to apply a light to medium coating, let the board dry eight hours or so and apply a second coating. Applying the second coating at right angles to the first spraying direction will ensure good coverage.

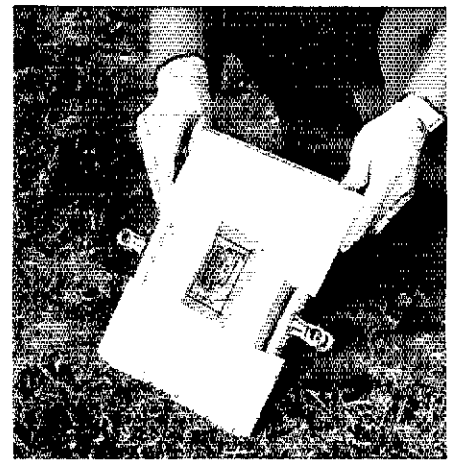
The drying process may be reduced to about an hour by following the oven-drying directions on the label of the spray can. If you use the kitchen oven for this, remove the light bulb before putting the board in and be prepared for some lingering odors. Remember that the board is light sensitive once it starts to dry. Safe handling from here on involves working under a yellow bug light or equivalent.

Contact

You will need a way to hold the artwork



After coating the board with the sensitizing agent, move it to a convenient, warm, dry and dark place for several hours to let it dry thoroughly. As soon as the agent is sprayed onto the board, it is light sensitive; handle by the edges and avoid direct light.



Exposing the photosensitive board. The homemade contact printer consists of a sheet of glass that holds the positive and the circuit board in place. A sheet of Styrofoam and a rigid sheet of fiberboard serve as the backing. The large paper clips hold the printer together.

tightly against the copper-clad board to keep light from getting underneath the transparency and undercutting the pattern. Contact printers are commercially available for this purpose, but the one shown in the photo is just as effective and costs under a dollar. Paper clamps are used to press the board and artwork together between the glass plates. The styrofoam provides some cushioning to protect the glass.

Photoetching could turn out to be your first solar-powered project! That is, if you use sunlight to expose the resist. The sun is a strong source of UV radiation and sure beats buying a special $35 light. It is important to expose the board during periods of bright sunlight, as cloudy or hazy days are less satisfactory. Of course, if you live in New England as I do, you may have to wait to get a sunny day!

My experience indicates that the board should be exposed for longer times than usually specified in the commercial literature. I typically use about a 15-minute sunlight exposure. Shorter times seem to incompletely polymerize (chemically convert) the positive resist. This ultimately results in not being able to remove all of the unwanted copper. The longer exposure time is one factor in why

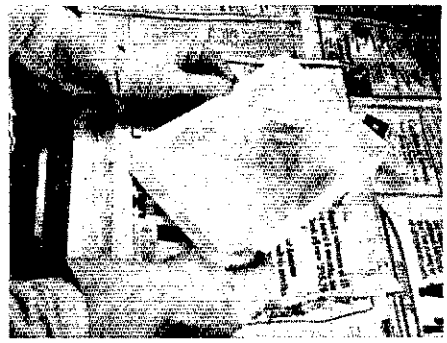
the Thermofax positives don't seem to work out satisfactorily.

The developer you use should be the one supplied by the same company that made the resist itself. This avoids incompatibility problems and variations in solution concentrations. You probably have realized by this point that the type of developer used (positive or negative) must match the resist type used. As with the exposure step, my best results are obtained with longer developing times than those in the manufacturer's literature. A three- to four-minute time seems satisfactory for the positive spray resist. Part of the reason for the longer time is that two resist applications were applied to the copper clad board.

It's What Develops That Counts

The board should be immersed coating side up in a developer and gently moved back and forth for the time mentioned. After the first 1 to 2 minutes, lightly brush the board's surface with a cotton swab to help remove the unwanted coating. Remove the board from the solution and wash it gently under cold and then warm water for a minute or so. Now the board is no longer light sensitive and the complete circuit should be visible. Any minor breaks in the pattern can be repaired easily at this point with a resist pen. In case there happens to be a lot of bad areas, the board can be solvent cleaned (acetone, lacquer thinner, etc.) and recoated. Positive developers can be used and stored in plastic or glass containers, and rubber gloves are recommended when using them.

Ferric chloride is the most common etchant used for this work. Although this chemical will not burn the skin, it can



With the etching process nearly completed, the circuit is clearly visible. Notice that the author is protecting his hands from the etchant by wearing rubber gloves.

stain it, so gloves are a good idea. Plastic or glass trays and bottles can also be used safely with ferric chloride. I place the tray of etchant in a sink filled with shallow water since this allows the board to be washed easily. The etchant level should be about 1/4 inch above the board, which is placed copper side up. Gentle agitation is used to wash away the dissolved copper. When all the unwanted copper has been dissolved, the board should be promptly removed and well rinsed. A new bottle of etchant normally takes about 10 to 15 minutes to do its job and can etch several boards before being discarded.

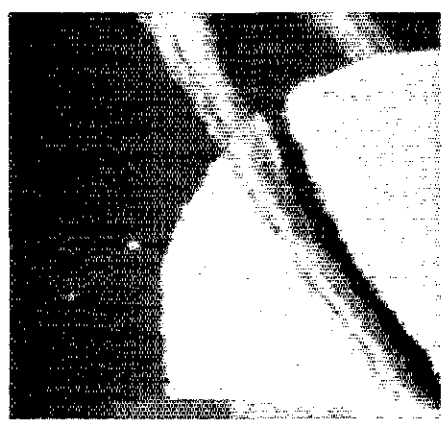
A no. 60 or 66 drill bit will work well for nearly all component lead holes and serves as a good pilot drill for the larger holes (such as ac line cords). These drills should only extend about 1/4 inch past the chuck to keep them from breaking. High-speed drill motors are best but good results can be obtained with either hand or portable drills. Note that the copper pattern on the board is still covered with the resist, which must be removed before soldering. Rubbing alcohol will work nicely. I find that rubbing the pattern lightly with a steel wool pad also helps the solder flow well.

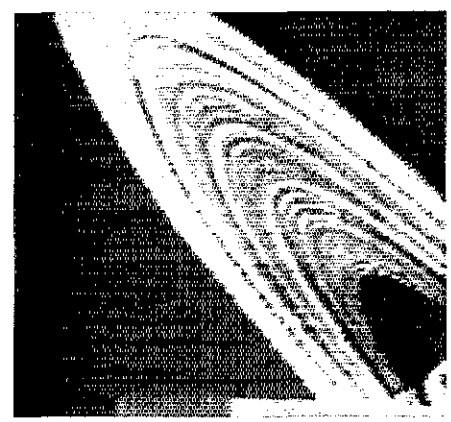
There are several techniques that will keep the copper pattern from tarnishing with time. Sometimes this can become a problem if you're working with rf circuits. A rather tedious method is to tin the entire pattern with solder; the simplest method involves spraying the completed and tested circuit using spray cans available commercially for this purpose. The drawback with the latter technique is that any eventual repairs will necessitate removing all of the sprayed material wherever soldering is to be done. Immersion tin plating can resolve these problems; the solution involved is available from most industrial supply outlets. A word of caution, however: This chemical can cause severe burns. If you are unfamiliar with handling such materials, I would suggest one of the alternate methods.

Closing Comments

There you have the ingredients for producing a professional-looking circuit board for your latest project. As mentioned at the beginning of the article, it isn't a difficult task. And once you try it, I doubt that you will want to go back to the old point-to-point method for anything but the simplest of circuits. Home construction has been growing by leaps and bounds lately and pc board fabrication seems to be a part of the reason for it. I hope that this article has helped to reduce any hesitation you may have had to jump in and enjoy this aspect of Amateur Radio. Good luck! 73

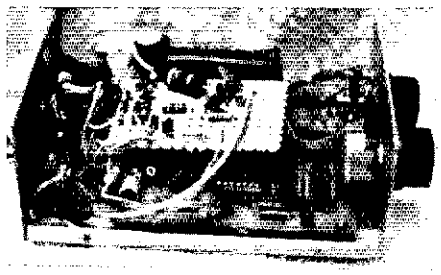
Strays





While most of the world had to wait to get a glimpse of Saturn, amateurs worldwide were viewing slow-scan television pictures of live Voyager 1 transmissions moments after they beamed in to scientists at the NASA Jet Propulsion Laboratory in Pasadena, California. The SSTV pictures, like these received at ARRL's operators' club station, W1INF, were sent out by members of the JPL ARC, W6VIO, on 20, 15 and 10 meters at 14.235, 21.340 and 28.680 MHz to commemorate the Voyager 1 flyby of the ringed planet in mid-November. From left to right: JPL club station SSTV CQ; a view of Saturn showing two of the planet's 10 moons, Tethys and Dione (lower left), and a close-up of Saturn's intricate sets of rings.

Accu-Control — A QSK System for the Kenwood TS-820/R-820 Twins



Smooth and fast, this QSK system is adaptable to other equipment combinations as well. It's a sure-fire way to add to your cw operating enjoyment!

By Michael R. Joyce,* N6ML

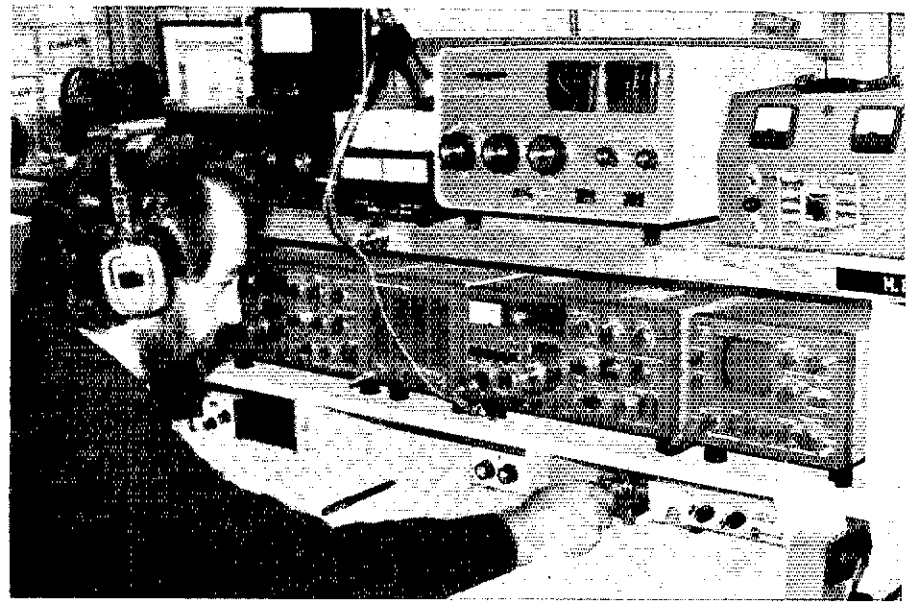
The Kenwood TS-820S is one of the more popular, dependable and admired rigs produced in the history of Amateur Radio. A testament to the TS-820 design is that few modification articles for it have been published. On-the-air reports leave the impression that this rig can do everything an amateur desires an hf rig to do, except . . .

Kenwood must have sensed that for a few serious amateurs, a high-quality transceiver alone would not be enough. The R-820 receiver was developed to fill that gap. Lab tests show that it is certainly one of the finest receivers ever marketed for the amateur fraternity.[1] The R-820, compatible with the TS-820, can do everything an amateur desires an hf receiver to do except . . .

"Well, except what?" Except there are no provisions for full-break-in operation (QSK) with either the transceiver alone or the transceiver/receiver combination. In fact, a Kenwood representative in California informed me that Kenwood considered QSK very difficult to implement and not an essential feature for the average amateur. So there was no justification for the additional work involved in adding QSK. The Kenwood representative had no QSK modification suggestions for the '820 twins.

What is QSK?

At this point, a definition of QSK is in order. My research of Amateur Radio literature of the last 25 years, and testing of commercially manufactured equipment designed for QSK, revealed a great disparity with regard to QSK parameters. For the purpose of this presentation, QSK shall be defined as the ability to hear one dash of S1 strength (as measured on the R-820 S meter) while transmitting a continuous string of dots at 30 wpm. Terms such as semi-break-in, slow QSK and VOX break-in shall be considered contradictions or misnomers. The system shown here is designed to permit QSK operation with the '820 twins in a full-



With Mike at the key [uh-oh! — Ed.], the Kenwood twins are ready for action. QSK? R BK.

*2234 Shelby Dr., Melbourne, FL 32935

[1]Notes appear on page 36.

transceive configuration.

System Requirements

To achieve QSK operation, a modern amateur station must meet the following requirements: The transmitter has to be free of clicks, chirps and backwave; it must not generate "white noise" and, preferably, the final amplifier(s) will be biased to cutoff (zero plate current). The linear amplifier must also comply with the biasing and "white noise" requirements demanded of the transmitter. The receiver must be able to recover immediately from muting and/or overload caused by the operation of the nearby transmitter. A sidetone monitoring system is desirable. Lastly, the T-R switch must switch the receiver into and out of the transmission line circuit immediately, not affect signal strength and, preferably, be silent in operation.

The Transmitter

Although the TS-820 has excellent cw keying, a backwave is present on the 20-, 15- and 10-meter bands, and the final amplifiers draw a resting plate current of 55 mA. The usual argument for biasing the final amplifiers to cutoff is that it eliminates "white noise" generated by the heat in the tubes. During tests at N6ML, no perceptible noise was detected from a variety of commercial and homemade transmitters and amplifiers that drew idling plate current; all had solid-state rectification in the power supply. It would initially appear that cutoff biasing to eliminate "white noise" is today more a matter of style and is more academic than absolute necessity. Not so! Two definite advantages are to be obtained: A reduction in the amount of heat produced (adding to tube life) and attenuation of backwave. By installing a transistor switch in the TS-820 to key the screen voltage of the final amplifiers, the plate resting current is reduced to zero (as read from the front panel meter) and the backwave is eliminated.[2]

The Linear Amplifier

The linear amplifier used at N6ML is a Heath SB-220 modified by adding electronic bias switching and a STANDBY/VOX-PTT CONTROL/TRANSMIT switch (see Fig. 1).[3,4,5] The electronic bias switch provides all of the benefits stated by Bryant. Previous articles described the usefulness of the STANDBY switch addition to the '220. This is further enhanced by providing an extra switch position, TRANSMIT, whereby the linear amplifier control relay is energized continuously and independently of the TS-820. This frees the TS-820 relay to be used to control the station Accu-Keyer during tune-up and ssb operation.

The Receiver

The R-820 has an excellent i-f derived, fast-attack agc system, but recovery is too slow for QSK. Receiver muting is accomplished by applying a negative bias to gate 2 of the dual-gate MOSFETs used as the rf and i-f amplifiers and mixers (see Fig. 2). For the receiver to be muted, the TS-820 T-R relay must be activated. This in turn switches 12 volts dc to activate RY1 in the R-820, removing the 9 volt source on line RLR and causing line RB (the biasing line of the MOSFETs) to go negative.

To monitor sending, the operator engages the MONITOR switch, which activates RY2. RY2 disconnects the antenna from the receiver, connects a dummy load to the receiver input, the partially activates the receiver by turning on the i-f amplifiers while maintaining the rf amplifier, buffer amplifier and first mixer at cutoff. Jack Gachesa, W6SCH, contends that the R-820 would be a good candidate for the "Relay Hall of Fame"! A transistor switch must be added to replace the slower mechanical relay to meet our QSK requirements. Although the operating and service manuals of the R-820 make no mention of providing a sidetone input, pin 15 of the remote connector (ST-1) serves this purpose.

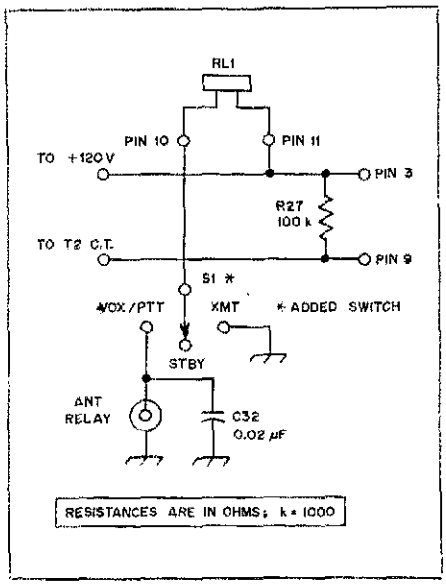


Fig. 1 — The Heath SB-220 linear amplifier is modified to include bias switching (not shown here — see text) and a standby switch. The switch is a Radio Shack spdt center-off type (275-653). Component designations are those of the manufacturer. Pin numbers are those of RL1.

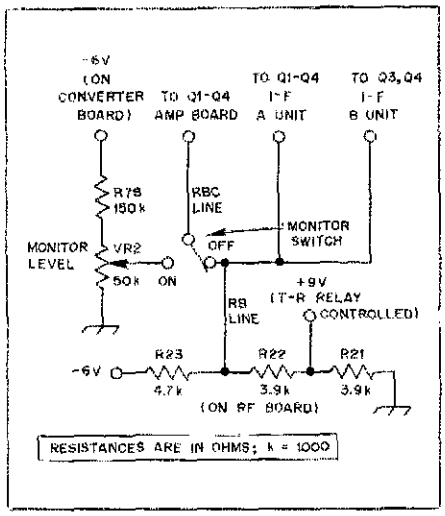


Fig. 2 — A simplified diagram of the R-820 biasing scheme. Component designations are those of the manufacturer.

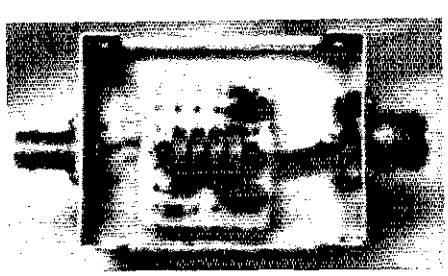
The T-R Switch

T-R switching can be handled effectively by a vacuum or reed relay system,[6,7,8] conventional electronic T-R switch,[9,10] PIN diodes[11] or diode switching.[12,13,14] All of the above methods were tried at N6ML, excluding the PIN diode switch.* The method used is a diode switch based on designs by Hildreth and Hitchcock. This method offers the following features: It is quiet; it involves no amplification or rf rectification; it is inexpensive; it provides excellent isolation; it eliminates the need for modification to the linear amplifier (if used) or transceiver; it is installed at a low rf voltage point in the system; it can be used with a separate receiving antenna; it is easily controlled by the logic circuits of modern keyers; and it is compact.

Control System

Muting the receiver, keying the screen voltage of the transceiver and activating the T-R switch requires a control system. The Accu-Keyer seemed to be the logical (no pun intended) choice.[15] In keeping with the various "monickers" of changes and accessories for the Accu-Keyer (Accu-Memory, Accu-Stop), I call this QSK feature Accu-Control. The control board addition to the keyer is shown in the top photo on page 32.

The basic Accu-Keyer circuitry is unchanged; an internal ac-operated power supply is used at my station. See Fig. 3. A



The simple T-R switch is enclosed in a small utility box. To prevent incorrect cabling, different types of coaxial connectors are used for the input and output circuits.

*Editor's Note: An article related to PIN diode T-R switching is planned for appearance in the March issue of QST.

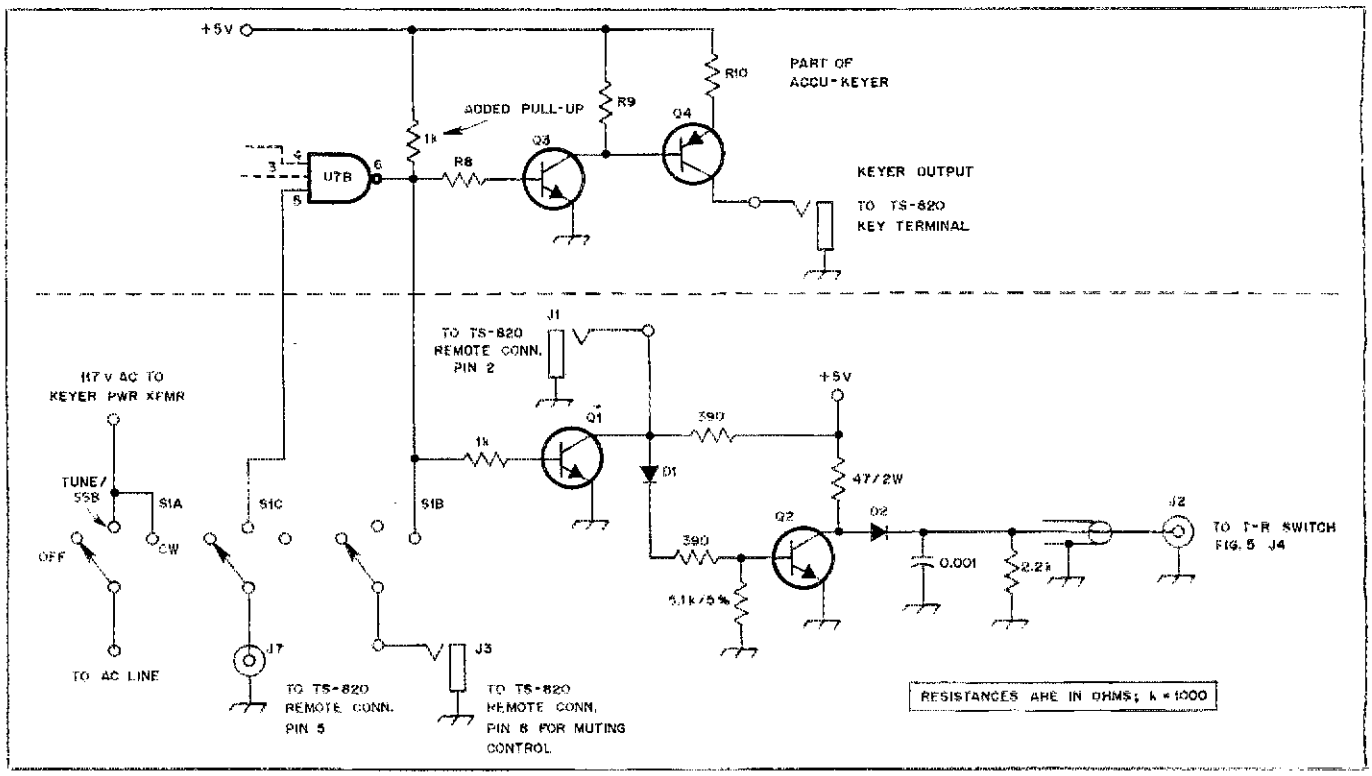


Fig. 3 — The Accu-Control circuit. The portion of the circuit above the dashed line is part of the original Accu-Keyer circuitry. A 1 kΩ pull-up resistor is added between the junction of U7B and R8 and the +5 volt line. All resistors are 1/2 watt unless otherwise specified.
D1, D2 — Silicon, 1 A, 600 PIV, 1N4004 or equiv.
J1, J3 — Miniature jacks.
J2, J7 — Phono jacks.
Q1 — Silicon npn switching bipolar transistor, 500 mW, 2N2222A or equiv.
Q2 — Silicon npn audio power bipolar transistor, 50 W, TIP31 or equiv.

3-pole, 3-position rotary switch (S1) replaces the ON/OFF toggle switch. S1A turns on the power supply during TUNE/SSB and CW conditions. S1B provides control of the receiver muting switch; when S1 is in the OFF or TUNE/SSB position, the receiver muting function is relay controlled. S1C grounds the manual key input to U7B pin 5 in the TUNE/SSB position through the TS-820 relay. A 1 kΩ pull-up resistor is added at the output of U7B pin 6. Q1 is used as an inverter. In the Accu-Keyer, U7C is unused and could replace Q1 if desired.

As shown in Fig. 4, Q3, Q4 and Q5 form the final-amplifier screen-voltage switch. When Q3 conducts during key up (Q4 and Q5 off), the 100 kΩ collector resistor reduces the screen voltage to +4 volts. When Q3 is turned off, Q4 is self-biased, turning Q5 on. Note that when this screen switch is disconnected from Q1 control, the switch self-biases and the TS-820 operates as though it were unmodified; ideal for operation of the transceiver alone.

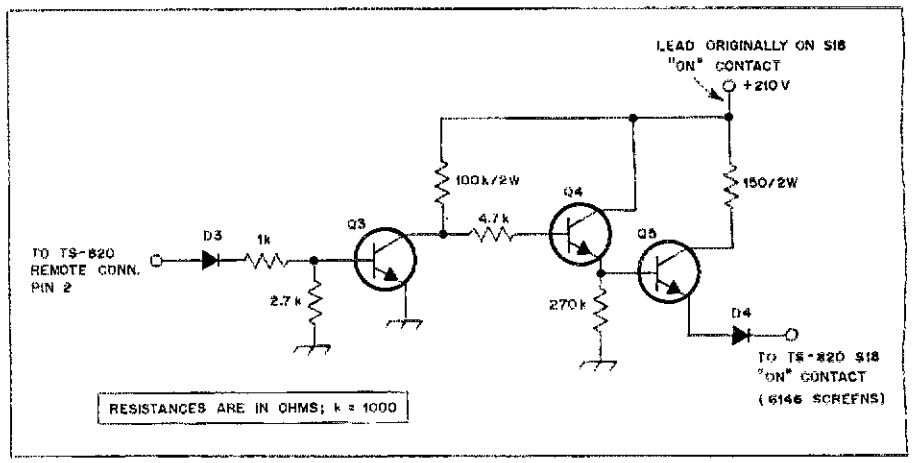


Fig. 4 — A solid-state screen switch for the TS-820 power-amplifier tubes. D4 is necessary only if the screen-switch circuitry is mounted outside the TS-820 chassis and cabled into the screen circuit; it acts as a safety device to prevent damage should the cables be reversed. All resistors are 1/2 watt unless otherwise specified.
D3, D4 — Silicon, 1A, 600 PIV, 1N4004 or equiv.
Q3-Q5, incl. — Silicon npn high-voltage audio power bipolar transistor, 300 V, MJE340 or equiv.

Q1 of Fig. 3 also controls the T-R switch of Fig. 5. When Q1 goes low, Q2 is turned off. This forward-biases D5, placing the junction of the choke, diode and two capacitors virtually at rf ground. This grounds the antenna-input circuit to the R-820. Diodes D6, D7 and D8 provide protection in case the biasing system fails. During initial testing, the logic control was not connected because of an operator oversight; no damage was sustained in the presence of 700 watts of rf power output!

QSK muting is performed by a switch (Fig. 6) composed of Q6 and Q7. Q7 is self-biased on through a 10 kΩ resistor, permitting +9 volts from the RLR line to bias the receiver to the operating mode via the RB line. When a logic voltage greater than +3 volts appears, the base of Q6 becomes positive with respect to the emitter and Q6 saturates. The base of Q7 is now negative with respect to its emitter and Q7 is off. When the logic voltage drops to less than +3 volts, Q6 turns off and Q7 turns on. This action is delayed 6 ms by the time constant of the RC network in the base lead of Q7. The receiver

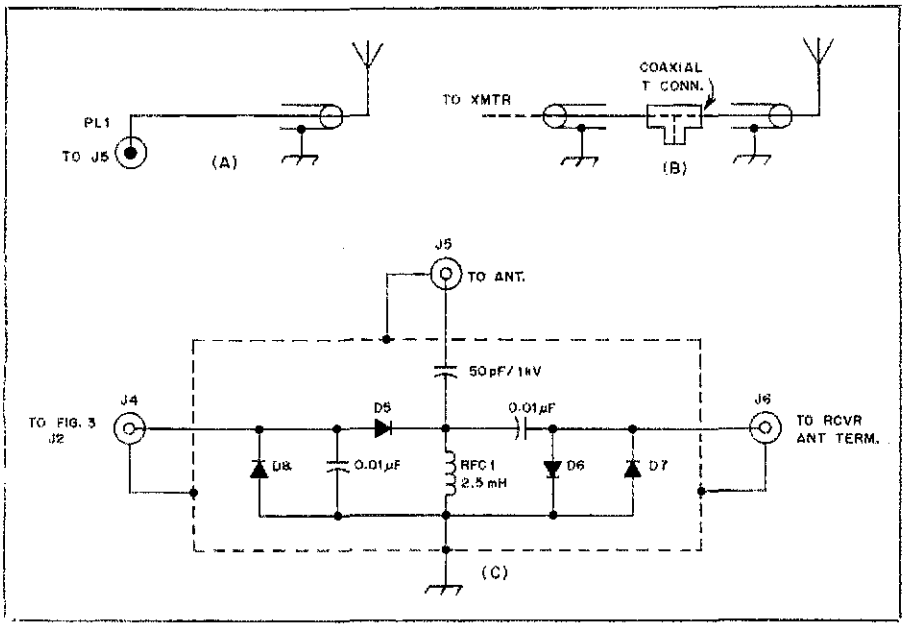


Fig. 5 — The T-R switch. At A, interconnections for using separate antennas on the receiver and transmitter. For use with a common antenna, the connections shown at B should be used.
D5-D8, incl. — Silicon, 1A, 600 PIV, 1N4004 or equiv.
J4 — Phono jack.
J5 — Type N or UHF chassis connector to mate with T connector.
J6 — Type BNC (or other) chassis-mount connector chosen to prevent confusion with J5 when interconnecting units.

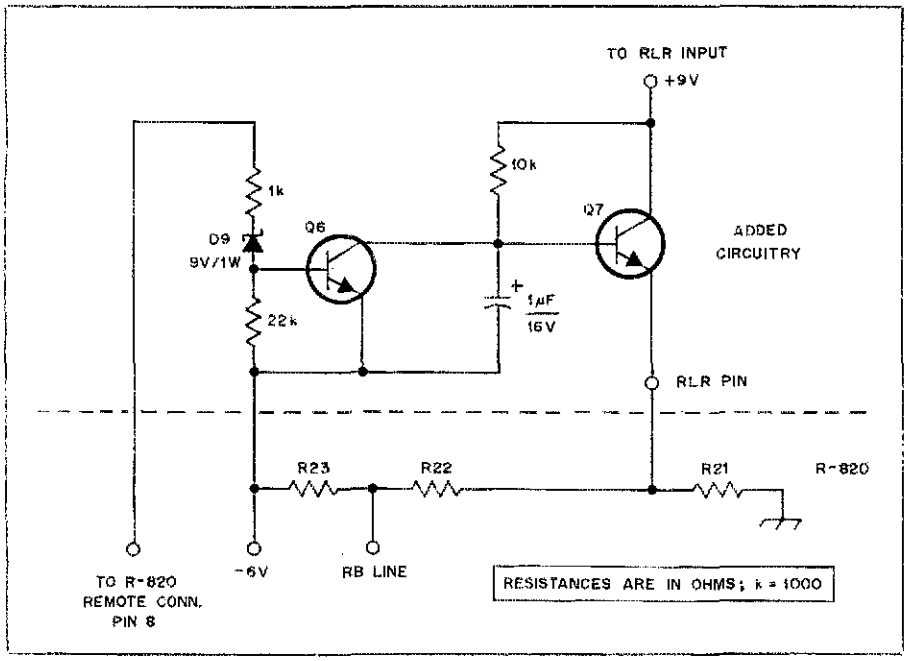


Fig. 6 — The R-820 muting switch. Components below the broken line are part of the R-820. All resistors are 1/2 watt.
D9 — 9-V, 1 W Zener diode (Radio Shack 276-562 or equivalent).
Q6, Q7 — Silicon npn switching bipolar transistor, 500 mW, 2N2222A or equiv.

is muted before rf is generated by the transceiver and remains so until a few milliseconds after the rf disappears. Since the cutoff bias is not applied to the age bus, the S-meter needle rests in the S0 position. The resulting receiver muting action is the fastest and smoothest ever experienced at my station.

Construction

No drilling or defacing of the '820 twins is necessary. By disconnecting leads from the terminal connectors in accordance with the manufacturer's instructions, circuits are installed using wire-wrap techniques on the connector pins and leads. This procedure makes it easy to return the twins to their original condition when trade-in time arrives.

Perfboard and point-to-point wiring may be used during construction. Terminal pins simplify board-to-board connections. The control board is stacked above the main Accu-Keyer board and they are housed in a Radio Shack chassis (270-252). The T-R switch board is mounted in a 2-3/4 × 2-1/8 × 1-5/8-in. (70 × 54 × 44-mm) box (Radio Shack 270-235) and attached to the SB-220 rf output connector by means of a coaxial T connector.

TS-820 Modifications

While this QSK system works just as well in the VFO transceive mode, factory-documented modifications for full transceive operation and anti-VOX operation with the R-820 should have been made previously. The screen switch board is placed beneath the final amplifier board of the TS-820. It is inserted into the final amplifier screen circuit at the +210-V terminal of the screen voltage ON/OFF switch (S18), which is located on the rear panel of the TS-820. Control wiring for the screen switch is brought in from an unused pin on the 8-pin accessory socket. Installation of a sidetone output jack is required. See Fig. 7.

If you do not wish to drill a hole in the rear panel of the TS-820, the RTTY input jack may be unscrewed and taped up, and a closed-circuit phone jack installed there. I preferred to drill a small hole next to the ac power connector, and installed a miniature closed-circuit jack there. The shielded leads to and from this jack may be either tack-soldered to the proper points or wire-wrapped on the pins of the card. Be sure to remove one end of cable ST from the circuit. Installation of the foregoing circuitry does not affect final-amplifier neutralization or any other transceiver adjustments.

R-820 Modifications

The FAST age time constant must be speeded up. This can be accomplished by tacking a 180 kΩ resistor in parallel with R40 on the IF-B board. There are two alternatives that provide greater control. The first is to replace R40 with a 5 MΩ potentiometer in series with a 50 kΩ resistor; then mount it in place of the VFO/FIXED CHANNEL switch on the front panel. The VFO/FIXED CHANNEL switch may be taped up and tucked out of the way until you are ready to restore the receiver to its original condition. The other alternative is to use the VFO/FIXED CHANNEL control to switch in various fixed resistances as shown in Fig. 8. This is the method used in my receiver.

Transceive operation and muting control require the following modifications:

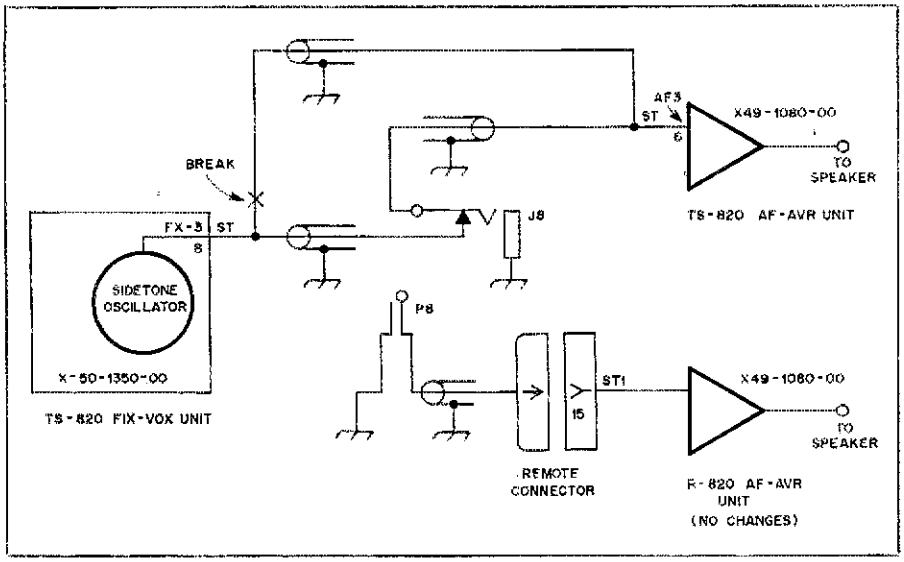


Fig. 7 — Sidetone-oscillator modification for the TS-820. J8 and P8 may be a compatible miniature jack and plug or standard 1/4 in. (6.4 mm) types if the TS-820 RTTY jack mounting hole is used; see text.

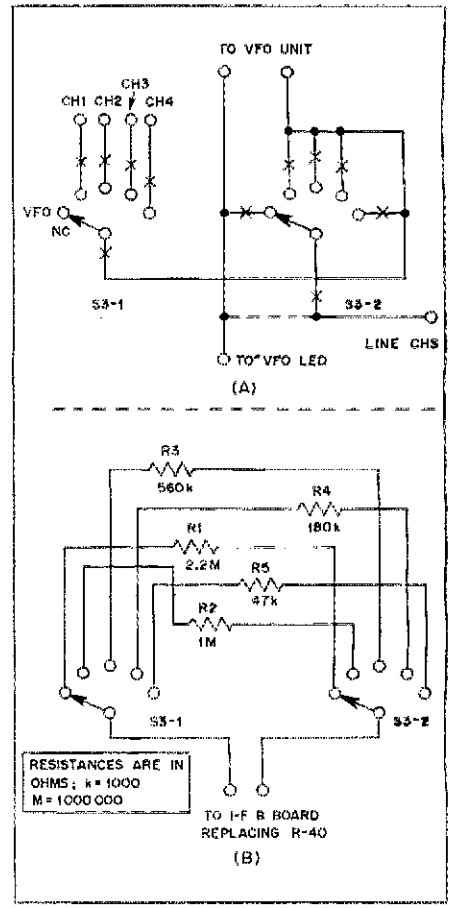


Fig. 8 — A diagram of one alternative method of modifying the R-820 VFO/FIXED CHANNEL switch. At A, the connections are broken at the points marked X. Fixed-value resistors are then connected between the various switch positions as shown at B. Resistors are 1/2 watt. The switch designation is that of the manufacturer.

1) Remove the lead going to MRL-4 on the converter board. This deactivates relay RL-2.

2) On the relay board, short pins 2 and 3 together by wrapping a wire around them and reinserting connector RL-3. (These pins are designated TCB-2 and RCB-3.) This action defeats the STANDBY function while in the MONITOR mode.

The muting switch is installed on a 2 in. (51 mm) spacer next to the rf amplifier board. A wire is soldered to pin 8 of the remote connector and to the logic input of the board. A connection is wire-wrapped to pin 3 (−6 V) of the rf amplifier board and then soldered to the −6-V input of the switch. The RLR wire is removed from the connector according to Kenwood instructions. This wire is then connected to the RLR input of the switch. The RLR output of the switch is wire-wrapped to the RLR pin of the rf amplifier board.

Operation

For ssb operation of the '820 twins, place the Accu-Keyer in the TUNE/SSB position, the linear amplifier (if used) in the TRANSMIT position and the MONITOR switch of the R-820 off. Your on-the-air ssb signal may be monitored by means of the TS-820 monitor function.

Cw QSK operation of the twins is accomplished by placing the Accu-Keyer in the ON position and the TS-820 in TRANSMIT (note the absence of a plate-current indication on the meter). The R-820 may be switched to either TRANSCEIVE or SEPARATE. In the TRANSCEIVE position, the VFO SELECT switch operates as follows: NORM — TS-820 VFO; RX — R-820 VFO; TX — TS-820 VFO; and REV — R-820 VFO. In the SEPARATE position, each unit uses its own VFO. Finally, place the MONITOR switch of the R-820 in the on position and the AGC switch to the FAST or OFF position.

VOX keying is obtained by putting the twins into the QSK mode, except the TS-820 should be in the VOX mode and the R-820 MONITOR switch should be turned off. During such operation, the VFO SELECT switch operates normally.

Comments

QSK operation of the '820 twins is incredibly smooth and fast-acting. The Accu-Control can be used with other rigs such as the Collins S-line (with the 32-S transmitter modified) and the Drake 4-line (no modifications necessary).[16] Additionally, the TS-520 (S, SE) used in VFO transceive with the R-820 works beautifully — don't forget to key the screens of the '520.

It's a good idea to purchase the TS-820 and R-820 service manuals; they may be ordered directly from Kenwood.[17] The operating manuals leave out much detail that is useful to the tinkering amateur. Addition of the sidetone output to the TS-820 is useful — it permits greater flexibility when using the TS-820 on cw with an external receiver.

The filter complement of my R-820 consists of the 500 Hz and 250 Hz second-i-f filters and the standard 2.4 kHz ssb filter in the first i-f. As a substitute for the Kenwood first i-f 500 Hz cw filter, I use the 400 Hz filter sold by the Fox-Tango Club.[18] My R-820 has a continuously variable i-f bandwidth tuning range from 100 Hz to 2.4 kHz.

I would like to thank Jack Gachesa, W6SCH, for his fatherly patience and technical advice. Thanks also go to Art Brittingham, W4MPT, for his constant reminder that "a lot of good will come from this!" QST

Notes

[1]Rusgrove, "Trio-Kenwood R-820 Receiver," *QST*, July 1979.
[2]Wade and Hallock, "CW Break-In for the Collins S-Line," *QST*, September 1970.
[3]Bryant, "Electronic Bias Switching for RF Power Amplifiers," *QST*, May 1974.
[4]Gleszer, "Upgrading Your SB-220 Linear Amplifier," *QST*, February 1979.
[5]Rolek, "For the SB-220," Hints and Kinks, *QST*, July 1979.
[6]Pluess, "A Fast QSK System Using Reed Relays," *QST*, December 1976.
[7]McKinley, "A New High-Powered Keyed Antenna Relay," *QST*, August 1967.
[8]Klinman, "A Vacuum Relay-TTL QSK Antenna Switch," *CQ*, July 1976.
[9]Rusgrove, DeMaw and Grammer, "Transmitting Accessories," *Understanding Amateur Radio*, 1977 edition.
[10]*The Radio Amateur's Handbook*, 1980 edition.
[11]Boomer, "Pin Diode Transmit/Receive Switch for 80-10 Meters," *Ham Radio*, May 1976.
[12]Hildreth, "More on Instant Voice Interruption," *QST*, June 1972.
[13]Hitchcock, "Syllabic VOX System for Drake Equipment," *Ham Radio*, August 1976.
[14]Hildreth, "Syllabic VOX System for the Collins S-Line," *Ham Radio*, October 1977.
[15]Garrett, "The WB4VVF Accu-Keyer," *QST*, August 1973.
[16]Klinman, "Full Break-In With the Drake T4XC-R4C Using the Vacuum Relay QSK," *CQ*, March 1980.
[17]Trio-Kenwood Communications, Inc., 1111 West Walnut, Compton, CA 90220.
[18]Box 15944H, West Palm Beach, FL 33406.

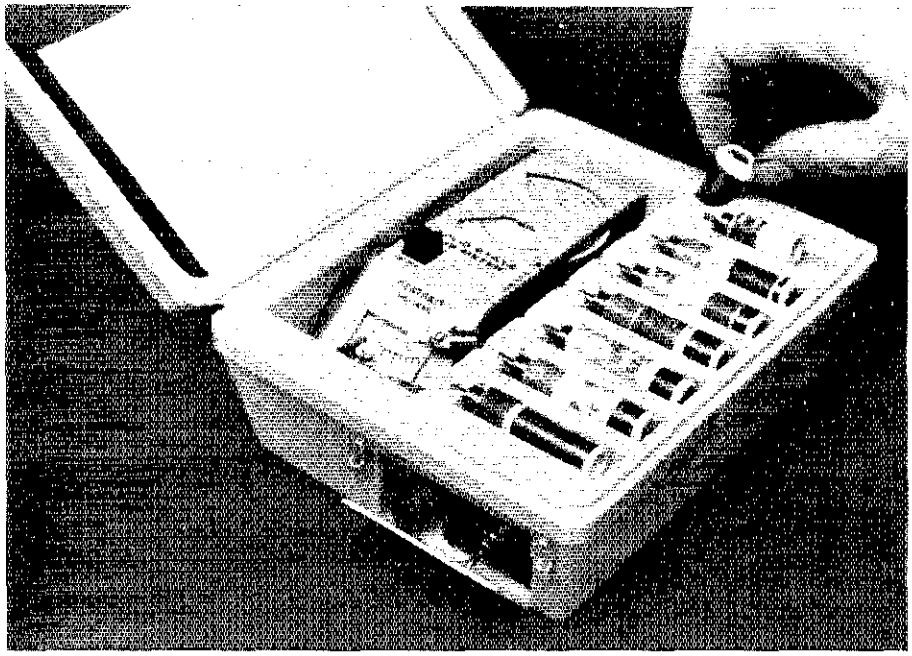
Add-Ons for Greater Dipper Versatility

Your dip oscillator may be in for a new ball game! These simple gimmicks and gadgets extend its usefulness and improve dial accuracy.

By Robert H. Johns,* W3JIP

Simple accessories can be added to your dip oscillator for increased usefulness. They do not require any modification of the basic instrument. All are "outboard additions" that complement the original equipment by providing improved dial accuracy and a means for capacitance coupling to inaccessible circuits. Furthermore, the add-ons make tuning easier by slowing the dipper tuning rate, an advantage when the device is performing as a signal generator. Another benefit is provision of convenient connections and components for measuring inductance and capacitance.

The accessories described apply directly to the Heathkit HD-1250 dip meter. The ideas, however, may be applied to other models, too.



The case of the Heath HD-1250 dip meter has plenty of extra space for accessories that belong with the dipper. A photocopy of the *Handbook* "L and C vs. frequency" graph is taped to the lid. Loose wire additions such as the capacitance probe and the phono jack are tucked in the instrument compartment. The door cut in the side permits access to the space under the coil tray for the plastic box and other coils. Solder lugs held by small hardware hold the door closed. The 5-μH standard coil has a plastic hat, white silicone rubber caulking compound, which prevents it from slipping through the mounting hole to the right of the dipper coils.

Accuracy

I found the dial calibration surprisingly accurate, especially for a kit. Dipper scales are never exact, and no one expects them to be. As I prepared a chart of how many kilohertz to add or subtract from the dial indication, I noticed that each amateur band required the use of a different coil except for 15 and 20 meters. The thought came to mind, "Why not adjust each coil so that it is 'right on' for the bands where the dipper is used most?" Not wishing to modify the coils themselves (they are nicely encased in plastic), I trimmed the inductance of each by the addition of tiny amounts of core material, either powdered ferrite or chips of copper.

First, I listened to the dipper on a calibrated receiver to determine the correction needed. If the dipper indicated 6.9 MHz when the receiver is getting the signal at 7.0 MHz, the coil is too small (too much C needed to resonate it at 7.0 MHz). This means a little more inductance needs to be added, which can be done by inserting pieces of ferrite from a junk-box coil. See Fig. 1. Use a hammer or pliers to break up the ferrite. Before adding the ferrite powder, plug the coil with some sort of plastic that will harden. Fill to a depth of 10 mm (0.4 inch) inside the coil form. Silicone rubber caulking or bathtub sealant has good electrical properties. Either makes a good embedding medium for the ferrite and can be dug out of the coil form if you later decide to remove it. As you add powder and little bits of ferrite, they stick in the silicone. You can follow the frequency change with your receiver and add inductance until both read the same frequency. Make sure that the dipper coil is plugged all the way into its socket since the capacitance involved at this point is part of the tuned oscillating circuit. Otherwise, a little slip will throw off the exact calibration you are aiming for.

Should the coil be too large (the dial

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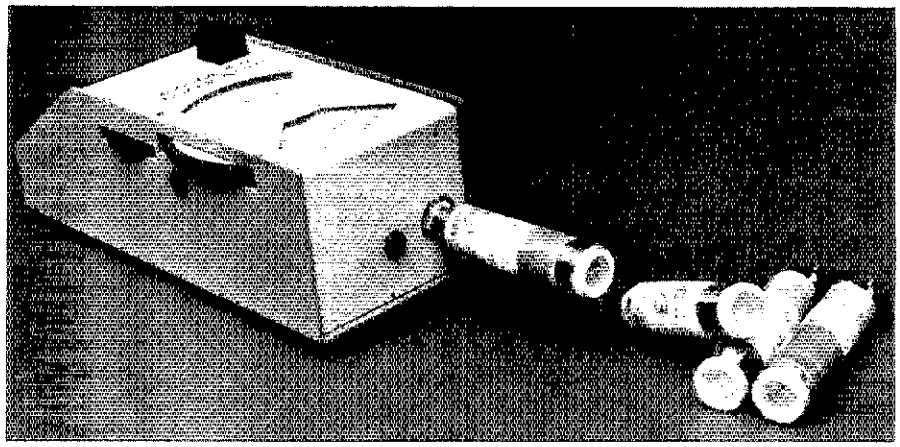


Fig. 1 — The Heath dip meter with plug-in coils. The silicone rubber that may be seen inside the coil has ferrite dust or copper chips embedded in it to trim the coil's inductance so that the dipper reads correct frequencies on amateur bands.

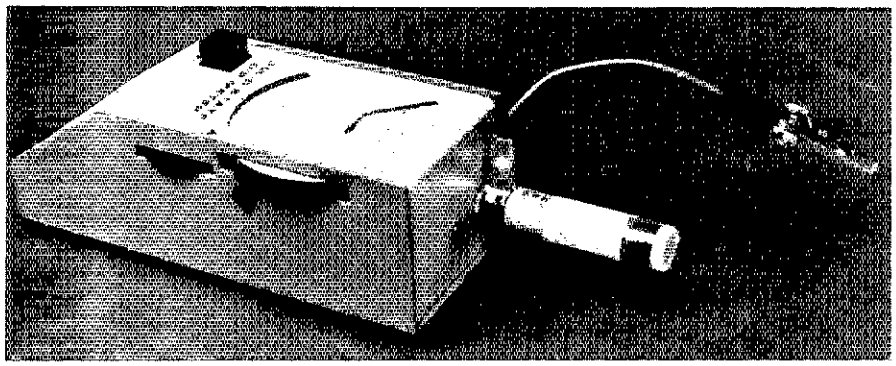


Fig. 2 — The capacitance coupling probe. The clip lead is connected to the circuit under test and is coupled to the dip meter through the small capacitance between the insulated collar and the phono plug of the coil.

indicating 7.1 MHz when the receiver is set at 7.0 MHz), the inductance may be decreased by placing small chips of copper in the coil. Each one acts as a shorted turn of a transformer secondary where the dipper coil is the primary. Cut pieces about a millimeter (0.04 inch) long from heavy copper wire and add them a few at a time to the silicone plug in the coil form. When enough core material has been added to a coil, squeeze some additional silicone into the coil form to cover and secure it. The silicone will set overnight and is easier to trim with a sharp knife than by trying to smooth out the uncured sticky stuff.

There is a little compromise concerning the 15/20-meter coil. That compromise in calibration amounts to the width of a calibration line. In other words, the calibration is about 1 mm (0.04 inch) off. That's very good, however.

Capacitance Coupling

After reading the recent article by Fred Brown, W6HPH,[1] I thought that I would try capacitance coupling to an unknown circuit as he describes. I agree with his conclusion that it works very well. I'm sorry that I did not know about this years ago! With capacitance coupling, you can dip an unknown circuit without having to place the dipper physically next to it so that the coils couple magnetically. The unknown can be a toroid or an LC circuit below a chassis or in a tight place. A single wire is clipped to the unknown and then lightly coupled (a few picofarads) to one side of the dipper tank circuit. A "no-holes" modification for the Heath dipper is accomplished by wrapping a turn or two of the insulated single wire around the outer surface of the phono plug of the dipper coil. This outer surface of the phono connector is not a ground. Rather, it is one side of the balanced oscillator circuit.

A more stable capacitance probe is shown in Fig. 2. An aluminum ring is bent and shaped to be a snug slip fit around the phono plug. The single wire is connected and black electrical tape wrapped around the ring for insulation. The capacitance between this ring and the phono plug is enough to couple the unknown circuit to the dipper so that a nice dip is observed at resonance. The ring may be cut and bent from aluminum sheeting, but I made the one shown from aluminum tape of the type sold in automotive stores. It can be cut with scissors, works easily and can be folded into layers to become as thick as

[1]Brown "A 1980 Dipper," *QST*, March 1980, p. 11.

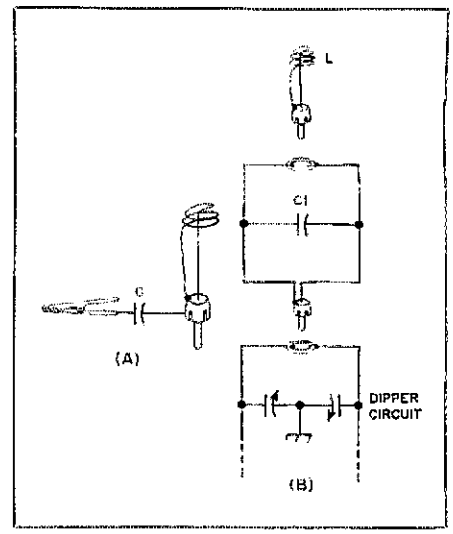


Fig. 3 — At A is shown the coupling capacitor, C, connected between the clip and the coil. Actually, this capacitor is simply the capacitance between the phono plug outer sleeve and the aluminum collar that fits around it but doesn't touch it. At B, a 150-pF or 100-pF capacitor, C1, is connected in parallel with the plug-in coil, L, and also the balanced tuning capacitors inside the dip meter. The capacitors are mounted in a plastic box and connections made by plugging the box in between the coil and the dipper.

desired. There are many uses for it in the ham shack.

This capacitance probe also provides uniform coupling to a circuit when measuring its Q, as suggested in the Heath manual. In brief, one measures the rf voltage across the test circuit and notes the change in frequency between the 3-dB-down points, where the voltage falls to 0.707 times the peak voltage. The Q of the unknown circuit is equal to the center frequency divided by the bandwidth. This measurement of Q with a dipper was new to me. It works out very well, provided that the coupling between the dipper and the unknown circuit is kept constant. The bandspread provided by the next circuit addition is also a help in measuring the 3-dB bandwidth since these frequencies are quite close together for high-Q circuits in the hf range.

Signal Generator

Although use of a dip meter as a signal source for an impedance bridge or as a signal generator in receiver work is common, the fast tuning rate is a handicap. It is tricky to get a dipper to stop in the passband of a receiver. Since the amateur bands are at the low end of the tuning ranges of the Heath dipper, a simple way to slow down the tuning rate is to add a capacitor in parallel with the tuning capacitor in the dip oscillator as shown in Fig. 3. No change need be made to either the dipper or the coil if the capacitor is placed between them. Placement must allow the coil to be plugged into the capacitor box and the capacitor box plugged into the instrument. With the 150-pF

padder in the circuit, the normal tuning range of the dipper from about 15 pF to 70 pF becomes about 165 to 220 pF. Accordingly, the frequency of the oscillator is both lower for a given coil and does not change over such a wide range. The green coil of the Heath dipper, which tunes from 12.5 to 26 MHz, oscillates from 6.7 to 7.7 MHz with the 150-pF capacitor in parallel with it. This capacitor serves to spread out the bands, 160 through 10 meters. The 50-pF capacitor gives 15- and 17-meter coverage with one coil and 30-meter coverage with another.

Capacitors, phono plugs and jacks are mounted in a small plastic box with the bandspread calibrations shown on the outside (Fig. 4). The calibrations are marked on colored tapes (Radio Shack 64-2340) that correspond to the colors of the coils. Which way to plug the box in is taken care of by the calibration scales; when you read the 40-meter scale, the box is plugged in with the proper capacitor connected.

The oscillator stalls at the high ends of the 160- and 80-meter ranges, probably from lack of feedback. This is easy to recognize, for the meter drops to zero and restricts the ranges only a little.

With the modification indicated, the dipper signal is easy to tune in on a receiver. Also, the Δf for Q measurements in or near the ham bands is easier to estimate from the bandspread scales, despite the inaccuracies in reading the calibration through the logging scale. The measurement of the rf voltage across the unknown circuit is made easier by using a digital voltmeter and a simple probe. The 0.1 millivolt sensitivity of these instruments makes this job a snap!

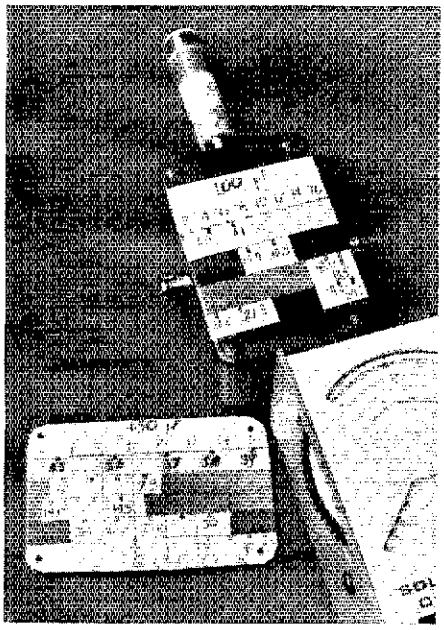


Fig. 4 — The 100-pF bandspread capacitor is connected between the coil and the dipper and the bandspread scales are taped on the plastic box. To use the 150-pF capacitor, the box is turned over and rotated 90°, and the other set of phono connectors is used.

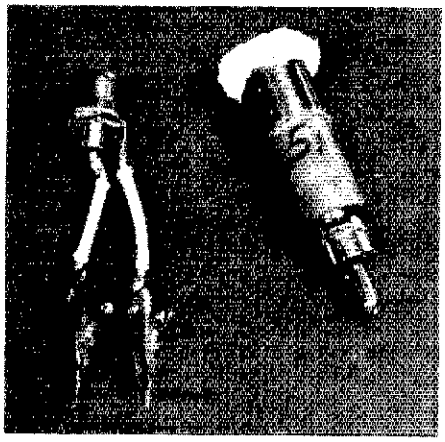


Fig. 5 — Accessories for measuring inductance and capacitance. The phono jack with clip leads will connect to the 100-pF standard in the plastic box and clip onto the unknown inductance. After locating the resonant frequency with the dipper, the value of the unknown coil may be read from charts in the ARRL *Handbook*. The standard 5-μH coil is about the same size as the dipper coils and can be plugged into the phono jack for connection to an unknown capacitor.

Measuring Unknown Coils and Capacitors

The box with a 50-pF capacitor inside fits right in with the graphs and the methods outlined in the measurements chapter in the ARRL *Handbook*. Unknown coils may be measured by connecting them to the 50-pF capacitor in the box via a phono jack equipped with short clip leads as in Fig. 5 and the resonant frequency of the combination found with a dipper. The graph of inductance vs. frequency for this capacitor will furnish the inductance of the unknown coil with no calculation.

Any of the dipper coils can be used as a standard in finding the capacitance of unknown capacitors; their inductance is given in the manual. This can get confusing, since the standard coil that is plugged into the phono jack and connected to the unknown capacitor is sometimes needed in the dipper to scan for the resonant frequency. I prefer to make up a small 5-μH standard that can be stored in the plastic dipper box along with other accessories. It could have been put in the plastic box, but I was afraid of stray coupling and false resonance. The small coil in Fig. 5 is wound on a length of half-inch PVC tubing which is obtainable from the plumbing department of many hardware stores. A good phono plug (Radio Shack no. 274-339) fits snugly in this tubing.

It should be clear that any of these additions to your dip meter could be made independently of the others and according to your interests and needs. The dipper is one of the most useful devices in the shack and it can become even more versatile!

Strays

TA PROFILES

☐ We are pleased to have Jim Stewart, WA4MVI on our team of ARRL Technical Advisors, serving as our radio propagation/predictions and EME specialist. In 1978 Jim had a book published on this subject, entitled *VHF Radio Propagation*.

First licensed at age 15, Jim presently has an Extra Class license, and is the proud holder of a WAS certificate on 6 and 2 meters, plus a WAC certificate on 2 meters. His principal interests in Amateur Radio include EME, vhf/uhf, propagation, radio astronomy and OSCAR programs. He is also involved in flying, skiing and sports cars.

As a chemistry major, Jim received his BS degree from Lander College. He resides in Hendersonville, North Carolina, and is employed in air traffic control and as a commercial pilot. — *Marion Anderson, WB1FSB*

TA Jim Stewart, WA4MVI

HAPPY BIRTHDAY AMSAT-OSCAR 8!

☐ March 5 marks the completion of three years of successful operation for AMSAT-OSCAR 8. The satellite will have provided flawless service to Amateur Radio operators, students and science teachers worldwide during 15,280 orbits.

To commemorate this anniversary, ARRL will issue a special QSL card. During the period March 1 through 7, send a signal-reception report to AMSAT-OSCAR 8 Third Anniversary, ARRL Club and Training Dept., 225 Main St., Newington, CT 06111. Provide as much information as possible, including calls heard, telemetry and frequency. Check the OSCAR Operating Schedule elsewhere in this issue or write ARRL Hq. for details on how to listen for AMSAT-OSCAR 8. — *Bernie Glassmeyer, W9KDR, ARRL Satellite Coordinator*

• *Basic Amateur Radio*

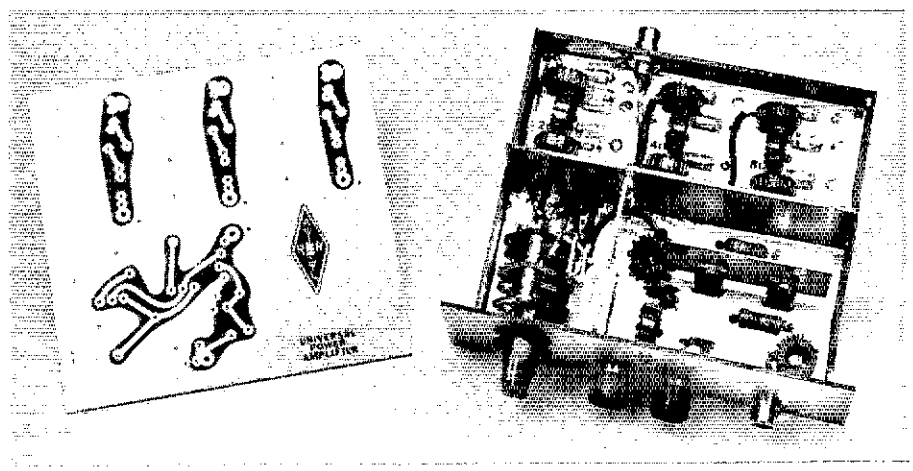
The Basic "Nonlinear" Amplifier

Has QRM put the skids under your QRP activity? Here's a 6 dB booster for the Universal Transmitter and other 2 watt QRP rigs.

By Doug DeMaw,* W1FB and Peter O'Dell,** AE8Q

Years ago coauthor O'Dell was fond of spicy food — in particular, *hot* spicy food. He often used the phrase, "the hotter the better." Then his father introduced him to some home-grown peppers; after two mouthfuls O'Dell decided that discretion is the better part of valor and thereafter modified his statement about hot, spicy food. When he returned home, his father insisted on sending along several cans of the peppers. One can was promptly given to friends who were hosting a New Year's Eve party. The brother-in-law of the host had the reputation for exhibiting many of the characteristics of a cross between a horse and a donkey — he was a self-made man. At the party he boasted that he liked hot things. How hot? The hotter the better, of course. As the host retreated to the kitchen to get something "special" for him, several others exchanged knowing glances.

After the first mouthful, the guest's face became flushed and tears streamed down his face. But he kept right on eating the peppers and insisting he liked them. He spent the rest of the evening drinking large quantities of soda-pop and whispering "excuse me."



Circuit board for amplifier and completed project. Notice that precautions have been taken to isolate the input from the output.

A Sense of the Appropriate

Some operators are dedicated to using *very low* power all the time, and reject the idea of running more than 1 or 2 watts, no matter what the conditions are. This is called "QRP," and is satisfying to some skilled operators. But Amateur Radio is a pastime some people enter with a relatively low level of skill — both technical and operating. Most continue to develop these skills by mastering increasingly difficult or more complex tasks. Running no more than a watt or two is difficult for the new operator. For a new operator to decide that it is never warranted to run more than 2 or 3 watts is a little like our friend with the peppers. He may be able to do it, but chances are he really won't enjoy himself! It is sometimes more fun to recognize our limits and then make the best of them and the circumstances.

The opposite end of the scale from the fanatic who insists on running QRP when conditions do not warrant it is the lid who fires up his 2 kW amplifier to chat with Charlie who lives five blocks away. FCC rules require that amateurs use no more power than necessary to maintain reliable communications. After some on-the-air experience, you will develop a sense of the appropriate. If conditions are poor, your skills are not quite up to par or you don't have a good antenna system, you will probably want to switch on the amplifier. On the other hand, if conditions are good, QRM is light and you can maintain reliable communications, you should turn the amplifier off. You will keep the QRM down and save energy as well!

DB, Gain and Confusion

An area of confusion concerning amplifiers is *gain*. Is a signal that is four times more powerful four times better? Usually, the gain of an amplifier or antenna or other device is expressed in decibels (dB). The decibel, which was originally formulated for audio work, is based on logarithms because it was discovered that

*Senior Technical Editor, ARRL
**Basic Radio Editor

the human ear has a logarithmic response. If a person thinks a 40 watt sound is twice as loud as a 10 watt sound, then he will think that a 400 watt sound is twice as loud as a 100 watt sound. In other words, it is the ratio that is important and not the absolute values of the two sounds.

A complete discussion of decibels is beyond the scope of this article, but there are a few simple relationships that we can work with. A 1 dB increase is that ratio at which a person will notice that there has been a change. If we double the power present in a signal, that is a 3 dB increase. If we double it again, it will be a 6 dB increase (3 dB + 3 dB). Decibels add, so don't fall into the trap of trying to multiply them. We once heard an operator on the air talking about his pair of stacked 11-element Yagis for 2 meters. He said they provided him with 26 dB of gain. Upon further questioning we found that he had arrived at this truly amazing figure by noting that one of the beams by itself was rated at 13 dB. Therefore, he concluded that two of them stacked together must give 26 dB of gain. If everything was optimum, the most our friend could have hoped for by doubling the size of his antenna was approximately 3 dB gain over one of the antennas by itself. There is a big difference between 16 dB and 26 dB!

These same limiting principles hold for amplifiers as well. Going from 500 W to 1000 W will result in a 3 dB gain in your signal. Figuring the trade-offs between increased expense and increased payoff (dB) is often downright frustrating. We have opted to build an amplifier for this project that will give us a 6 dB gain over our 2 W transmitter by itself. In other words, we will double our output from 2W to 4W for a 3 dB gain, and then we will double the 4 W to 8 W for the second 3 dB increase, yielding a total gain of 6 dB. This is a good compromise in terms of noticeable improvement in signal strength, cost and availability of components.

Linear vs. Nonlinear

Even those with only a modest understanding of the technical side of things find the contemporary misuse of the word "linear" humorous and sometimes embarrassing. An amplifier is a device that increases the power of a signal. If the amplifier is linear, the output signal will be a large-scale version of the input signal — sort of like a photographic blow-up. If the amplifier is nonlinear the output signal will probably occur at the same frequency as the input signal, but the envelope (shape) of the output will not necessarily correspond to the input — that is, it will be somewhat distorted.

If the output of a "nonlinear" is distorted, then it must be useless, right? Wrong! For cw communications, the receiving operator needs to know whether the signal is on and for how long, not whether it is an exact replica of the signal that came out of the oscillator or driver stages. This kind of distortion is irrevelant for fm communications also.

The most common type of nonlinear amplifier is the Class C amplifier. The other types of amplifier commonly used in radio circuits are the Class A, Class AB and Class B. Assuming they are properly connected, these last three will operate as linear amplifiers. A Class A amplifier conducts during 100% of each cycle. A Class B amplifier conducts for 50% of the cycle; linearity is usually achieved by using two devices (one for each half of the cycle) and summing their output. A Class C amplifier conducts for only about 30% of the cycle — hence the distortion to the envelope of the signal.

The major advantage of a Class C amplifier is in terms of efficiency. Efficiency (expressed as a percentage) is the ratio of power out of a circuit to dc power into it. For instance, if the output of an amplifier was 10 watts and the dc input power (not driving power) required to operate it was 20 watts, the efficiency would be 10 divided by 20 multiplied by 100, or 50%. Input power here refers to the dc voltage and current taken from the power supply. Class C amplifiers can have an efficiency in excess of 70%, while linear amplifiers seldom display more than 60%.

A nonlinear amplifier can be more practical if the output signal is not required to be an exact replica of the input signal, which is the case with cw and fm.

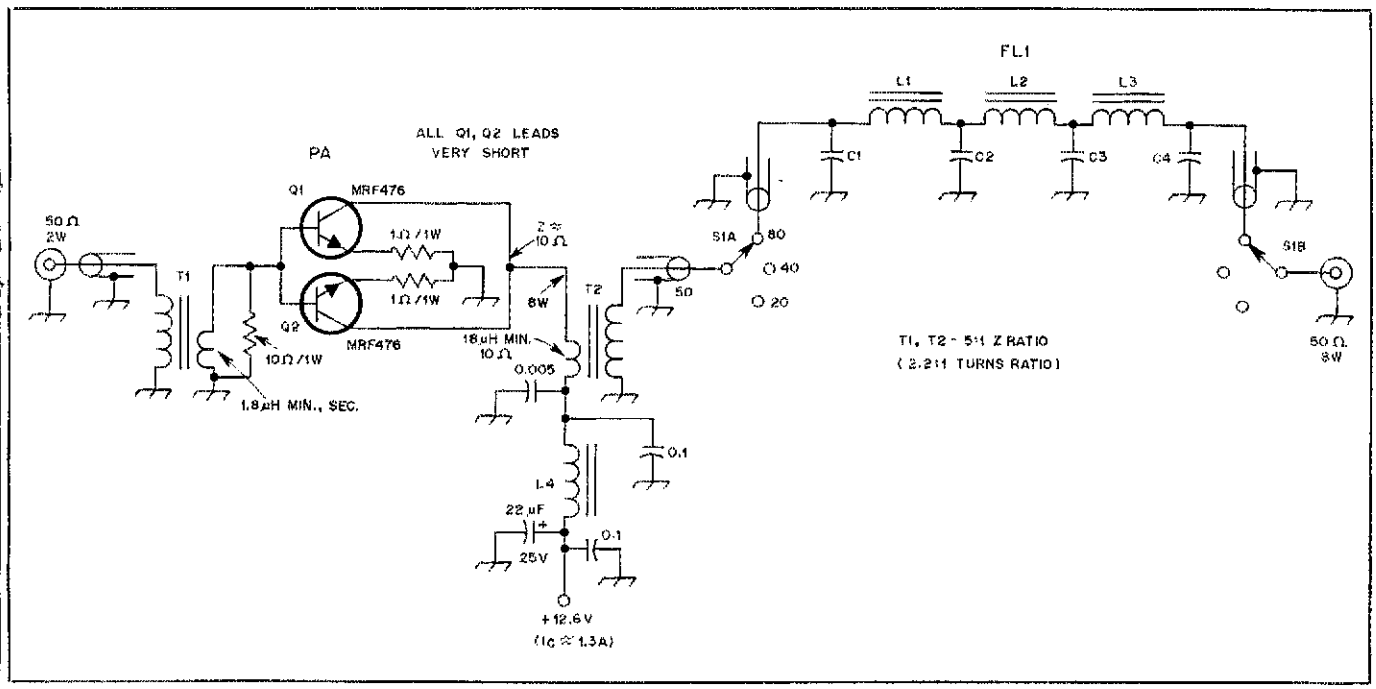


Fig. 1 — Schematic diagram of the amplifier. Capacitors are disc ceramic, except those with polarity markings, which are electrolytic. Resistors are 1-watt carbon-composition types. Parts values for the components of the filter sections can be found in Table 1.

L4 — 8 turns of no. 20 enam. wire on an Amidon Associates FT-50-43 ferrite toroid.

Q1, Q2 — Silicon npn rf bipolar transistor, 10 W, Motorola MRF476 or equiv.

T1 — Broadband toroidal transformer, 5:1 impedance ratio. Primary contains 11 turns of no. 22 enam. wire on an Amidon Associates FT-50-61 toroid core. Secondary consists of 5 turns of no. 22 enam. wire over the primary winding.

T2 — Broadband toroidal transformer, 5:1 impedance ratio. Primary consists of 5 turns of no. 20 enam. wire wound on an Amidon Associates FT-82-61 toroid core. Secondary consists of 11 turns of no. 20 enam. wire over the primary winding.

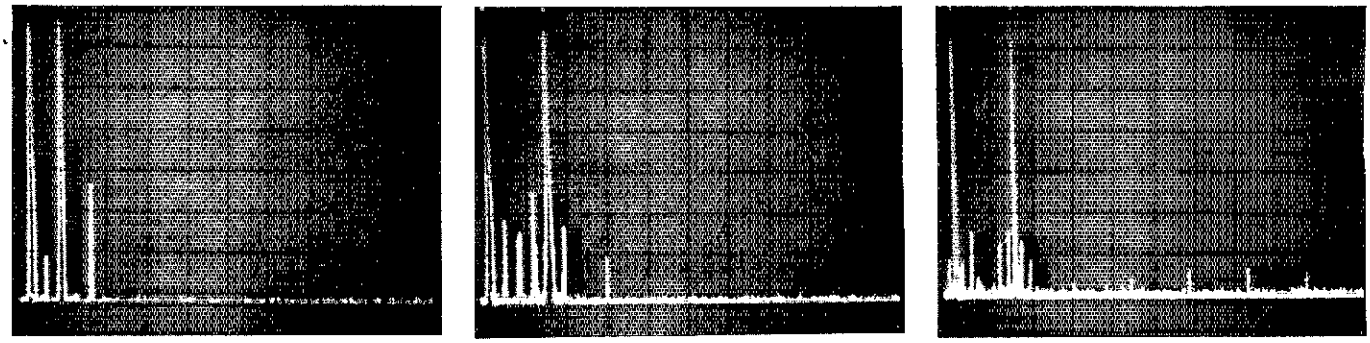


Fig. 2 — Spectral display of the amplifier for each band of operation, 80, 40 and 20 meters, left to right. At full power output all spurious emissions are more than 40 dB down from peak power. Vertical scale: 10 dB per division. Horizontal scale: 5 MHz per division for 80 and 40, 10 MHz for 20. The amplifier complies with current FCC spectral purity requirements.

A-m signals (including ssb) require a linear amplifier. The misuse of the term linear seems to have started with the CB service; most of the users talk about "linears." Unfortunately many of the illegal amplifiers purchased by operators in this service (which is confined to a-m types of signals) are in reality Class C amplifiers,[1] far from being linear. Although some vhf amplifiers can be operated either Class C or Class AB by throwing a switch that changes the bias, the vast majority of these amplifiers in service are Class C only, which is all that is needed for fm operation. Common amateur parlance lumps them all together wrongly as "linears." Depending on the circumstances, this malapropism can be either humorous or embarrassing.

How the Circuit Operates

Our objective in building this amplifier is to boost the power of the QRP transmitter described in December 1979 *QST*.[1] Of course, this amplifier will work with other low-power rigs, provided no more than 2 watts of drive is applied (e.g., the Heathkit HW-7 and HW-8 transceivers).

We want not only to boost the power, but to have an amplifier that is stable, reliable and low in harmonic output. This has been achieved through careful circuit layout, short leads and the use of broadband circuits.

T1 of Fig. 1 is a broadband toroidal transformer that gives us a 2.2-to-1 turns or voltage ratio. This can be converted to an impedance (Z) ratio by simply squaring the numbers. Hence, Z ratio = 2.2^2 or 4.84:1. This is close enough to the desired 5:1 impedance transformation we need to go from a 50 ohm driving source to a Q1/Q2 base impedance of roughly 10 ohms. A slight mismatch will not spoil the amplifier performance. Rather, it will reduce the drive reaching the bases of the amplifier transistors. The result is reduced output power from the amplifier. With the turns ratio specified for T1, the maximum safe power for the two transistors is realized when 2 watts of drive is applied to T1. The 10-ohm resistor across the T1 secondary winding helps to stabilize the amplifier by lowering the Q (quality factor) in that part of the circuit.

Each emitter (Q1 and Q2) is returned to ground via a 1-ohm resistor. This helps to ensure that one transistor doesn't "hog" the current and have its power rating exceeded. We can think of these components as "equalizing" or "balancing" resistors. Since they are not bypassed for rf, they cause the amplifier to be slightly *degenerative* (degenerative feedback), which causes a small but not significant power loss. Emitter bias in a Class C solid-state amplifier aids the Class C conduction angle, however, thereby (in theory) improving the amplifier efficiency.

The impedance of the Q1/Q2 collectors in parallel is approximately 10 ohms at 8 watts of output. This is approximated by

$$Z_o = \frac{V_{cc}^2}{2P_o}$$

where Z_o is the collector impedance in ohms, V_{cc} is the collector-to-emitter voltage and P_o is the amplifier output power.

T2 is another broadband transformer that transforms the 10 ohm collector impedance to 50 ohms, thereby providing a proper match to the 50 ohm harmonic filters (FL1). L4 is a decoupling choke that is used in combination with the four associated bypass capacitors to prevent amplifier rf energy from following the +12.6-volt line to other parts of the system — notably the exciter and VFO. If unwanted rf energy was permitted to reach the exciter it could lead to instability in the exciter or the amplifier, or both, because of feedback voltage. Various values of capacitance are used in this part of the circuit to ensure effective bypassing from vhf down to audio frequencies.

To prevent TVI and interference to other services we must make certain that the amplifier output is clean (contains essentially the desired signal energy). The 7-element low-pass filter (FL1) does an excellent job of "laundering" or "sanitizing" the amplifier output. Spectral photographs are shown in Fig. 2. A separate filter is switched into the circuit for each band of operation by means of S1. For this filter (or any filter) to work as designed it must be terminated in its characteristic impedance. Therefore, our antenna must present a 50-ohm impedance to the amplifier. The SWR should always be lower than 2:1 (preferably 1:1) to prevent damage to Q1 and Q2 and to ensure proper filter action.

The MRF476 transistors were designed primarily for the CB market. Therefore, they work nicely from 160 meters through 10 meters. This amplifier will provide a 6 dB increase over your 2-watt signal — a real boon to being heard better when the going is rough or marginal. For a more thorough discussion of amplifier circuits, consult the appropriate chapters of *The 1981 Radio Amateur's Handbook* and *Solid State Design for the Radio Amateur* (available from ARRL postpaid for $10 and $7, respectively).

Singular Board

As this series developed, it soon became apparent that the Universal Breadboard was as popular as it was functional. In fact, it was so functional and so popular

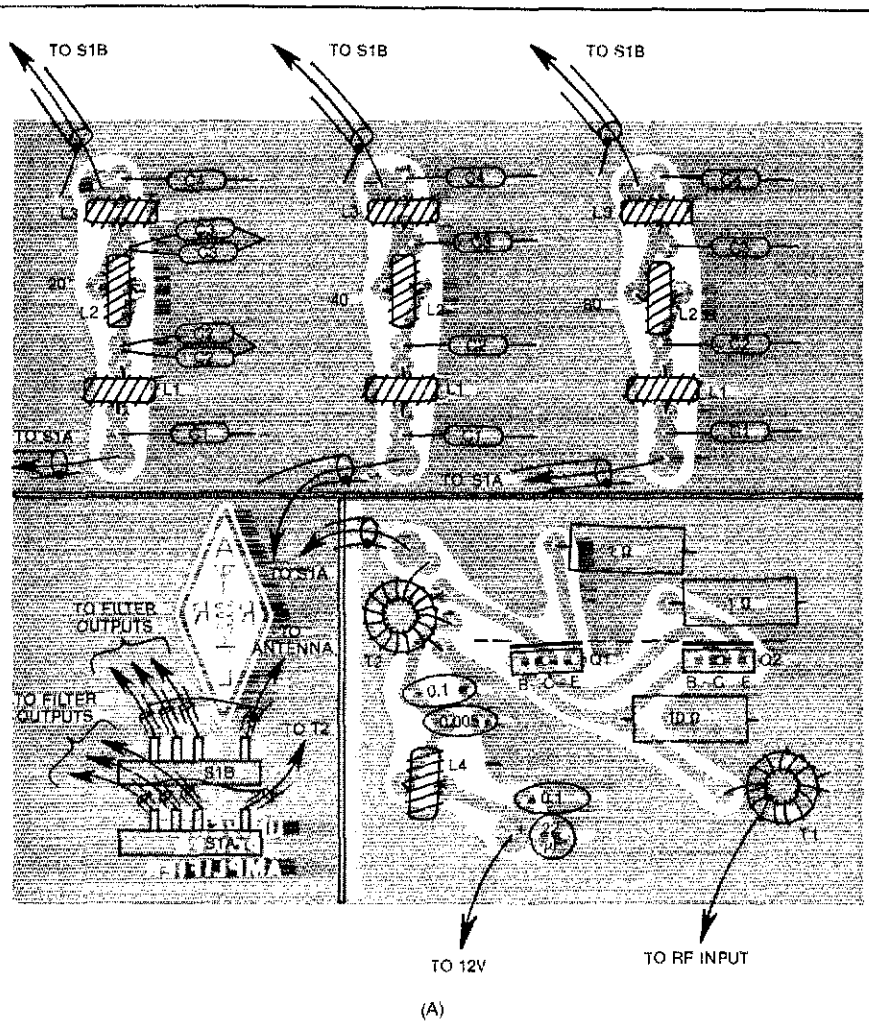
Table 1

Filter Component Values

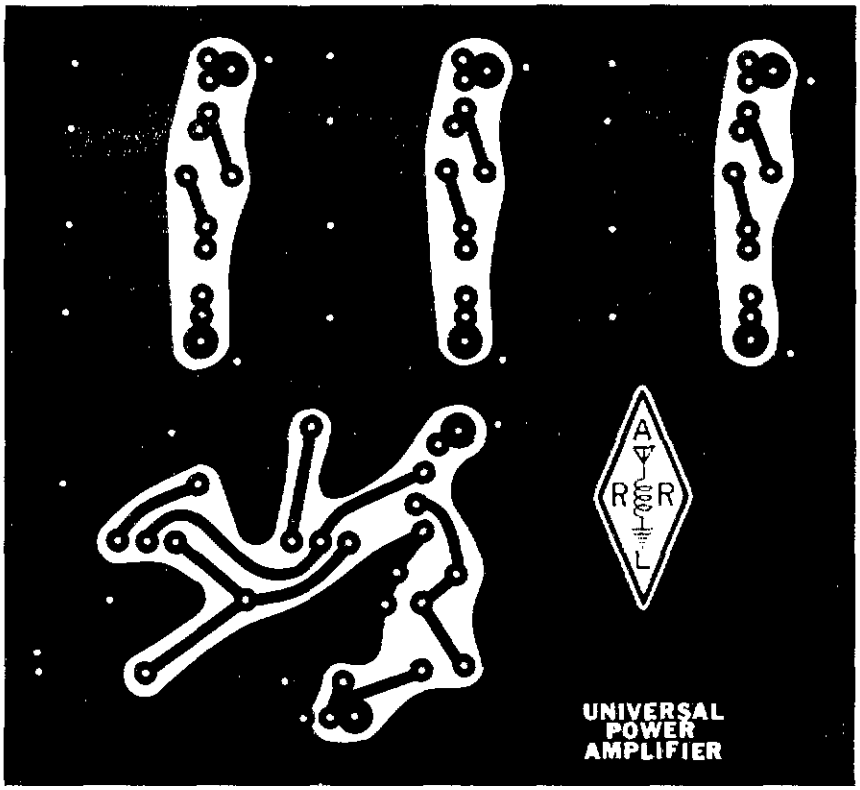
Band	C1, C4	C2, C3	L1, L3	L2
80 M	560 pF	1200 pF	2.7 μH, 23 t. no. 22 T50-2	3.2 μH, 25 t. no. 22 T50-2
40 M	300 pF	680 pF	1.46 μH, 17 t. no. 22 T50-2	1.75 μH, 19 t. no. 22 T50-2
20 M	150 pF	360 pF	0.75 μH, 14 t. no. 20 T50-6	0.9 μH, 15 t. no. 20 T50-6

Note: Capacitors are polystyrene or silver mica.

[1]Notes appear on page 44.



(A)



(B)

that it precipitated several bad jokes — the proposed projects ranged from the ridiculous to the bizarre, with one or two being physically impossible. Originally, we considered building this circuit on the Universal Breadboard. We did construct a version on one board, and it did work — sort of. Component spacing and isolation of input from the output were real problems. Those of you so choosing will be able to build this circuit on *two* of the breadboards with little difficulty. However, we decided that an etched circuit board designed specifically for this project — a singular board, if you will — would suit our purposes nicely and would be a worthy culmination to this series.[2] Fig. 3A provides a parts-placement guide for this circuit board.

Notice in the photograph of the amplifier that we have paid particular attention to shielding. The circuit has been divided into three compartments with vertical strips of double-sided pc-board material. Where it is necessary to pass leads from one compartment to another, holes have been drilled in the pc board "walls" and miniature shielded cable (RG-174/U or equivalent) has been used. Also, notice that in each filter section L2 is mounted perpendicular to L1 and L3. This is done to minimize stray coupling between the stages of the filters.

If you look closely, you will see that our foundation is a double-sided pc board. The top (component side) is only etched around those holes where leads pass through the board to be soldered. This is done to reduce the likelihood of a lead shorting to the top-side foil. The top foil, which is soldered to ground connections in several spots, serves as a ground plane and aids stability. The ground plane acts as a large capacitor and will bypass to ground any stray vhf or uhf currents that might develop. Connecting the ground plane to the etched-side ground in several spots reduces the potential for ground-

Fig. 3 — At A, parts-placement guide for amplifier components. Parts are placed on the top side of the board; the shaded area represents an X-ray view of the copper pattern on the bottom side. Resistances are in ohms. Capacitance values are in microfarads. Solid lines indicate compartment shields. The broken line indicates the heat sink for Q1 and Q2. Component values for the filter sections can be found in Table 1. A 27 pF and a 330 pF capacitor have been wired in parallel to provide approximately 360 pF at C2 and at C3 of the 20-meter section (it is often difficult to locate values of 360 pF). The four braids of the cables coming into S1A are soldered together as close to the switch as practical. A piece of fine bare wire may be used to lace the braids together to facilitate soldering. A similar procedure is used to solder the braids together at S1B. At B, circuit-board etching pattern for the amplifier. Black represents copper. The layout is shown at actual size from the pattern side of the circuit board. Leave the other side of the double-sided board intact during the etching. After drilling holes for leads, scrape 1/8 inch (3 mm) of the foil away from each hole.

loop currents to occur.

C1 through C4 should all be silver-mica or polystyrene capacitors. If polystyrene capacitors are chosen, be careful during installation. These capacitors simply will not withstand high heat. (Don't linger at the connection with the soldering iron.) The wire for winding the coils should be enameled. The 1 W resistor paralleled with T1 should be a noninductive carbon composition type. The band switch is a double-pole, three-position rotary type. At this power level, phenolic insulation is adequate for the switch; of course, if you have a small ceramic switch available, it will be ideal.

Although Q1 and Q2 are operated within their safe limits, it is a good idea to provide them with a heat sink. These transistors are packaged in the TO-220 style of case and have the collector connected directly to the mounting tab. A small heat sink is fashioned out of a strip of copper or pc-board material. The mounting tabs are then bolted to this strip. Because this is a direct electrical connection to the collectors of the transistors, make certain that the heat sink does not come in contact with the housing or any other component.

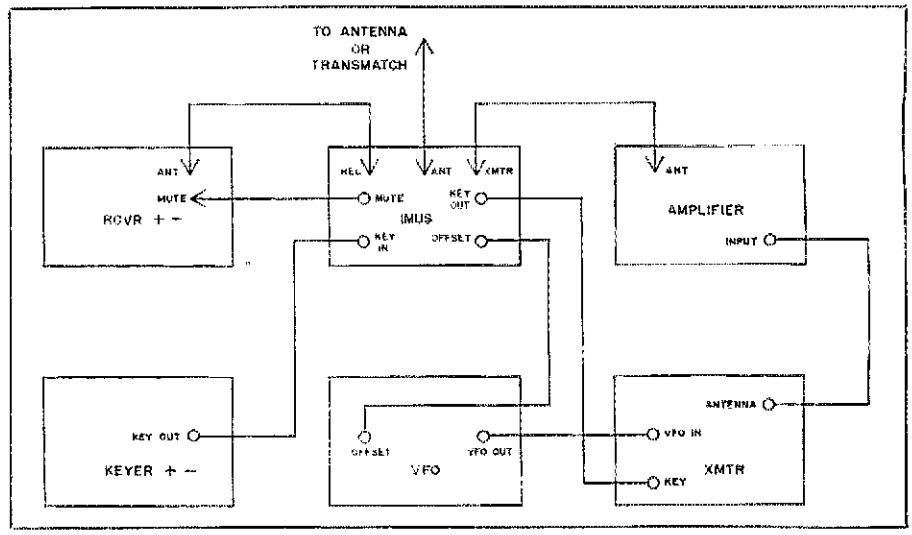


Fig. 4 — Pictorial of front panels and interconnection cables for the amplifier and the other units of this series. Power supply connections are indicated by + and −. Arrow heads indicate connections to be made on the rear of the unit.

Hookup

Simply put, the amplifier must go between the transmitter output and the antenna. Even though this seems simplistic, the logistics of installing the amplifier can be a little complex, depending upon your individual station and what accessories you may have. If you have built the other projects in this series, then the amplifier goes between the transmitter and the IMUS control (Fig. 4). If you will be driving the amplifier with an HW-8 or similar *transceiver*, then you will have to make arrangements to switch the amplifier out of the antenna line during reception. Additionally, we suggested at the beginning of this article that you should learn when to use the amplifier and when not to. How are you going to switch the amplifier in and out of the line conveniently? Two thoughts come to mind. You might consider adding an additional switch (double throw, double pole) which will allow you instantly to select between the amplifier and a *short* conductor. Remember to keep the input and output of the amplifier isolated. If you are using the projects from this series, then you might consider replacing J1 and J2 with short runs of coax with plugs on the ends. It would be a simple matter to unplug the amplifier and plug in the original jumper cable that runs from the transmitter to the IMUS control. Before you begin construction, sit down and carefully think through what you want in terms of options and convenience. Then custom-design this installation to fit your station.

If you have been operating your station from the variable power supply from this series,[3] you will need to make other arrangements for powering the amplifier. In fact you will be better off operating the amplifier from a different supply even if the supply that you are currently using will provide enough current for the amplifier and the other pieces of equipment that you are using. Separate power supplies lessen the possibility of rf from the amplifier getting into the low-level stages of the transmitter and causing problems. The 5 A supply from this series[4] would be ideal, or you could use one of the 2 A regulated supplies commonly sold for powering CB rigs.

The End? No, It's Just Starting

If you have followed these projects from the beginning and have assembled a complete station from this series, please drop us a note with your personal impressions of your equipment. If you can, please send along a good, high-contrast black-and-white photo of your station. We can't promise anything, but some of the material just might make it into "Strays." By the way, "instant" photos are almost never suitable for reproduction.

The whole idea behind this series is to provide you with simple (Universal, eh?) projects that would give you a basic station that is fun and convenient to operate. If it is not convenient, the fun wears off fast. Don't be like our friend with the hot peppers — if it is not fun, figure out why not and do something about it. Once you've perfected the device that will make it fun and convenient again, write us and ask for our author's guide. That is how we get a lot of our good outside articles. ~

Footnotes

[1] DeMaw and Shriner, "Transmitter Fundamentals," Basic Amateur Radio, *QST*, December 1979, p. 11.
Circuit boards, negatives and complete parts kits for this project are available from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002.
[3] DeMaw and Shriner, "A Simple Utility Power Supply," Basic Amateur Radio, *QST*, November 1979, p. 22.
[4] O'Dell and Shriner, "5-A Loafer," Basic Amateur Radio, *QST*, November 1980, p. 43.

Strays

ATTENTION AFFILIATED CLUBS

Annual Report forms are due for the 1981 calendar year. They were mailed with *Radio Club News* in January. If your records are up to date, your club has received a copy. Complete the forms now and remain on the active list. — *Sally O'Dell, AE8P, Club Program Manager*

HAM SAVES FIRE VICTIM

When seconds meant the difference between life and death, Charlie Helmick, W8JZN, chief engineer at WTAP-TV, Parkersburg, West Virginia, rose to the occasion. Firefighters had just lowered the only victim of an apartment building fire from a second-story window when Charlie administered life-saving mouth-to-mouth resuscitation. The veterinarian who examined the victim said the golden retriever, named Fetch, would recover fully.

SWISS BEAR AWARD

The New Bern ARC is sponsoring the "Swiss Bear Award," available to those who complete three two-way contacts with amateurs in the New Bern, North Carolina, area, between October 23, 1980 and October 23, 1981. Write to New Bern ARC, Inc., P. O. Box 2483, New Bern, NC 28560.

Technical Correspondence

Conducted by
Jerry Hall,* K1TD

SMOKE DETECTOR INTERFERENCE — PART 2

☐ I enjoyed the article on SDI[1] and as an amateur who has developed many custom-built, apartment-size, unobtrusive antennas, I sympathize with the guy who puts more rf into gadgetry than into the ether. Soon you begin to use the gadgetry as a replacement for your field-strength meter.

My concern is for those people who dismantle smoke detectors with ionization type detectors. Smoke detectors come in mainly two varieties, the optical refraction sensor, and the ionization sensor. The former is the one you described in your article in November 1980 *QST*. The principle of the ionization detector is the use of a capacitor with air dielectric and a radioactive ionization source. When smoke comes between the capacitor plates and is ionized by the radiation, the capacitance changes and trips the circuit. The danger in dismantling one of these detectors is the source of radioactivity. If the container is broken the radioactive chemical could be spread around or even ingested. Although the chemical comes in a small amount, "small" is not well defined when it comes to radiation poisoning. Therefore, as a safety precaution, I would recommend keeping one's fingers out of smoke detectors using ionization sensors. — *Andy Cwalina, WA4JJZ, 6 Duvall Ct., Arundel, Wilmington, DE 19808*

☐ Since I have been a city fire fighter for more years than I like to admit, I read your smoke detector article in November 1980 *QST* with considerable interest. The fire-protection community is quite sensitive to comments on smoke detectors. The number of U.S. deaths from fire has dropped from an average of 12,000 to approximately 8500 in 1979, and many experts cite smoke detectors as a major factor.

Two organizations in the U.S. test smoke detectors for operation and efficiency. Underwriters Laboratories Inc. tests and "lists" smoke detectors, and Factory Mutual Research Corp. tests and approves detectors. If your smoke detector has an Underwriters Laboratories label on it, it is "listed" as an acceptable smoke detector, not just as a safe piece of electrical equipment. If it is also approved by Factory Mutual, the letters FM appear inside a diamond.

I am concerned not so much that some smoke detectors "false" in the presence of rf, but that they might not perform *as intended* in the presence of rf. This probably would not be a great problem for the average user, but boggles the mind at the possibility of a high-rise apartment building with several communications antennas on the roof. I suggest the ARRL correspond with Underwriters Laboratories and Factory Mutual Research Corporation about the results you've had. Their testing procedures may not be infallible, and perhaps you've discovered a significant sector. — *Don Norman, AF8B, Assistant Fire Chief, 41991 Emerson Ct., Elyria, OH 44035*

[Editor's Note: ARRL Hq. is following up on this suggestion.]

CHECK THAT CORD

☐ Miserable winter weather and an upswing in amateur activities persuades me to make an annual power check then. We see if the generator will start in cold weather, change the dry-cell batteries and check the power cords. Not just the amateur equipment power cords, either!

Fig. 1 shows one of the culprits found this year. I had missed this plug for heaven-knows-how-many years behind the XYL's dresser, and I have no idea why we haven't had a fire. It doesn't take a fire in the ham gear to put a station off the air permanently!

Another good trick is to check the power cords for insulation life. Pull the plug from the wall receptacle and bend the cords on about a half-inch radius (around your finger) and watch for insulation cracks. Replace the cord if any are seen. Incidentally, do this at each end and the middle of the cord — often one part has brittle insulation while the other parts seem good. In some cases, this test has resulted in a shower of insulation flakes and two bare wires. P.S. It's also a good time to check your fire insurance policy. — *David T. Geiser, WA2ANU, RD 2, Box 787, Snowden Hill Rd., New Hartford, NY 13413*

Fig. 1 — Strong evidence that routine checks of power plugs and cords may prevent disaster!

MEASURING RESISTANCE OF ELECTRICAL CONNECTIONS

☐ The very low resistance associated with an electrical connection is difficult to measure. Knowing its value, however, can be of great help to the amateur, particularly where joints are made mechanically and are subject to corrosion. The aluminum-to-aluminum connection in antenna systems is a good example, and is notorious for lowering the efficiency of antennas with low radiation resistance. Exposure to the elements can easily introduce resistance through the growth of aluminum oxide or other insulating compounds. Just a few tenths of an ohm will seriously degrade the performance of a shortened vertical or Yagi. The loss of high-Q traps will increase dramatically with small values of resistance.

Unfortunately, simply connecting a VOM across the suspicious joint and trying to measure resistance will prove futile because of the very limited ability of most meters to resolve fractions of an ohm. The solution lies in applying the "force" and "sense" principle known as the Kelvin contact. The Kelvin approach involves four measuring leads instead of the usual two (see Fig. 2). Two of the leads force a current through the suspected joint (in this example, a junction of aluminum tubing), and a second pair of leads senses the resulting voltage drop. Unavoidable voltage drops (V1 and V2) also occur where the forcing leads contact the tubing, but the sense leads are placed where they do not read this drop.

Although contact resistance is also present at the point where the sense leads contact the tubing, negligible current flows through the sense leads, resulting in virtually zero voltage error. The voltmeter sees only the drop V_x across the suspected joint. To find the resistance of that connection, divide the voltmeter reading in volts, V_x, by the current, 1A, to get ohms, R_x. This means that a VOM with 1 V full scale will read 1 Ω full scale and provide a very meaningful indication of joint quality. A good quality connection should be less than 10 milliohms.

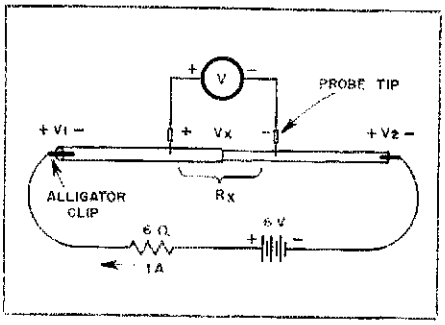


Fig. 2 — Setup for measuring resistance of electrical connections. Voltage drops V_1 and V_2, shown here with polarity marked, are unavoidable, but the measurement method excludes those drops. The resistance, R_x, equals the measured voltage divided by the current flowing through the connection. Resistances down to a few milliohms can be measured easily with this technique.

*Technical Editor, *QST*

[1]O'Dell, "SDI — Dangerous Crippler of Radio Amateurs," *QST*, November 1980, p. 34.

Using a 3-1/2 digit DVM will yield a resolution of 0.1 milliohms! This means that even the resistance of heavy, solid wire can be measured, or multiple soldered joints can be measured and compared for quality.

For portable work, a lantern battery (6 V or 12 V) works just fine as long as the forcing current is only allowed to flow long enough to make a reading. Even a single fresh "D" cell will work in a pinch. You need not limit yourself to working with only 1 A, either, as other values will give good results. Just remember that the lower the forcing current, the less will be your resolution.

We have used the Kelvin technique very effectively in troubleshooting a weathered vertical antenna. All joints, both mechanical and soldered, were checked in a short period of time and the culprits were readily identified. We feel the Kelvin technique can be a powerful tool for hams working on antennas. In addition to antenna work, you will find this technique useful in the shack to measure meter shunts, switch contacts, relay contacts, and so on. — *Dennis Monticelli, AE6C, and Jim Congdon, KA6CPJ, 48617 Tonopah Ct., Fremont, CA 94538*

ANSWERS TO LAST MONTH'S ANTENNA AND TRANSMISSION-LINE QUIZ

☐ Here are the answers to the 30-question quiz by Richard C. Fenwick, K4RR, in January 1981 *QST*. Our apologies for erroneously omitting one of the questions:

23) The gain of a horizontally polarized antenna at hf is significantly greater if the antenna foreground is sea water rather than ground.

A score of 20 puts you in the really knowledgeable class, while 15 is about average — provided, of course, that you were sure of the answers and not just guessing! If you missed on Questions 3, 4, 6, 11, 12 and 30, you're weak on fundamentals that every ham should know.

1) False. VSWR is lower at the input because of line losses.

2) True. VSWR depends on the impedance of the load, which is the receiver when receiving and the antenna when transmitting. These impedances are seldom identical.

3) True.

4) False. Reflected "power" is not actually power at all, but is a convenient fiction.

5) False. Feed-line radiation is usually negligible, unless the antenna is unsymmetrical with respect to the feed line or unless the conduction path along the outside of the coax from the antenna to ground is resonant.

6) False. Greater VSWR gives greater line loss.

7) True.

8) False. However, radiation is usually negligible below uhf.

9) False. However, some gamma-fed beams have exhibited a slight skewing of the pattern, which would seldom be of concern.

10) True.

11) False. Open wire can better handle the large voltages which may be encountered, has lower loss at high VSWR, and may be used as a quarter-wave impedance transformer — i.e., as a "tuned feeder."

12) False. The Transmatch affects only the impedance seen by the transmitter.

13) True. The gain of a dipole can be increased by as much as 7.2 dB by placing it in front of a flat screen reflector. Gains in excess of 6 dB are readily achieved in practice.

14) False. The difference is about 2 dB if both are tuned for maximum gain.

15) False. The radial system gives greater efficiency, typically by 3 dB or more.

16) False. Longer radials improve the gain, from decreased ground-reflection losses on sky wave.

17) True. The horizontal dipole has greater gain in its most favored direction, even near the horizon where the vertical monopole is often thought to be superior.

18) True. Signal-to-noise ratio is usually determined by atmospheric or other external noise, and is not significantly altered unless antenna efficiency is very low.

19) True, when loss resistance of the loading coils is made sufficiently low. The main advantages of the half-wave dipole are simplicity and greater bandwidth.

20) False. The folded dipole normally has greater bandwidth depending on construction details.

21) True.

22) True — much better, because of lower ground-reflection losses.

23) False. Ground-reflection losses are small in either case.

24) True.

25) False. Arriving signals will be randomly polarized, and a horizontal antenna usually gives greater gain.

26) True, when all noise is arriving at elevation angles near the horizon. Thus, a longer Yagi is preferable to two stacked Yagis, since the larger Yagi reduces the azimuthal beamwidth.

27) True. Almost 5 dB is achieved at a spacing of 0.67 wavelength.

28) False. Up to about 6 dB is obtained, from doubling of the field strength by addition of the direct and ground-reflected waves. The ground reflection is more efficient with horizontal polarization than with vertical, which accounts for the superior performance of sufficiently elevated horizontally polarized antennas for DX work. Ground-reflection characteristics also depend on ground electrical properties as well as the smoothness of the terrain in the antenna foreground.

29) False. The gain varies with height within a ±1 dB range, and is maximum for a height of about 0.6 wavelength, at an elevation angle of 24.6° above the horizon.

30) False. They are essentially equivalent. The folded dipole simply provides an impedance transformation. QST

Feedback

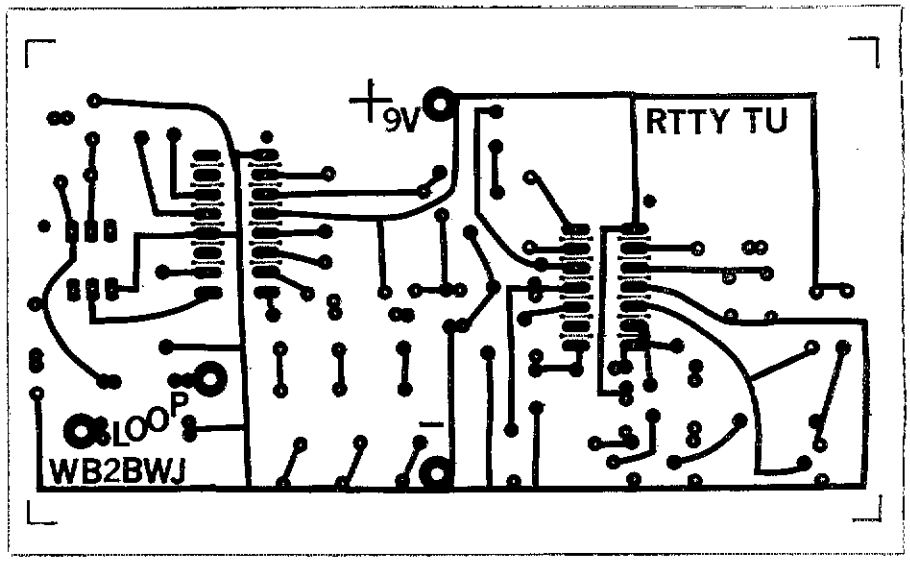
☐ Contrary to the statement in the caption, the etching pattern for Di Julio's "State-of-the-Art Terminal Unit for RTTY" appearing on page 55 of December 1980 *QST* is *not* at actual size. The pattern is reproduced here at the correct size.

☐ The list of abbreviations in December 1980 *QST*, page 66, includes the entry "THz." It stands for "terahertz," or 10^{12} Hz. — *Gene Preston, K5GP, Austin, Texas and Hans Schroeder, AE9G, Milwaukee, Wisconsin*

☐ In the article, "Broad-Band 80-Meter Antenna," by Harbach, December 1980 *QST*, page 36, the equation for k near the end of the article is missing a radical sign. The correct equation is

$$k = \sqrt{\frac{(R - Z_0)^2 + X^2}{(R + Z_0)^2 + X^2}}$$

☐ The Red Stick DX Association, Baton Rouge, Louisiana, is another "100 Percent" Club ("Club Corner," December 1980 *QST*, page 88).



Circuit-board etching pattern for the "State-of-the-Art Terminal Unit" (see Fig. 3, page 22 of December 1980 *QST*). Black represents copper. This pattern *is* shown at actual size from the foil side of the circuit board.

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

A DUST COVER FOR THE BENCHER PADDLE

☐ A dust cover provides a lot of protection for a Bencher iambic paddle, especially for the average amateur who is likely to pile things and work on the radio operating bench as I do. I fabricated a cover from clear 1/8-inch (1.5 mm) Plexiglas in the manner shown in the accompanying diagram. The cover and sides are cemented together. Dimensions are shown in the drawing. The 1/64-inch (0.39 mm) dimension for the cut sizes is the tolerance needed to provide clearance for the base of the Bencher paddle. Be careful to hold to this measurement to obtain a proper fit. Item D in the drawing is the stop that allows you to position the cover 3/16 inch (4.8 mm) from the top of the Bencher. You may take some liberty with this measurement, but be sure that all four corners are made alike. — *C. L. (Chet) McClellan, K7HNM, Phoenix, Arizona*

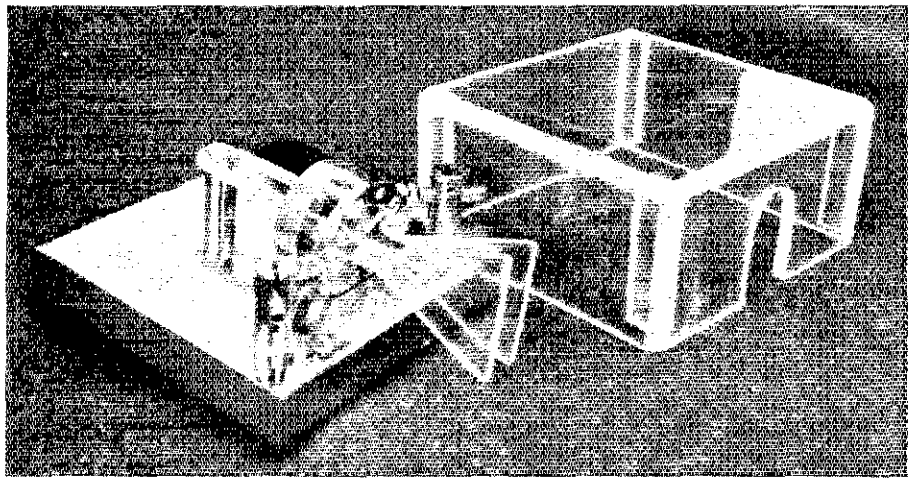


Fig. 1 — A practical, attractive dustcover for a Bencher paddle can be made with Plexiglas in the manner illustrated above. Chet McClellan, K7HNM, provided this idea for *QST*.

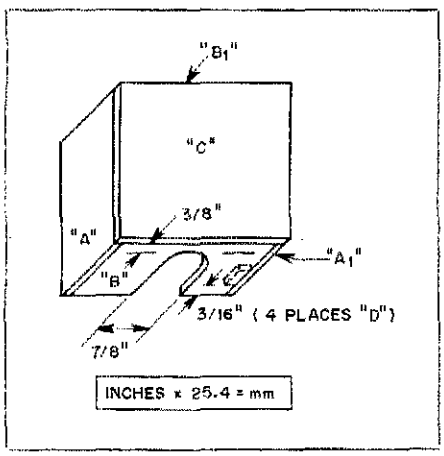


Fig. 2 — Details of the K7HNM Bencher paddle dust cover.

LOGIC PROBE MODIFICATION

☐ The Vest Pocket TTL Logic Probe (Rogers and Bartels, July 1979 *QST*) works fine, but reads zero on high-speed pulses. This can be overcome by adding a 1000-ohm resistor between pin 10 of U1 and the unused decimal point of the 7-segment readout. Actually, any value of resistor could be used as long as the decimal point is not dimmed to any great extent. A higher value does limit the current and thus the load on U1.

With this resistor in place, the decimal point will then light at all times *except* during a logic low (zero). If the decimal point is lit with a zero, then the circuit being tested is pulsed.

For packaging, a clear plastic tube (21/32-inch or 16.7 mm ID) can be used. I use a rain gauge. Plastic dust caps from SO-239 uhf connectors fit very snugly as end plugs. The probe tip can then be mounted directly on one of the caps rather than soldered to the board. For better visibility, the circuit board can be placed in the tube so that the readout is at the same end as the probe tip. A short wire is then used to connect the tip to the board. — *Dallas Williams, WAØMRG, Brush, Colorado*

MOSQUITO-LIKE WHINE IN OMNI-D

☐ An Omni-D (Series B) I was testing had a low-level but annoying mosquito-type whine in the receiver audio. I noted that not only could the whine be altered with the volume control but also with the digital display. I concluded that the source was probably the logic board, the result of the digital display enable-pulse scan frequency. In a telephone call to Ten Tec I was advised that the condition is not normal, but may occur in some units.

Ten Tec's Larry Worth and John McCoy suggested that perhaps the +12-V supply line to the logic board was radiating a signal that was being picked up by the i-f board. Before attempting anything else, I was advised to reroute the supply line if it was passing under the i-f board. This is a red wire connected to a feed-through insulator on the right side of the aluminum enclosure of the logic board.

To remove the supply line from a position under the i-f board, I first dismounted the i-f board and gently levered it upward with hemostats to release it from the socket. The supply line had been harnessed with tie-wraps which I cut to permit its extraction from the harness bundle. After removing it all the way to the shield at the rear of the i-f board, the harness was resecured with three new tie-wraps. The supply line was placed aside for remounting the i-f board. Once the board was secured, I rerouted the supply line above the board and against the shield. A single tie-wrap fed through a convenient hole in the shield keeps the line in place. After reconnecting the supply line to the logic-box feedthrough, the unit was tested and the annoying whine was completely gone. — *Bob Wheaton, W5XW, VP1XW/XE2XW, San Antonio, Texas*

MODIFYING THE HEATHKIT HW-101 FOR ZERO BEATING

☐ Being able to zero beat an incoming signal is as dear to the heart of a cw operator as full break-in and is sometimes more important. The lack of this ability is an inconvenience, to say the least. And it's a downright nuisance to operators on the other end, especially those who are trying to operate on a net frequency. I overcame this in my Heathkit HW-101.

The HW-101 has a separate crystal to accomplish offset tuning (to enable you to copy an incoming signal by the audio tone or beat frequency) 1 kHz away from the actual transmitting frequency. The audio oscillator, which supplies the sidetone and keys the transmitter circuits, is also 1 kHz in frequency and is supposed to provide on-frequency operation by comparing the pitch of the sidetone with the pitch of the incoming signal.

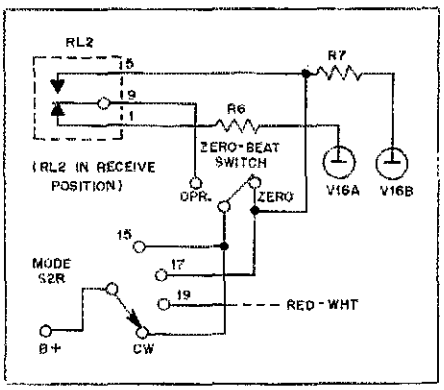


Fig. 3 — Installing an spdt switch is all that is necessary for this modification to allow zero beating of an incoming signal with the HW-101. This change is furnished by James Hicks, W5EZY, of Llano, Texas

*Assistant Technical Editor

Unfortunately, it doesn't work that way in practice. In the first place, the ear may not be that accurate. Second, the frequency separation of the receive and transmit crystals is not always exactly equal to the sidetone pitch because of the circuit variables involved.

Referring to the schematic diagram, we find that the receiving crystal (Y1) is 1 kHz higher in frequency than the cw transmit crystal (Y2). These crystals oscillate in the grid circuits of V16A and V16B respectively when voltage is appropriately applied. Voltage is applied to V16A when receiving and is switched via relay RL2 to V16B only when transmitting.

By installing an spdt toggle switch, the voltage can be manually switched to V16B while still in the receiving mode. This places the VFO dial on or very close to the zero beat of the incoming signal. A slight adjustment will put it right on frequency. Switching the voltage back to V16A restores the beat-frequency oscillator without disturbing the VFO setting and, presto, the transceiver is exactly on the frequency of the incoming signal.

I mounted my switch on the front panel midway between the dial escutcheon plate and the meter, placing it on a level with the other controls. This seemed to be the only location available, although I would have preferred having it elsewhere. Circuit changes are minor. Simply remove the blue-blue-white lead from lug 15 on the rear wafer of the mode switch (the wafer nearest the panel). I used three lengths of differently colored hookup wire, which I twisted together to make a neat installation. The blue-blue-white lead is soldered to either of the wires that connects to an outside terminal of the toggle switch. Connect the center wire from the toggle switch to lug 15 where the blue-blue-white lead has been removed. The lead from the remaining outside terminal of the toggle switch is wired to lug 17 of the rear wafer of the mode switch (it is right next to lug 15 and is identified by a yellow lead from terminal 5 of RL2).

No operating compromises result from this modification. One position of the toggle switch restores the circuit to normal. It has no effect on sideband operation or on transmitting. Because this modification requires drilling a hole in the panel of your HW-101 to install the toggle switch, consider first whether operating pleasure and efficiency mean more to you than the warranty on your rig or its trade-in value. Some companies will not accept trade-ins with irreversible modifications. If you eventually sell the rig yourself, however, the new owner will probably appreciate the improvement. As for myself, I plan to keep mine and enjoy it for a long time! — *James M. Hicks, W5EZY, Llano, Texas*

TRANSCEIVER CAUSES UNEXPECTED CAR BATTERY DRAIN

When I found the battery in my Chevy Monte Carlo completely dead one cold morning, I checked all electrical switches including that on my Kenwood TS-120S to be sure none had been left on. Finding each one turned off eliminated "cockpit trouble" as the cause. I proceeded then to charge the battery and be on my way.

The next morning brought on a repeat performance. The battery once more was dead. That meant off to the Chevrolet dealer for a further examination. They found no mechanical or electrical reason for the difficulty but they were suspicious of the battery. It was placed on their charger, brought up to full voltage and I returned home. The next morning, once again I was back at square one. . . . the battery was dead. What to do?

Checking the electrical circuitry more carefully led me to the source of the problem. I found that there was a 1.25 A current drain on the +12 V line to the TS-120S even though the ON-OFF switch on the equipment was in the OFF position. A bench test of the transceiver established that Q4 was leaking. Furthermore, a check of the diagram disclosed that the voltage feed for the collectors of the two final transistors does not go through the ON-OFF switch, but in fact is taken from the battery line prior to the switch. What to do?

My solution to the problem was to use a relay circuit as shown in the accompanying diagram. This will allow the +12 V line to the transceiver to be disconnected except when the ignition key is on. I elected to use this method rather than make internal circuit changes that would affect the resale value of the TS-120S. Since then there has been no recurrence of battery failure. Other TS-120 owners who operate mobile may benefit from this information. — *Cary L. Townsend, W3BX, Bartlesville, Oklahoma*

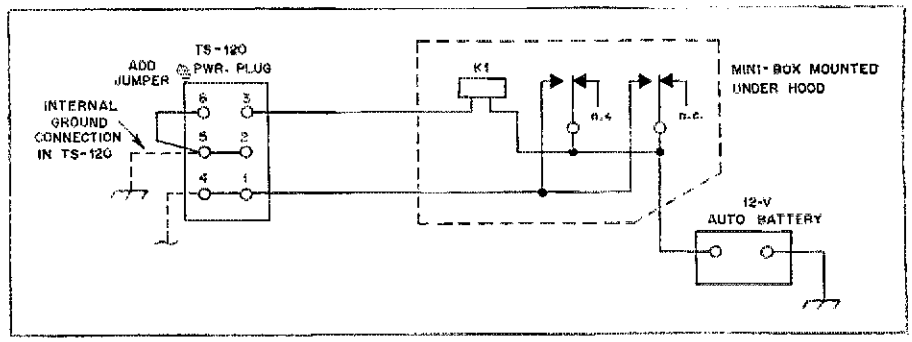


Fig. 4 — This relay circuit in the 12-V power supply line to the W3BX mobile transceiver ended a series of battery failures resulting from a leaking semiconductor in the TS-120 even though the power switch on the transceiver was off. The text explains. K1 should have a contact rating of 10 A for each section. A suitable relay is Radio Shack no. 275-208 or no. 275-218.

WEATHERPROOFING COMPOUNDS

In November 1978 *QST* "Hints and Kinks," a method of installing PI-259 connectors on hardline coaxial cable was explained. As an added measure to prevent oxidation between the aluminum-to-copper braid contact area, coat the aluminum hardline jacket with one of the commercial anti-oxidation compounds made for aluminum-to-aluminum and aluminum-to-copper electrical connections. Such products are available at most electrical supply houses under the name of No-Alox or Oxiban. Compounds like these are very useful when assembling antennas that have aluminum-to-aluminum contact areas. Beam and vertical antennas are in this category.

Another compound that is useful when assembling any fitting that must stand up to the weather is called Gaco Liquid Rubber. This is a brush-on liquid neoprene coating that will stick to most metals and plastics. It will not shrink or crack. Gaco is manufactured by Gaco Western, Inc., Seattle, Washington. — *Roger Linton, W2ZY, Vineland, New Jersey*

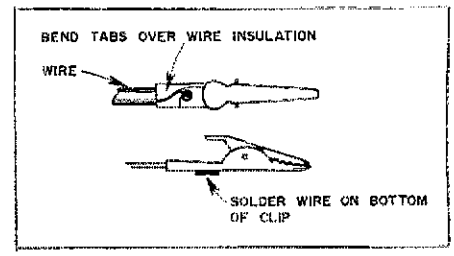
CB ANTENNA TO PC TOOL CONVERSION

Recently I acquired a 10-meter fm rig for the car. I purchased a CB stainless-steel whip (Radio Shack 21-903), which was installed on a bumper mount that I already owned. To tune the antenna for 10 meters, I removed about 1 foot from its length. (The easiest way to cut a stainless-steel whip is with a bench grinder.)

Because the whip is welded to the threaded ferrule, I cut the excess length from the top of the antenna. Being a bit on the cheap side, I used a bench grinder to turn the wasted top of the whip into a useful tool. First, I cut the rod about 5 inches from the static ball; with a heavy heart, I threw away the short piece that I had just removed. The newly cut end of the whip was turned down to a sharp point. This tool is quite useful for circuit-board work and general shop use. If I need to apply heavy pressure, the static ball saves a lot of wear and tear on my hands. If you aren't cutting a CB whip down for 10 meters, you might try stopping by your local two-way repair shop and asking if they have any defunct whips around that you can have. — *Pete O'Dell, AE8Q/1*

OLD TIMER'S NOTEBOOK: MAKE THOSE JUMPER WIRES LAST LONGER

Do you buy those inexpensive alligator-clip jumper wires that break off at the clip? To make them last longer, put strain relief on the wire. Push the insulator away from the clip. Unsolder the wire from the clip. Push the bare wire through the hole in the clip and resolder. Bend the tabs of the clip over the wire insulation to provide strain relief. Then replace the insulator over the wire end of the clip, as shown in the accompanying sketch. *Rich Summers, W5ZXG, Garland, Texas.* QST



FCC Proposes "Plain Language" Rules

Elimination of logging requirements and a new name for the Amateur Radio Service are highlighted in the Commission's proposed revision of the amateur's old friend — Part 97.

By Richard Palm* K1CE

Amateur Radio Service to become Amateur Telecommunications Services?. No more logging requirements? Simpler, easier-to-understand rules? These ideas may be converted to reality if the Federal Communications Commission decides that its proposal in Docket 80-729 is in the best interests of the government, the amateur community and the general public. As a continuing effort to make its rules more understandable, the Commission recently released its proposal to revise Part 97, the Amateur Radio Service rules, into "plain language." In its comments accompanying the 210-page Notice of Proposed Rulemaking (NPRM), the Commission indicated its feeling that the existing rules are "unnecessarily complex and difficult to understand." The Commission's goals are to reduce the complexity of the rules and foster greater understanding of them by eliminating some and rewriting others in simple language. All amateurs have the opportunity to participate in this federal proceeding by providing the FCC with their support or opposition and possible additions and modifications to the text of the proposed new rules.

Background

The Commission's effort to simplify its rules began in December 1976, when it reorganized Part 95 governing the personal radio services into four subparts: the General Mobile Radio Service; the Radio Control (R/C) Radio Service; the Citizen's Band Radio Service; and Technical Standards. In March 1978 it issued a "plain language" version of the CB rules.

In choosing the Amateur Radio Service rules as its latest "plain language" revision, the Commission noted that many applicants and licensees are young persons. Unlike other radio services, there is no minimum age to qualify for an amateur license. The Commission is hoping that less-complex rules will lead to greater understanding and compliance, and make them more useful to the wide range of applicants and licensees. The agency feels that much more benefit may be gained from the amateur services if the rules contain useful information on correct radio operation.

New Title and Structure for Amateur Radio Service

If the proposed rules are adopted, the present name "Amateur Radio Service" will be redesignated "Amateur Telecommunications Services." The agency feels that the new title would be clearly understood by all and would also cover digital networks and other types of amateur communications of the future.

The proposed revision uses a part structure similar to the one used in the Part 95 CB rules rewrite, and uses the same question-and-answer format. Specifically, the proposal divides the present Part 97 into four subparts:

Subpart A — Amateur Radio Service (AR Rules)

Subpart B — Radio Amateur Civil Emergency Service (RACES Rules)

Subpart C — Amateur Satellite Service (ASAT Rules)

Subpart D — Technical Standards (TEC Rules)

Each subpart contains the rules for that service, except that Subpart D contains the technical standards for all three services (the Commission consolidated them into one subpart rather than repeat them for each service).

Major Rule Changes

Although the Commission's purpose in this proposed rulemaking is not to change the rules governing Amateur Radio, a few rule changes and additions are intended. First, *all logging requirements would be eliminated.* In place of the present logging requirements, the Commission would mandate the retention of certain items in a station's records including a copy of the amateur rules. (The Commission feels that if a copy of the up-to-date rules were kept at each amateur station, the longstanding tradition of self-regulation by amateurs would be greatly facilitated. Better radio operation and greater spectrum efficiency should be the result.)

Licensees would be told explicitly in the new rules that FCC representatives can inspect stations "at any time during the business day or any time your station is transmitting or has just finished transmitting." This is nothing new, simply a notification in the rules of the Commission's authority granted in Section 303(n) of the Communications Act.

Highlights

Table 1 lists the outline of the proposed revision of Part 97. Particular points of interest include the addition of rules concerning phone-patch installation and operation in AR Rule 55 (§97.55). The station log requirements and the proposed "station records" requirements are covered in §97.103 and §97.105 of the present rules and §97.57 (AR Rule 57) of the proposed rules. In §97.15 (AR Rule 15) of the proposed rules, telegraphy test credit may be had by virtue of holding an FCC commercial ticket. The proposed rules do not specify how an amateur should make station measurements, but only how the FCC inspectors would make them should they visit a station (TEC Rule 10 and 11).

Because of the sheer volume of the document, it is not possible to reprint the proposal in its entirety here. Rather, we'll present excerpts (Table 2) to show key points and the general flavor of the text. The document presents the rules in a "before-and-after" manner, first by listing the present rule followed by the proposed rule, and finally the Commission's explanation of the proposed change.

Other substantive changes, when required, will be made to these rules through other rulemakings. For example, the Commission recently adopted rules for the Amateur Satellite Service, which is a subpart of Part 97. Some of the rulemakings that affect Part 97 are now underway, while others may get underway before this "plain language" revision is completed. These changes will be discussed in separate rulemakings. Any changes made to Part 97 by these rulemakings will be written in a format and style consistent with the "plain language."

How Can You Participate in This Proceeding?

All relevant and timely comments will be considered by the Commission before final action will be taken in this proceeding. If you wish to participate formally, you must file the original and five copies of your comments with the FCC Secretary (FCC, 1919 M St. NW, Washington, DC 20554). If you wish each

*Assistant Manager, Membership Services, ARRL

Commissioner to have a personal copy of your comments, file the original and 11 copies. Members of the general public may express their interest informally by submitting one copy of their comments. All comments are given the same consideration, regardless of the number of copies received. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D.C. For a good overview of the FCC's rulemaking process, see "Washington Mailbox," May 1980 *QST*. League Hq. has complete copies of the proposal and is sending one, free of charge, to every one of the over 2100 ARRL-affiliated clubs. If you would like a personal copy, write to ARRL, 225 Main St., Newington, CT 06111. Please enclose a dollar with your request (to help defray the cost of mailing and printing).

Can you improve the Commission's "plain language" rules proposals? Here's a golden opportunity for amateurs to become an integral part of the rulemaking process by making their feelings known in an important matter affecting Amateur Radio. As a recent *QST* editorial said, "Participate, eh?"

Table 1

Outline of FCC's Proposal to Revise Part 97 — the Amateur Rules

The FCC proposes to revise Part 97 of its rules, 47 CFR, as set forth below:

PART 97 — AMATEUR TELECOMMUNICATIONS SERVICES

Subpart A — Amateur Radio (AR) Service

General Information on the AR Service

Sec.
97.1 (AR Rule 1) What is the Amateur Radio (AR) Service?
97.2 (AR Rule 2) How do I use these rules?
97.3 (AR Rule 3) Do I need a license?
97.4 (AR Rule 4) Am I eligible to get an AR station license?
97.5 (AR Rule 5) Am I eligible to get an AR operator license?

How To Get Your AR Licenses

97.6 (AR Rule 6) How do I qualify for an AR operator license?
97.7 (AR Rule 7) What must I know to pass the Telegraphy Tests?
97.8 (AR Rule 8) What must I know to pass the Written Tests?
97.9 (AR Rule 9) Where do I take the tests?
97.10 (AR Rule 10) How do I take the Novice AR operator class tests?
97.11 (AR Rule 11) How do I give a test as a volunteer examiner?
97.12 (AR Rule 12) How do I take the Technician, General, Advanced and Amateur Extra AR operator class tests?
97.13 (AR Rule 13) What do I do if I pass the tests?
97.14 (AR Rule 14) What do I do if I fail the tests?
97.15 (AR Rule 15) Can I get test credit for a license I already have?
97.16 (AR Rule 16) How do I apply for an AR station license?
97.17 (AR Rule 17) What information must I furnish on my application?
97.18 (AR Rule 18) How long is my license term?
97.19 (AR Rule 19) How do I renew or modify my AR licenses?
97.20 (AR Rule 20) May I renew my AR licenses if I forget to apply in time?
97.21 (AR Rule 21) How does the FCC assign call signs to AR stations?
97.22 (AR Rule 22) What privileges does my license allow?
97.23 (AR Rule 23) What must I do if my name, station location or address changes?
97.24 (AR Rule 24) Are there any special restrictions on the location of my AR station?
97.25 (AR Rule 25) How do I get permission to put my antenna higher than normally allowed (over height)?

How to Operate Your Station

97.26 (AR Rule 26) On what frequencies may I transmit?
97.27 (AR Rule 27) How do I select the frequency to transmit on?
97.28 (AR Rule 28) Where are the ITU Regions?
97.29 (AR Rule 29) What transmitter or amplifier may I use at my AR station?
97.30 (AR Rule 30) How high may I put my antenna?
97.31 (AR Rule 31) How much power may I use?
97.32 (AR Rule 32) What communications may I transmit?
97.33 (AR Rule 33) What communications are prohibited?
97.34 (AR Rule 34) May I transmit communications for third parties?
97.35 (AR Rule 35) May I be paid to use my AR station?
97.36 (AR Rule 36) How do I use my AR station in an emergency?
97.37 (AR Rule 37) Does my AR station need a control operator?
97.38 (AR Rule 38) Who may operate under my license?
97.39 (AR Rule 39) Who is responsible for transmissions made under the authority of my license?
97.40 (AR Rule 40) Who must not operate under my license?
97.41 (AR Rule 41) How do I identify my communications?
97.42 (AR Rule 42) Where may I operate my AR station?
97.43 (AR Rule 43) How do I operate my AR station by remote control?
97.44 (AR Rule 44) How do I operate my AR station as a repeater?
97.45 (AR Rule 45) How do I operate my AR station as an auxiliary?
97.46 (AR Rule 46) How do I operate my AR station to remotely control a model craft?
97.47 (AR Rule 47) When may I operate my AR station by automatic control?

Other Things You Need To Know

97.48 (AR Rule 48) How long must I keep my license?
97.49 (AR Rule 49) Where must I keep my license?
97.50 (AR Rule 50) What must I do if I misplace my license?
97.51 (AR Rule 51) Do I need to have a copy of the Amateur Telecommunications Service Rules?
97.52 (AR Rule 52) What are the penalties for violating these rules?
97.53 (AR Rule 53) How do I answer discrepancy notifications?
97.54 (AR Rule 54) What must I do if the FCC tells me my AR station is causing interference?
97.55 (AR Rule 55) May I interconnect my AR station transmitter to a telephone?
97.56 (AR Rule 56) Do I have to make my AR station and its records available for inspection?
97.57 (AR Rule 57) What do I have to keep in my station records?
97.58 (AR Rule 58) How do I contact the FCC?
97.59 (AR Rule 59) Can I get these rules changed?
97.60 (AR Rule 60) Can the FCC modify my AR licenses?
97.61 (AR Rule 61) May I operate an AR station in the United States under Canadian authority?
97.62 (AR Rule 62) How are the key words in these rules defined?

Subpart B — Radio Amateur Civil Emergency Service (RACES)

General Information on RACES

97.101 (RACES Rule 1) What is the Radio Amateur Civil Emergency Service (RACES)?
97.102 (RACES Rule 2) How do I use these rules?
97.103 (RACES Rule 3) Do I need a license?
97.104 (RACES Rule 4) Is my station eligible for RACES station authority?
97.105 (RACES Rule 5) Am I eligible to get a RACES station license?
97.106 (RACES Rule 6) How do I get a certificate of enrollment?

How To Get Your RACES License

97.107 (RACES Rule 7) How do I apply for a RACES station license?
97.108 (RACES Rule 8) What information must I furnish on my application?
97.109 (RACES Rule 9) What kind of operation does my RACES authorization allow?

How To Operate Your Station in RACES

97.110 (RACES Rule 10) On what frequencies may I transmit?
97.111 (RACES Rule 11) What are the limitations on the use of these frequencies?
97.112 (RACES Rule 12) What communications may I transmit?
97.113 (RACES Rule 13) What communications are prohibited?

Subpart C — Amateur Satellite Service (ASAT)

General Information on the ASAT Service

97.201 (ASAT Rule 1) What is the Amateur Satellite (ASAT) Service?
97.202 (ASAT Rule 2) How do I use these rules?
97.203 (ASAT Rule 3) Do I need a license?
97.204 (ASAT Rule 4) What is earth operation?
97.205 (ASAT Rule 5) What is telecommand operation?
97.206 (ASAT Rule 6) What is space operation?

How To Operate Your AR Station in the ASAT Service

97.207 (ASAT Rule 7) On what frequencies may I transmit?
97.208 (ASAT Rule 8) What are the limitations on the use of these frequencies?
97.209 (ASAT Rule 9) How do I use my AR station in earth operation?
97.210 (ASAT Rule 10) How do I use my station in telecommand operation?

Information on Requirements for Space Operation

97.211 (ASAT Rule 11) When may my AR station be in space operation?
97.212 (ASAT Rule 12) How do I use my AR station in space operation?
97.213 (ASAT Rule 13) What are telemetry transmissions?
97.214 (ASAT Rule 14) May telemetry messages be coded?

How To Notify the FCC of Space Operation

97.215 (ASAT Rule 15) Why must I notify the FCC?
97.216 (ASAT Rule 16) When do I send my notifications to the FCC?
97.217 (ASAT Rule 17) Where do I send my notifications?
97.218 (ASAT Rule 18) What information must I furnish in my pre-space operation notifications?
97.219 (ASAT Rule 19) What orbital parameters must I furnish?
97.220 (ASAT Rule 20) What technical parameters must I furnish?
97.221 (ASAT Rule 21) How do I determine the lowest equivalent satellite noise temperature?
97.222 (ASAT Rule 22) What information must I furnish in my in-space operation notification?
97.223 (ASAT Rule 23) What information must I furnish in my post-space operation notification?

Subpart D — Technical (TEC) Standards

General Information on Technical Standards

97.301 (TEC Rule 1) What are technical standards?
97.302 (TEC Rule 2) How do I use these rules?

Information on Requirements

97.303 (TEC Rule 3) What are emissions?
97.304 (TEC Rule 4) On what frequencies may my station transmit the various emissions?
97.305 (TEC Rule 5) What are the technical standards for sideband emissions?
97.306 (TEC Rule 6) What are the technical standards for spurious emissions?
97.307 (TEC Rule 7) What are the technical standards for voice transmissions?
97.308 (TEC Rule 8) What are the technical standards for video transmissions?
97.309 (TEC Rule 9) What are the technical standards for digital transmissions?

Information on Measurements

97.310 (TEC Rule 10) How does the FCC measure transmitter power?
97.311 (TEC Rule 11) How does the FCC measure levels of transmitter emissions?

Other Things You Need To Know

97.312 (TEC Rule 12) What amplifiers may I manufacture, market or use in the Amateur Telecommunications Services?
97.313 (TEC Rule 13) What are the standards for amplifier type acceptance?

Appendices

Appendix A What areas of the world are included in each ITU Region?
Appendix B What are the ITU rules governing the Amateur Telecommunications Services?
Appendix C Where are the FCC field offices located?
Appendix D Where are the FCC monitoring stations located?
Appendix E What are the procedures for protecting FCC monitoring stations?
Appendix F How do I determine antenna height above average terrain (AHAAT)?
Appendix G How do I determine effective radiated power (ERP)?

Table 2

Highlights of FCC's "plain-language" revision proposal in Docket 80-729

Subpart A — Amateur Radio (AR) Service

EXISTING RULE

§97.1 Basis and purpose.

The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service particularly with respect to providing emergency communications.

(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

(e) Continuation and extension of the amateur's unique ability to enhance international good will.

PROPOSED HEADING

General Information on the AR Service

PROPOSED RULE

§97.1 (AR Rule 1) What is the Amateur Radio (AR) Service?

The AR Service is for persons interested in the technical side of radio communications. They use the service only for their own personal satisfaction and get no financial benefit from its use. They learn about radio, communicate with other operators around the world, and find better ways to communicate by radio.

EXPLANATION

This rule replaces §97.1. We rewrote the rule in simple language, using the definition of the service contained in Article 1 of the ITU Radio Regulations. It defines the Amateur Service as follows:

"A service of self-training, intercommunication and technical investigations carried on by amateurs, that is, by duly qualified persons interested in radio technique solely with a personal aim and without pecuniary interest."

EXISTING RULES

§97.61 Authorized frequencies and emissions.

(b) Limitations:

(1) The use of frequencies in this band is on a shared basis with the LORAN-A radionavigation system and is subject to cancellation or revision, in whole or in part, by order of the Commission, without hearing, whenever the Commission shall determine such action is necessary in view of the priority of the LORAN-A radionavigation system. The use of these frequencies by amateur stations shall not cause harmful interference to LORAN-A system. If an amateur station causes such interference, operation on the frequencies involved must cease if so directed by the Commission.

(3) Where, in adjacent regions or subregions, a band of frequencies is allocated to different services of the same category, the basic principle is the equality of right to operate. Accordingly, the stations of each service in one region or subregion must operate so as not to cause harmful interference to services in the other regions or subregions (No. 117, the Radio Regulations, Geneva, 1959).

(5) Amateur stations shall not cause interference to the Government radiolocation service.

(8) No protection in the band 2400-2500 MHz is afforded from interference due to the operation of industrial, scientific, and medical devices on 2450 MHz.

(9) No protection in the band 5725-5875 MHz is afforded from interference due to the operation of industrial, scientific and medical devices on 5800 MHz.

(10) No protection in the band 24.00-24.25 GHz is afforded from interference due to the operation of industrial, scientific and medical devices on 24.125 GHz.

(12) Amateur stations shall not cause interference to the Fix-Satellite Service operating in the band 3400-3500 MHz.

§97.85 Repeater operation.

(b) Except for operation under automatic control, as provided in paragraph (e) of this section, the transmitting and receiving frequencies used by a station in repeater operation shall be continuously monitored by a control operator immediately before and during periods of operation.

§97.63 Selection and use of frequencies.

(a) An amateur station may transmit on any frequency within any authorized amateur frequency band

(c) The frequencies available for use by a control operator of an amateur station are dependent on the operator license classification of the control operator and are listed in §97.7.

PROPOSED RULE

§97.27 (AR Rule 27) How do I select the frequency to transmit on?

(a) Your AR station may transmit on any frequency authorized for the AR operator class of the control operator (see AR Rule 26) and the location of your station (see AR Rule 31 and Article IV, Section 2 of the ITU's rules).

(b) You must be sure that transmissions from any AR station you are the control operator of do not interfere with —

(1) Other AR stations already operating on the frequency;

(2) Stations in other radio services in the adjacent ITU regions (see AR Rule 28) or subregions where a band of frequencies is allocated to different services of the same category;

(3) The LORAN-A radionavigation system in the frequency band 1800-2000 MHz;

(4) The government radiolocation system; *OR*

(5) Stations in the Fixed Satellite Service operating in the frequency band 3400-3500 MHz.

(c) The FCC does not give any protection to your AR station from interference caused by an industrial, scientific or medical device when —

Your AR station is operating in the band —	*And the device is operating on —*
2400-2500 MHz	*2,450 MHz*
5725-5875 MHz	*5,800 MHz*
24.00-24.25 GHz	*24.125 GHz*

EXPLANATION

This rule replaces portions of existing §§97.61, 97.63 and 97.85. The proposed rule emphasizes that in selecting a frequency, control operators must be sure that transmissions from their station do not interfere with other stations. It also informs them of frequencies where they may encounter interference from industrial, scientific and medical devices.

EXISTING RULE

None.

PROPOSED RULE

§97.51 (AR Rule 51) Do I need to have a copy of the Amateur Telecommunications Services Rules?

(a) You must keep a current copy of Part 97, FCC Rules for the Amateur Telecommunications Services, in your AR station records. The Amateur Telecommunications Services Rules are published periodically by the Government Printing Office.

(b) You must stay up to date with changes to the Amateur Telecommunications Services Rules. Changes are found in the *Federal Register* and in other publications.

EXPLANATION

We are proposing to add this new rule because we thought it was important that each AR operator have a copy of the Amateur Telecommunications Services Rules. We think this requirement will help licensees know and understand the rules better and will help promote self-regulation by licensees. This in turn will result in better radio operation and more efficient use of the limited radio spectrum.

EXISTING RULE

§97.131 Restricted operation.

(a) If the operation of an amateur station causes general interference to the reception of transmissions from stations operating in the domestic broadcast service when receivers of good engineering design including adequate selectivity characteristics are used to receive such transmission and this fact is made known to the amateur station licensee, the amateur station shall not be operated during the hours from 8 p.m. to 10:30 p.m., local time, and on Sunday for the additional period from 10:30 a.m. until 1 p.m., local time, upon the frequency or frequencies used when the interference is created.

(b) In general, such steps as may be necessary to minimize interference to stations operating in other services may be required after investigation by the Commission.

PROPOSED RULE

§97.54 (AR Rule 54) What must I do if the FCC tells me that my AR station is causing interference?

(a) If the FCC tells you that your AR stations is causing interference, you must follow all instructions the FCC sends you.

(b) You must comply with any restricted hours of AR station operation which may be included in those instructions.

EXPLANATION

This rule replaces §97.131. We simplified the existing rule by telling licensees to follow any instructions the FCC sends to them. We are proposing in this rule to delete the specific "quiet hours" referred to in the existing rule and to replace them with a simple requirement that licensees comply with any restricted hours of operation included in the instructions they receive from the FCC. This proposal will enable the FCC to deal more effectively with interference problems.

EXISTING RULE

None.

PROPOSED RULE

§97.55 (AR Rule 55) May I interconnect my AR station transmitter to a telephone?

(a) You may interconnect your AR station transmitter with a public telephone system to —

(1) Use as a wireline control link between your AR station and the remote control point (see AR Rule 43).

(2) Get messages from third parties for your AR station to transmit (see AR Rule 34). You must not let a caller activate transmissions from your AR station. The control operator must receive incoming calls from the public telephone system and screen them before your AR station may transmit them.

(b) You must obey any restriction that the telephone company places on the interconnection of an AR station transmitter to a telephone. Your interconnection ("phone patch") device must be registered with the FCC.

(c) You may not interconnect your AR station with a mobile radiotelephone system (see AR Rule 33(a)(6).)

EXPLANATION

Although there is no existing rule on interconnecting an AR station transmitter to a telephone, the proposed rule states what the FCC policy on this subject has always been. We think that including this policy in the proposed rules will help readers know and understand the restrictions on interconnecting an AR station transmitter to a telephone. AR Rule 55(a)(2) was included to provide information on the use of "reverse autopatch."

EXISTING RULE

§97.105 Retention of logs.

The station log shall be preserved for a period of at least 1 year following the last date of entry and retained in the possession of the licensee. Copies of the log, including the sections required to be transcribed by §97.103, shall be available to the Commission for inspection.

PROPOSED RULE

§97.56 (AR Rule 56) Do I have to make my AR station and its records available for inspection?

(a) If an authorized FCC representative requests to inspect your AR station and its records, you or the control operator must make the station and its records available for inspection.

(b) The FCC may inspect your station and its records at reasonable times. The FCC considers that a reasonable time to inspect your station is any time during the business day or any time your station is transmitting or has just finished transmitting.

EXPLANATION

While there is an existing rule on inspection of AR station records in Part 97, the proposed rule on inspection of AR stations is new to this part. We are proposing to add this for the Amateur Telecommunication Services because the FCC believes that the addition is necessary to encourage compliance with these rules. We have similar station inspection rules for our other radio services.

Subpart B — Radio Amateur Civil Emergency Service (RACES)

EXISTING RULE

§97.161 Basis and purpose.

The Radio Amateur Civil Emergency Service provides for amateur radio operation for civil defense communications purposes only, during periods of local, regional or national civil emergencies, including any emergency which may necessitate invoking of the President's War Emergency Powers under the provisions of section 606 of the Communications Act of 1934, as amended.

§97.163 Definitions.

For the purposes of this Subpart, the following definitions are applicable:

(a) *Radio Amateur Civil Emergency Service.* A radiocommunication service conducted by volunteer licensed amateur radio operators, for providing emergency radiocommunications to local, regional, or state civil defense organizations.

PROPOSED HEADING

General information on RACES.

PROPOSED RULE

§97.101 (RACES Rule 1) What is the Radio Amateur Civil Emergency Service (RACES)?

RACES is a service of AR operators who volunteer their time and their AR stations to assist local, regional and state civil defense organizations with their radiocommunications during emergencies.

EXPLANATION

This rule replaces §97.161 and §97.163(a). We rewrote this rule to give a simple explanation of what RACES is.

Subpart C — Amateur Satellite (ASAT) Service

EXISTING RULE

§97.401 Purposes.

The Amateur-Satellite Service is a radiocommunication service using stations on earth satellites for the same purposes as those of the Amateur Radio Service.

PROPOSED HEADING

General Information on the ASAT Service

PROPOSED RULE

§97.201 (ASAT Rule 1) What is the Amateur Satellite (ASAT) Service?

The ASAT Service is for amateur radio operators. They operate their AR stations on earth satellites, and on earth, for the same purposes they use the Amateur Radio Service (see AR Rule 1). An earth satellite is a body which revolves around the planet earth. It has motion determined by the force of attraction of the earth.

EXPLANATION

This rule replaces §97.401. We rewrote the rule in plain language, and added an explanation of the term "earth satellite," based upon the definition given in Article 1, I.T.U. Radio Regulations. We also included the phrase "and on earth," since these rules do provide for operation of amateur stations on the earth as well as in space.

Subpart D — Technical (TEC) Standards

EXISTING RULE

None.

PROPOSED HEADING

General Information on Technical Standards

PROPOSED RULE

§97.301 (TEC Rule 1) What are technical standards?

Technical standards are rules. They list the minimum performance the FCC will allow for transmissions from your station.

EXPLANATION

We included this proposed rule to give readers a brief summary of what technical standards are.

EXISTING RULE

§97.65 Emission limitations.

(c) On frequencies below 29.0 MHz, the bandwidth of an F3 emission (frequency or phase modulation) shall not exceed that of an A3 emission having the same audio characteristics.

(f) Below 225 MHz, A3 and A5 emissions may be used simultaneously on the same carrier frequency provided the total bandwidth does not exceed that of an A3 double sideband emission.

PROPOSED RULE

§97.307 (TEC Rule 7) What are the technical standards for voice transmissions?

(a) The bandwidth of an A3 emission may not be more than 7 kHz.

(b) On frequencies below 29.0 MHz, the bandwidth of an F3 emission may not be more than 7 kHz.

EXPLANATION

This rule replaces §97.65(c) and (f). We devoted an entire rule to this subject to stress the importance of licensees complying with technical standards for voice transmissions. We are proposing to simplify the bandwidth limitations in this rule by referring to an *actual* bandwidth rather than to another measurement. We are proposing the 7 kHz bandwidth to make it agree with our measurement technique in Tec Rule 11.

Your Place in Your League

Part 1: ARRL is a lot more than a building in Newington, Connecticut — ARRL is *you*! Here's how to get more from your membership in Amateur Radio's national association.

By David Sumner,* K1ZZ

Chances are, your perception of the American Radio Relay League is of a professional staff of people situated somewhere in Connecticut that publishes *QST* and provides a handful of other services to League members. You know there are people who call themselves "League officials" who don't live in Connecticut, but how they got to be officials and what they do to earn the title is something of a mystery. You probably also know that "the League" makes decisions which affect Amateur Radio, but you sometimes have disagreed with those decisions and are not sure how they were made, or how you might have participated in the process.

If this describes what you know about the League, you have plenty of company! Most radio amateurs, members and nonmembers alike, have an incomplete picture of their national association. The ARRL is a complex organization, and even members who are very active in one facet of its work may not fully appreciate everything that takes place under its banner. Also, like any other healthy organism, the League has grown and changed over the years; what you learned about the ARRL in the past may no longer be true today. The purpose of this series of articles is to give you a better understanding of what the League is and how it functions — and, we hope, to make you want to become more involved in the work of your organization. Here are just a few of the facts we want to get across:

- Most of the work of the League is done by *volunteers* — people just like yourself who are willing to accept some responsibility for what happens in Amateur Radio.
- The League is a representative democracy, just like the United States and Canada, and the members control its policies through the power of the ballot.
- The League isn't only in Newington, Connecticut. It's *everywhere*. It's *you*.

Why the League was Formed

The story of the founding of the American Radio Relay League in 1914 is told in Clinton B. DeSoto's classic history of Amateur Radio's first three decades, *Two Hundred Meters and Down*[1]. In a nutshell, the League grew from Hiram Percy Maxim's vision of a highly qualified network of amateur stations organized to relay messages from one to another. In the beginning, even the paying of dues was voluntary; more important to maintaining one's status as a "Relay Station" was consistent activity and the observing of high operating standards, a tradition which has been preserved to this day in the programs of the League's Communications Department.

In the decade that followed, there were several serious challenges to Amateur Radio's continued existence. World War I caused the closing of all amateur stations, and the assumption of control of all radiocommunication by the Navy Department. Thousands of amateurs volunteered for military service in this time of need, offering the skills they had developed to a nation that sorely needed them. After the war, bills were introduced in Congress to give the Navy permanent control, which might have resulted in a permanent ban on amateur transmitting. Thanks in large part to organized opposition by the amateur community, the bills were defeated. It took a reluctant Navy Department a year to lift the ban after the Armistice was declared, and pressure from Congress was required even to accomplish that. In the early 1920's the growth of broadcasting threatened amateurs' operating privileges, as the number of broadcast listeners grew rapidly and their willingness to tolerate interference from nearby amateur stations diminished. That Amateur Radio survived to become the avocation we enjoy so much today is due in large measure to the tireless work of the League's first president, Hiram Percy Maxim, and other leaders from across the country who saw the need for a strong national organization to protect their interests.

Hiram Percy Maxim, founder and first president of The American Radio Relay League.

It is worth noting that the League was not the only organization of radio amateurs in the country, nor was it even the first. In the early days the distinctions between the radio listener, the transmitting amateur, and the radio experimenter/engineer were rather blurred. Local radio clubs played an important role in radio's early days; according to DeSoto, some of them had hundreds of members who were equipped with simple spark sets capable of communicating five

*Assistant General Manager, ARRL

[1]Notes appear on page 55.

miles or so, and were generally unlicensed — the CB'ers of the day, perhaps. Some "amateur" organizations were, in fact, paper creations of publishers or manufacturers which lacked the high standards and the resulting *esprit de corps* of the League. (Formation of ARRL preceded the appearance of *QST*, not the other way around.) Eventually these other organizations began to cater more to the broadcast listener or to the professional, and the League evolved into *the* national organization for the person interested in two-way, amateur radiocommunication and experimentation.

Another important development was the discovery that the short waves (what we now call the high-frequency, or hf, bands) could support long-distance propagation via the ionosphere. With this came international regulations which might have spelled the end of Amateur Radio, because official support for the radio amateur had not developed in other countries to the extent that it had in the U.S., Canada, Australia and New Zealand. Fortunately, thanks once again to the vision and organizational abilities of Mr. Maxim and other League officials of the time, the International Amateur Radio Union was formed and provided capable representation of amateur interests at the Washington International Radiotelegraph Conference of 1927. It was an uphill battle, but our supporters were able to win allocations amounting to more than 10 times what the European administrations were initially prepared to accept.

ARRL was deeply involved in battles at the local level, as well. The most important legal case was a 1927 decision in *Whitehurst v. Grimes* which established that Amateur Radio was interstate commerce and as such was subject only to federal, and not to state or local, regulation. The League's General Counsel, Paul M. Segal, brought the suit and developed the arguments in the case. *Whitehurst v. Grimes* established the precedent for overturning countless misguided efforts by state and local officials to restrict our right to operate[2].

The ARRL Today

This is our heritage, as radio amateurs and as members of the American Radio Relay League. We owe a great deal to our predecessors, who were willing to sacrifice their time and money for a cause they believed in: the preservation and promotion of Amateur Radio. What about today, and the future? How do we protect and expand the privileges we now enjoy? What will be our legacy to future generations of radio amateurs? That depends on our willingness to make the same sacrifices, and to support a unified organization which can speak with authority on our behalf. Some of the work can be done most effectively by a paid, professional staff; this is where Newington comes into the picture, and why your ARRL membership dues are important. But the biggest job we face is at the local level: public relations, training new amateurs, organizing emergency communications capabilities, heading off unreasonable restrictions on antennas, solving TVI and other interference problems, building healthy relationships with local officials and opinion leaders, and so on. The responsibility for solving local problems must rest at the local level: as amateurs we could never afford to hire a professional staff large enough to handle them all on our behalf. The importance of member participation in promoting and preserving Amateur Radio has never been greater.

Other opportunities for member involvement have been created by the rapidly expanding scope of Amateur Radio. Radio amateurs today are a diverse group, with interests to match. Specialized operating and technical activities have become increasingly important in the scheme of things. In response, the League has created national-level advisory committees staffed by volunteer experts in those fields, to provide guidance to the Board of Directors and the headquarters staff.

There are a number of other ways in which members lend their time and talent to their fellow amateurs through the ARRL organization. Fig. 1 is an attempt at depicting the rather complex volunteer structure which has evolved in ARRL over the years. Believe it or not, this is a *simplified* diagram; one showing all the interrelationships would be even more difficult to read and understand. If one were to start from scratch in designing an organization to do the work of the League, no doubt a different and somewhat simpler structure would emerge. Still, the organization that exists today reflects traditions that can be traced back to the founding of the League, and those traditions have a greater value than a neat, simple organization chart. Let's take a closer look at how the pieces fit together, and how the broad field of Amateur Radio interests are covered by the ARRL umbrella.

The Membership

In the American Radio Relay League, as it should in any membership association, everything starts with the *members*. The members are the ultimate authority, and collectively have the ultimate responsibility for the work and the direction of the organization. Although anyone interested in Amateur Radio may become a member of the League, only Full Members have voting rights. To be a Full Member, one must be a licensed radio amateur residing in the U.S., its possessions, Puerto Rico or Canada (or temporarily residing elsewhere). Prior to 1934 voting rights were available to others, and some members who are not licensed hold Full Membership by virtue of continuous and unlapsed membership dating back to 1934. All others are Associate Members.

Sometimes there is confusion between Associate Membership and Family Membership. A Family Member is the husband or wife, brother or sister, son or daughter, or father or mother, of another member living at the same address. Family Members pay dues of only $2 per year (or a one-time payment of $50 for Family Life Membership, if the other member is also a Life Member) and do not receive *QST*; however, *all other benefits of membership, including voting rights in the case of licensed amateurs, are available to Family Members.* More and more spouses, siblings and children are becoming licensed amateurs, and they should be taking advantage of this very special dues rate for membership. There is no greater bargain in Amateur Radio today.

Life Membership conveys no special privileges, but it does prepay one's dues for life (for a payment equal to 25 times the annual dues rate). This has proved to be an effective hedge against inflation for thousands of members, and is regarded by many as a stronger expression of support for the League than is conveyed by regular membership.

The Board of Directors

Because it is impractical for 140,000 Full Members to get together and hammer out League policy, the League's Articles of Association[3] give this responsibility to an elected Board of Directors. In many ways, the functioning of the Board is similar to that of a unicameral legislature. Sixteen Directors are elected on a regional basis, one per ARRL Division (see Fig. 2), to serve two-year terms. All it takes to be nominated as a candidate for Director is a nominating petition signed by 10 Full Members of the Division. The other eligibility requirements, set forth in detail in the Articles of Association and in the "call for nominations" which appears in July and August *QST* each year, are intended to ensure that candidates possess a lasting interest in Amateur Radio and the League, have the legal capacity to make decisions for ARRL, and are free of conflicts of interest. Directors receive no monetary compensation for their service, but are eligible for reimbursement of out-of-pocket expenses incurred in the performance of their duties.

Directors have demanding responsibilities. Each year there are two meetings of the Board, each occupying the better part of a week. In addition there are committee meetings, conventions, hamfests and club meetings to attend; a heavy load of correspondence and telephone calls to handle; reams of information from ARRL Headquarters and other sources to read; and a staff of volunteer assistants to

oversee. Even the most ardent amateurs find their on-the-air operating curtailed somewhat when they take on these burdens. The By-Laws of the League require that each Director ". . . keep himself informed as to conditions and activities in his territorial division and as to the needs and desires of the members therein in order that he may faithfully and intelligently represent the true interests of such members." Accomplishing this is no mean feat in view of the League's growing membership and the increasing breadth of members' interests.

The officers of the League are chosen by the Directors. Every two years, the Directors nominate and elect a President, three Vice Presidents, an International Affairs Vice President, a Secretary and a Treasurer. Most of the officers are members of the Board, but without vote. The President presides at meetings of the Board and is the official spokesman of the Board on all matters of League policy. He also has specified responsibilities in the areas of governmental and public relations. The incumbent President, Harry Dannals, W2HD, is in great demand as a speaker at ARRL conventions and other Amateur Radio affairs and maintains a heavy schedule of such commitments. The Vice Presidents provide assistance to the President as requested, particularly with respect to the Board's standing committees.

There are six permanent Board committees. The Executive Committee is empowered to act for the Board between Board meetings. The EC consists of the President, four Directors elected annually by the Board and, without vote, the First Vice President and the General Manager. The five standing committees have specific responsibilities detailed in the By-Laws, though their names generally describe their scope.

The committees are:

International Affairs
Plans and Programs
Membership Affairs
Management and Finance
Legal and Regulatory

Each standing committee consists of three or four Directors (one of whom is designated Chairman) and one Vice President. Members are appointed annually by the President.

From time to time the Board may direct the President to appoint an Ad-Hoc Committee for a specific purpose. There is no set formula for the membership of an Ad-Hoc Committee. Typically, such a committee will include one or more members of the Board, a Headquarters staff liaison, and recognized experts selected from the general membership of the

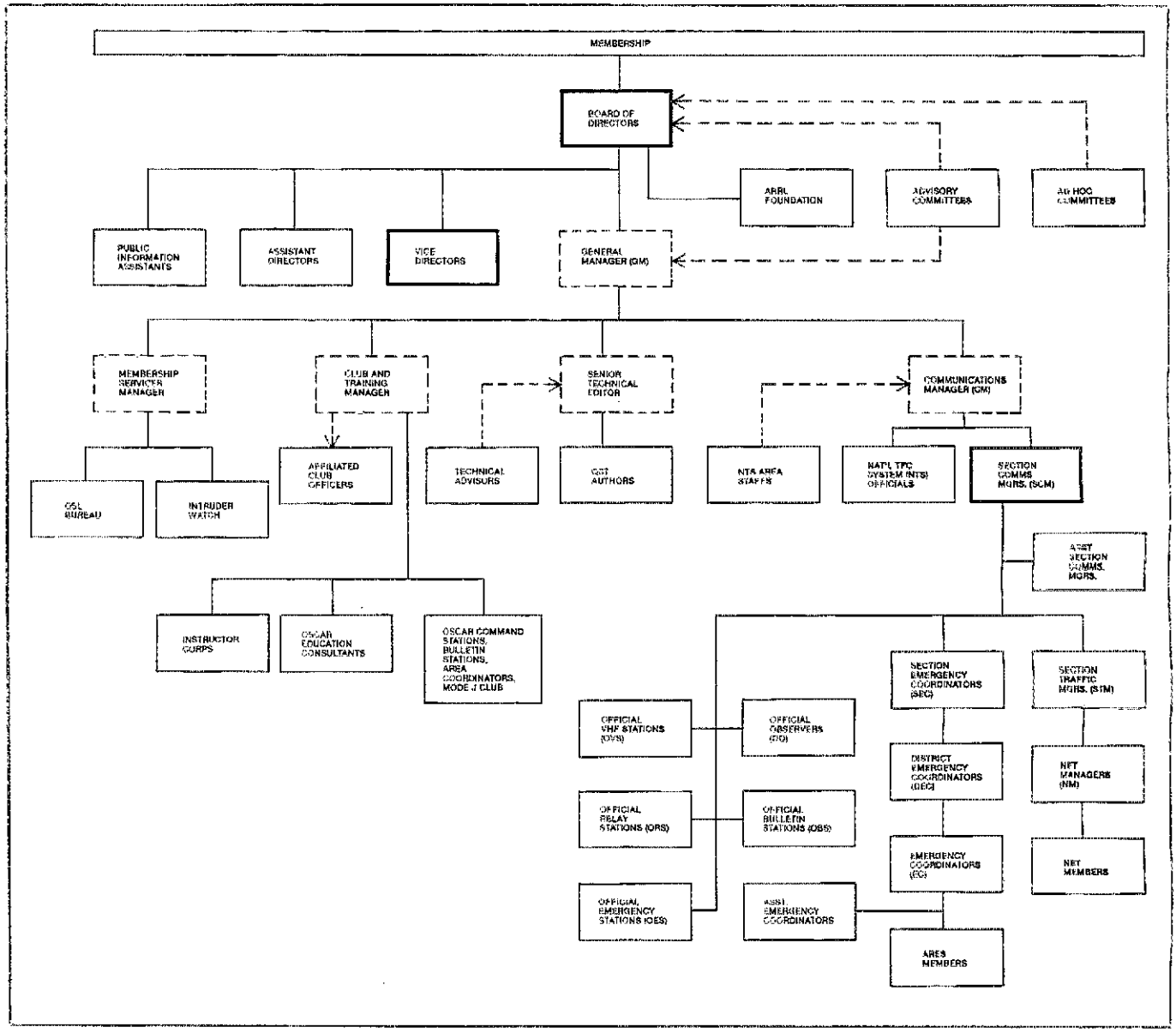


Fig. 1 — The ARRL volunteer organization. Solid lines show reporting relationships; dashed lines show advisory relationships; dashed boxes indicate professional Headquarters staff; heavy boxes indicate officials elected by the Full Membership of the League.

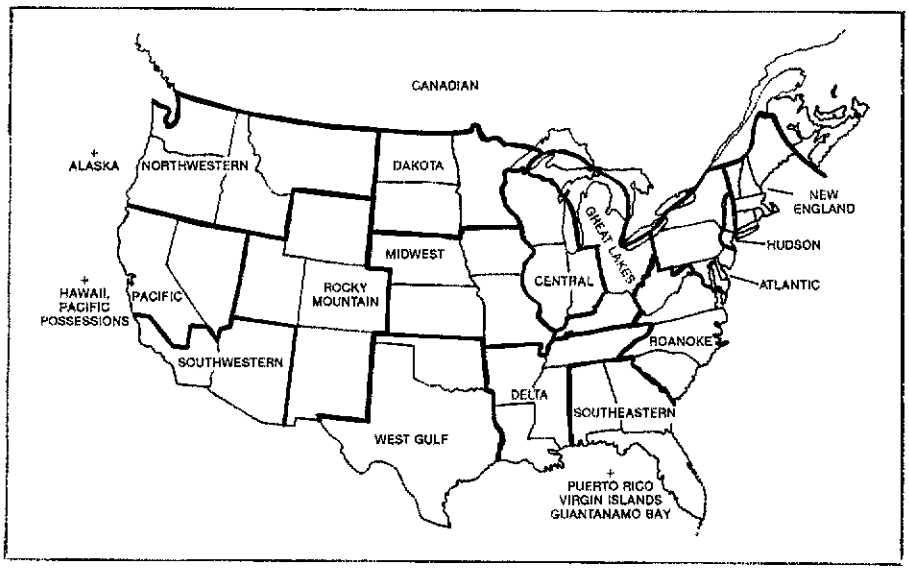


Fig. 2 — The 16 ARRL divisions.

League. Sometimes an Ad-Hoc Committee is created in an area where, it turns out, continuing attention is required. Then the committee may assume an ongoing role, as in the case of the RFI Task Group, the Committee on the Biological Effects of Radio Frequency Energy, and the Interference Task Force. These groups report regularly to the Board and continue in existence without formal renewal of their mandate as long as a useful contribution to the work of the League is being made.

The most important function of the Board of Directors is to establish the policies of the organization. This can happen in several ways. Often an idea will originate with a member, who shares it with his Director either in person or by letter. If the Director feels the idea has merit he will discuss it with his colleagues on the Board, and perhaps with the General Manager, at or prior to the next Board meeting. If the reaction is generally positive the sponsoring Director will put the idea into the exact words of a motion and will ask a supporting Director to second the motion when he introduces it. Once it is on the floor of the meeting and has been discussed, one of four things usually happens. The motion either is adopted as it stands or in a slightly amended form, it is referred to a standing committee for further study, it is tabled (*i.e.*, consideration is postponed indefinitely), or it is defeated. *Robert's Rules of Order* governs the proceedings. Usually the Board prefers to have proposals studied at the committee or staff level and to act on their recommendation, so even an idea with broad support may be referred to a committee when it is first introduced. On those occasions when there is not enough time for the Board to act, the Executive Committee will act in its place. Rarely, a special meeting of the Board may be scheduled to deal with an important issue, but the expense and inconvenience of such meetings limits their frequency.

When they elect a Director, members also elect a Vice Director for their Division. The eligibility requirements are the same as for Director, because the Vice Director's responsibility is to be available to serve in the absence of the Director. Many Vice Directors function as the chief assistant of the Director, although the two are not elected as a "ticket" and the Director is not obligated to involve the Vice Director in the affairs of the division.

Directors have the authority to appoint other personal assistants, called Assistant Directors and Public Information Assistants. Assistant Directors have widely varying responsibilities which are entirely the prerogative of the Director. In general, Directors rely on Assistant Directors to provide a personal interface with the membership of the Division, usually at the local club level. There are approximately 500 Assistant Directors in the League organization; the typical Division has between 30 and 50. They receive a steady stream of news and information from Headquarters in the form of "Directors' Letters" which provide in-depth coverage of all aspects of the Amateur Radio and ARRL scene. AD's are not eligible for reimbursement of expenses.

Public Information Assistants have more clearly defined responsibilities. Their role is:

- To act as public relations advisor to the Director.
- To develop and coordinate the public relations function among affiliated clubs, encouraging and assisting club publicity chairmen.
- To provide liaison with the Public Information Office at ARRL headquarters.
- To assist the Director in the preparation and dissemination of his communications within the Division, including newsletters, convention programs, etc.

The League has approximately 100 PIA's. They are eligible for reimbursement of postage and telephone expenses up to a limit of $250 per Division per year.

Advisory Committees

Responding to a need for more membership input in some specialized areas, in 1968 the Board created its first Advisory Committees[4]. Since then the two original committees (for Contests and VHF Repeaters) have been joined by Advisory Committees for DX, Emergency Communications, VHF-UHF and Public Relations. Advisory Committees submit recommendations in their areas of expertise to the Board and/or Headquarters staff, as appropriate. Membership on each committee is limited to 11, plus liaisons to the Board and to Headquarters. Terms normally are two years, and are staggered to provide continuity. *QST* each year carries a solicitation of nominations for membership, most recently in the October 1980 issue, page 57. The usual pattern is for the President to appoint one member from each U.S. call area, plus Canada, to each committee.

Advisory Committees are expected to function almost entirely by correspondence, and the more active ones handle a heavy load of paperwork. Each committee has a budget of $250 per year for postage, telephone expenses, etc.

We've Only Just Begun

In Part 1 of this series, we have described the origins of the American Radio Relay League and how the League's early history influenced the shape of the organization we have today. We have looked at how the membership establishes the policies of their organization, through their elected Directors, and have examined in some detail the Board of Directors and the other volunteers who support the Board directly with assistance and advice. In all, some 700 members are active volunteers in this part of the ARRL organization. But we have only scratched the surface; there are tens of thousands of others whose involvement in the League goes well beyond their annual payment of dues. In future installments we will look at each of the other boxes pictured in Fig. 1, to see how each one contributes to the work of Amateur Radio's national organization — and, we hope, to find a slot for you!

Notes

[1]A reprint of this 184-page book is still available from ARRL for $3, postpaid. It's must reading for anyone who wants to understand Amateur Radio's "roots."

[2]"Paul M. Segal — A Tribute," *QST*, January 1962, p. 40.

[3]Any member may request a copy of the League's Articles of Association and By-Laws from Headquarters. It's free, but a stamped, self-addressed envelope will speed processing of your request.

[4]The Rules and Regulations Concerning Advisory Committees are contained in the same booklet as the Articles of Association and By-Laws.

Happenings

Conducted By W. Dale Clift,* WA3NLO

Don't Call Me "Good Buddy": FCC Releases Phase III of the Call-sign Assignment System

In March 1978, the Federal Communications Commission instituted the most comprehensive change in the amateur call-sign structure since World War II. The FCC stated, "All prior call-sign policies and procedures, written or unwritten, are canceled and are hereby replaced." In January 1979, the Commission implemented Phase II of the system that continued most of the policies of Phase I but added a few modifications.

Recently, the Commission released Phase III of the call-sign assignment system. Under this new phase, *all* amateurs not holding a call sign from the group corresponding with their license class are eligible for a call-sign change (Group A: Amateur Extra; Group B: Advanced; Group C: Technician/General; and Group D: Novice). Additionally, amateurs are eligible for call-sign changes if they are upgrading present licenses or moving to a new call-sign district.

All new and changed call signs are assigned according to operator class and mailing address district. Phase III continues the policy of Phase I and II: A call sign will *not* be changed unless the licensee specifically requests, and is eligible for, a change. The licensee always has the option of keeping his or her present call sign upon renewal or modification. Requests for *specific* call signs will not be honored, and can result in processing delays. A secondary station call sign may be assigned to the primary station upon request any time before the expiration date of the secondary station license. The secondary station license will be canceled at that time (secondary station licenses are not issued, renewed or modified).

To request a call sign change, an eligible licensee must place a mark in item 2F on the Form 610 in addition to any other items, 2A through 2J, that may pertain to the application. (All applications must be made on the new Form 610 dated August 1980). — *Richard Palm, K1CE*

Group A Call Signs

Block no.	Contiguous USA
*1	K#cc
*2	N#cc
*3	W#cc
4-13	AA#c-AK#c
14-36	KA#c-KZ#c
37-59	NA#c-NZ#c
60-82	WA#c-WZ#c
83-92	AA#cc-AK#cc
93	Group B

The following prefixes will *not* be assigned to stations in the contiguous 48 states: AH KH NH NL NP WH WL WP. Pacific-area stations will be assigned AH#c KH#c NH#c WH#c, then Group B. Alaska-area stations will get AL7c KL7c NL7c WL7c, then Group B. Atlantic-area stations will be assigned KP#c NP#c WP#c, then Group B.

Group B Call Signs

Block no.	Contiguous USA
1*	KA1cc
2-23	KB#cc-KZ#cc
24-46	NA#cc-NZ#cc
47-69	WA#cc-WZ#cc
70	Group C

*KA prefixes will be assigned only to persons living in the first call district. Other KAs are assigned to U.S. personnel living in Japan.

The following prefixes will *not* be assigned to stations in the contiguous 48 states: KH KL KP NH NL NP WH WL WP. Pacific-area stations will be assigned calls in the format, AH#cc, Alaska-area stations, AL7cc, and Atlantic-area stations, KP#cc. Once these blocks are used up, assignments will be made from Group C call signs.

Group C Call Signs

Block no.	Contiguous USA
*1	K#ccc
2	N#ccc
*3	W#ccc
4	Group D

Pacific-area stations will be assigned KH#cc NH#cc WH#cc, in that order; Alaska-area stations KL7cc NL7cc WL7cc; Atlantic-area stations NP#cc WP#cc. After these are depleted, Group D will be used.

Group D Call Signs

Block no.	Contiguous USA
1-23*	KA#ccc-KZ#ccc
24-41	WA#ccc-WZ#ccc

*Except KC4AAA-AAF and KC4USA-USZ.

The following call sign formats will *not* be assigned to stations in the contiguous 48 states:
KH#ccc KL#ccc KP#ccc WC#ccc WH#ccc WK#ccc WL#ccc WM#ccc WP#ccc WR#ccc WT#ccc. Pacific-area stations will be assigned KH#ccc WH#ccc; Alaska-area stations KL7ccc WL7ccc; Atlantic-area stations KP#ccc WP#ccc.

*Call signs using these prefixes are not currently being issued.

PREPARATIONS FOR MOBILE WARC OUTLINED; LEAGUE CONCERNED ABOUT 160-METER BAND

In March 1982, the International Telecommunication Union (ITU), of which the United States is a member, will hold a Mobile Services World Administrative Radio Conference (WARC). The 1982 Mobile WARC will deal primarily with safety and distress radio matters. So far, the FCC has issued two Notices of Inquiry (NOIs) in General Docket No. 80-184. After receipt and analysis of comments from the public, the Commission will recommend U.S. proposals for the Conference.

In response to the initial NOI, the League stated that its objective would be to ensure that regulatory provisions proposed by the U.S. do not have the effect of impeding the experimental, technical and public-service communications work being conducted worldwide by radio amateurs. The League's second series of comments have voiced concern with paragraph 35 of the FCC's Second NOI, which discusses navigational warning broadcasts. In discussing the possible options for such broadcasts, the paragraph states: "We will also look at the 1850-2000 kHz band to examine the relative merits and its potential for providing satisfactory service." According to comments filed by its General Counsel in Washington, ARRL "views with great concern any proposal to introduce new services into the 1800-2000 kHz band, which is usually called the 160-meter band by amateurs."

After reviewing the history of radio amateurs' use of the 160-meter band, the League pointed out that hams today use the band for reliable daytime communication over paths of up to approximately 80 km, especially where terrain does not permit reliable vhf communication. In the evening the band carries communications over distances of up to 1000 km. This nighttime activity is especially important during the winter months and during periods of low solar activity, when a skip zone, often present at 3.5 MHz, seriously inhibits communications over these distances on that band.

Amateur experimentation with shortened vertical antennas also has been an important activity in the 160-meter band. The band affords the Amateur Service with its only opportunity to become familiar with medium-frequency propagation phenomena, and as amateurs develop their interests and capabilities here, some of the pressure on the seriously over-crowded high-frequency bands will be eased. The League also pointed out that because of the band's importance to the Amateur Service it has already filed with the Commission a formal request to delete the geographical power and frequency restrictions imposed to protect Loran-A (Long Range Aid to Navigation). Loran-A has been or soon will be discontinued by the U.S. Coast Guard.

The League also questioned the advisability of allocating radio frequencies with such widely varying propagation characteristics as

*Deputy Manager, Membership Services

the 160-meter band for navigational warning broadcasts. During the day, propagation is by groundwave and the range is limited because of the relatively high attenuation encountered here as compared with lower frequencies. At night, propagation is mainly by skywave, which causes interference to groundwave signals. The skywave signals themselves vary tremendously in strength according to the time of day, season and solar conditions. If a requirement for improved navigational and meteorological warnings to ships exists, it should be met in the low-frequency range, or better still, by satellite, where much higher reliability can be achieved. However, if the Commission determines that the medium frequencies are the only possibility for such a system, the League suggested that this need be accommodated in medium-frequency spectrum already allocated exclusively to the Mobile Service. [Editor's Note: At the present time the nongovernment allocation of the 160-meter band in the U.S. is to the Radionavigation Service as primary users, and to the Amateur Service as secondary users. Internationally, the allocation is to the Amateur, Fixed, Mobile (except aeronautical mobile) and Radionavigation Services on a coequal, primary basis. The 1979 General WARC established an exclusive amateur allocation of 1800-1850 kHz in Region 2 (North and South America), and maintained the sharing arrangement at 1850-2000 kHz with the addition of the Radiolocation Service as a sharing partner. Footnotes modify these provisions in certain countries, and mandate the removal of Loran stations by December 31, 1982.]

NO THIRD-PARTY MODEL CONTROL IN AMATEUR SERVICE — FCC

The FCC has upheld its staff's ruling that a third party may not operate an Amateur Radio transmitter to control model aircraft. The Commission's staff ruled that Section 97.79(d) of the rules did not permit an Amateur Radio station to be operated by an unlicensed person for the purpose of controlling model aircraft, since such use constitutes one-way transmission. The staff made its ruling in a letter answering an inquiry from Mr. Francis E. Morris of San Diego, California. When the Academy of Model Aeronautics (AMA) learned of the staff's letter to Mr. Morris, it requested the Private Radio Bureau to reconsider its interpretation. The staff reconsidered the matter and advised the AMA that it stood by its ruling. Shortly after this communication, the AMA petitioned for review of the Bureau's ruling by the full Commission.

At the onset of its consideration, the Commission emphasized the fundamental differences between the Amateur Radio Service and the Radio Control Service. The Amateur Radio Service is for technically inclined persons who wish to learn about and experiment with radio communications equipment and operating techniques. On the other hand, the Radio Control Service is for anyone, whether technically inclined or not, who wishes to use radio for controlling a remote object. It felt that to allow a nonlicensed person to engage in one-way communication to control a remote object would be to strain an interpretation of the third-party traffic rule. "Worse," the Commission's statement added, "it is yet another instance of chipping away at the basic requirement that only licensed operators be permitted to operate amateur radio stations." The Commission continued, "In our view, *bona fide* third-party communications . . . can be distinguished from one-way communications designed to control movement of a remote object."

The AMA argued that under this interpretation of the rule, model aircraft enthusiasts who are not yet licensed amateur operators will be deprived of exposure to Amateur Radio activity because they are not permitted to control the aircraft by operating the Amateur Radio transmitter. However, the Commission rejected this argument, stating that the person who truly has an avid interest in Amateur Radio has a myriad number of opportunities to advance that interest and acquire proficiency in the art and hobby of Amateur Radio. "In fact, it is quite probable that the model airplane enthusiast's major interest is model airplanes, not radio," the Commission stated.

The FCC concluded that any need for more channels for control of model aircraft should be met in the Radio Control Radio Service. In this connection, it noted that AMA has a petition for rulemaking (RM-3248) currently on file with the Commission for this purpose.

FCC PROPOSES CHANGES IN HF RADIO SPECTRUM USE

The FCC has adopted a Notice of Proposed Rulemaking (NPRM) in General Docket No. 80-740 for changing the Fixed and Land Mobile Services' use of the high frequency (hf) radio spectrum below 27.5 MHz. The 1979 General World Administrative Radio Conference (General WARC) made several allocation changes between 3 and 27.5 MHz that reduced spectrum space allocated to these services and increased the spectrum allocated to the Broadcasting, Maritime Mobile, Amateur Radio and Radio Astronomy Services. Therefore, the Commission proposes to amend its rules by adding new provisions for the use of the hf spectrum by the Fixed and Land Mobile Services. For example, it proposes to no longer guarantee protection for these services from international interference on these frequency assignments.

The Commission also proposes to add a new section to its rules to help accomplish reaccommodation actions which become necessary as a result of the 1979 General WARC. The Commission added, however, that it did not want to foreclose totally the use of hf spectrum by Fixed and Land Mobile Services because such use could be advantageous in certain instances to provide backup to higher technology communications, for intermittent use occasioned by disasters and emergencies, and for important communications links when other facilities are unavailable. It gave public health and safety hf circuits in isolated communities and energy resource exploration as examples.

Comment deadlines had not been announced at presstime. For additional information, contact FCC staff member Bill Torak at 202-632-7025.

PREPARATIONS FOR 1984-1985 SPACE WARC BEGUN

The FCC has issued a Notice of Inquiry (NOI) in General Docket No. 80-741 asking for public input to develop U.S. proposals for a World Administrative Radio Conference (WARC) that would regulate the geostationary satellite orbit and radio spectrum for communications satellites. The international conference, referred to as the Space WARC, will be held under the auspices of the International Telecommunication Union (ITU), of which the United States is a member.

The geostationary satellite orbit is the path in space approximately 22,500 miles above the equator. Satellites placed in such an orbit travel at a speed that matches the earth's rotation. They thus appear to be stationary above the earth. Geostationary satellites enable broadcasters and other users of radio communications via satellite to provide constant coverage of a country or other desired area. However, the number of possible geostationary satellites is limited at any level of technology because of the spacing between satellites needed to prevent harmful interference and promote efficient use, including sharing of frequency bands.

Among the foremost questions to be taken up at the Space WARC is how to guarantee all countries equitable access to the geostationary satellite orbit and the radio spectrum allocated to space services. At the present time, regulatory procedures require advance publication of notice and notification to the ITU about any proposed satellite (except broadcasting satellites). Issues raised by all countries registering their interest are then resolved through negotiations during the coordination process under ITU auspices. Some countries have called the current regulatory approach inherently inequitable, however, particularly to those countries just beginning satellite communications activities.

The U.S. position has been that current regulatory procedures are adequate. The U.S. has pointed out that no country had ever been denied access to geostationary satellite orbit under the existing rules. It is concerned that detailed frequency and orbit location regulations may freeze technology. Once a detailed plan is put into place, the fear is that it will not have the flexibility to accommodate new technology.

Recognizing the difference between the U.S. position and the expressed desire of some countries for detailed planning, the FCC has asked for comments that would examine ways of satisfying the equity considerations while enhancing continued growth of technology. Other points on which the Commission requested comments include: (1) how the satellite operations of international organizations could be incorporated into any plan; (2) criteria for evaluating a plan or other approach, and how to incorporate technological developments into each; (3) immediate requirements and long-term trends of various services; and (4) the need for and desirability of a joint government-industry advisory committee and the cost-effectiveness, compared with contracted studies.

Comments on the NOI in General Docket 80-741 are due February 4, 1981, and reply comments are due March 4. For further information, contact Thomas Tycz at the Commission, tel. 202-653-8102.

PIRATE SHORT-WAVE BROADCASTER CLOSED DOWN

An unlicensed pirate broadcasting station operating in the 7- and 21-MHz international short-wave broadcasting bands was closed down by engineers from FCC's Seattle district office. James T. Dolan of Seattle was identified as the operator of "RX4M Voice of Clipperton" when FCC engineers traced the il-

legal signals to Dolan's home by using sophisticated mobile direction finders.

Dolan was fined $750 after he was found to be in violation of Section 301 of the Communications Act of 1934. The fine was assessed under authority of Public Law 95-234, which authorizes the Commission to issue forfeitures of up to $5000. A forfeiture may be issued to any person who violates any provision of the Act, the Commission's Rules, or any treaty to which the United States is a party. According to the Commission, operation of pirate broadcasting stations can cause interference to legitimate radio services, including emergency communications involving safety of life or property.

UNLICENSED CB OPERATOR FINED $1500

David Lee Grimm of Garden Grove, California, was sentenced to one weekend in jail, fined $1500, and placed on two years probation by U.S. District Judge Terry J. Hatter, Jr. for operating an unlicensed Citizens Radio Station in violation of Section 301 of the Communications Act. Judge Hatter placed Grimm on probation with the condition that he not operate any radio transmitting equipment during the two-year probationary period without proper authorization from the Commission.

The sentencing was a result of a three-year investigation by the FCC's Special Enforcement Facility in Long Beach, California, of Grimm's radio operations. Though Grimm had his license revoked in 1978, he continued to operate his station in violation of the FCC's Rules. In 1979, FCC inspectors detected Grimm operating on 27.900 MHz, a frequency assigned to U.S. Government radio stations. The FCC served him with a written notice warning him of the penalties of unlicensed radio operation. However, Grimm chose to ignore these warnings and in 1980 he was again detected operating on another government frequency.

Finally, U.S. marshals arrested Grimm and seized radio equipment valued at approximately $8000. Included in the equipment were four radio-frequency power "linear" amplifiers, two Amateur Radio transceivers and one CB radio transceiver. Federal radio laws provide a maximum penalty of $10,000 and/or one year imprisonment for conviction of the first offense of unlicensed radio operation and a maximum penalty of $10,000 and/or two years imprisonment for conviction of a subsequent offense.

ARRL ADVISORY COMMITTEES

ARRL President Harry Dannals, W2HD, has announced the names of the members of the ARRL Advisory Committees effective January 1981. These committees prepare recommendations within their specialty areas to the ARRL Board of Directors and/or Hq. staff. These recommendations are based upon consultation with segments of the membership and studies conducted by the committees (* denotes committee chairman).

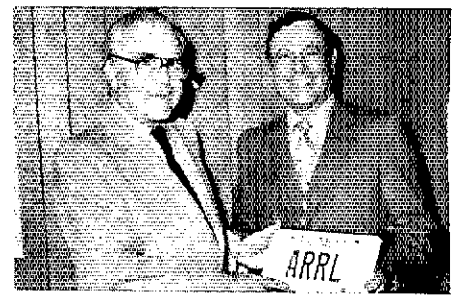
Contest Advisory Committee (CAC): Bill Myers, K1GQ, Laurel Hill Road, Hollis, NH 03049; Lew Tompkins, N2LT, RD 1, Box 246-A, Stockton, NJ 08559; Phil Koch, K3UA, 124 Lang Dr., Coraopolis, PA 15108; Ellen White, W1YL/4, 19620 SW 234th St., Homestead, FL 33031; Tom Morrison,* K5FM, Box 817, Round Rock, TX 78664; Alan Brubaker, K6XO, 34456 Colville Pl., Fremont, CA 94536; Larry Strain, N7DF, Box 213, Fort Duchesne, UT 84026; Jim Stahl, K8MR, 3592 Atherstone Rd., Cleveland Heights, OH 44121; Howard Huntington, K9KM, 65 South Burr Oak Dr., Lake Zurich, IL 60047; Edward Gray, WØSD, Rte. 2, Salem, SD 57058; Henry Thel, VE7WJ, Box 3112, Langley, BC, Canada V3A 4R3; Board liaison is Tod Olson, KØTO, 292 Heather La., Long Lake, MN 55356; and Hq. liaison is Tom Frenaye, K1KI, 225 Main St., Newington, CT 06111.

DX Advisory Committee (DXAC): Anthony C. Berg, W1OT, 7 Conant Dr., Stow, MA 01775; David Beckwith, W2QM, 151 Whitney Ave., Pompton Lakes, NJ 07442; Edward J. Kuebert, K3KA, 3369 Tanterra Circle, Brookeville, MD 20729; David Novoa, KP4AM, P. O. Box 50073, Levittown, PR 00950; Sanford E. Hutson,* K5YY, P. O. Box 5299, Little Rock, AR 72215; James T. Rafferty, N6RJ, 178 Paseo Robles, Anaheim, CA 92807; Robert W. Hudson, K7LAY, 29826 24th Place So., Federal Way, WA 98003; Daryl H. Kiebler, WB8EUN, 517 Farmstead La., Lansing, MI 48917; Norman E. Meyers, N9MM, RR 1, Box 490, Rossville, IN 46065; James L. Spencer, WØSR, 3712 Tanager Dr., N.E., Cedar Rapids, IA 52402; Harold E. Parsons, VE3QA, RR #3, Metcalfe, ON Canada KØA 2PØ. Board liaison is John C. Kanode, N4MM, RFD 1, Box 73-A, Boyce, VA 22620; and Hq. liaison is Don Search, W3AZD, 225 Main St., Newington, CT 06111.

Emergency Communications Advisory Committee (ECAC): Frank Jasinski, W1XA, 42 Saddleback Hill Rd., Bellingham, MA 02019; Michael Karp, AF2L, 83 Onyx Pl., Matawan, NJ 07747; Robert Josuweit, WA3PZO, 9 Derwen Dr., Havertown, PA 19083; Edward W. Dunn, Jr., W4NZW, 917 Mid South Dr., Knoxville, TN 37919; Bob Schmidt,* W5GHP, 5100 Press Dr., New Orleans, LA 70126; Edward Giribi, Jr., WB6IZF, 51280 Pine Clayton Rd., King City, CA 93930; Dr. Allen S. Lefohn, KA7M, P. O. Box 196, Clancy, MT 59634; Ronald Moorefield, W8ILC, 6531 Le Mans La., Dayton OH 45424; James Stanley, WD9CIS, 649 Monroe Ave., Evansville, IN 47713; William D. Bemmels, WØKL, 40 Rockwood Dr., Ottawa, KS 66067; Dr. Michael Goldstein, VE3GFN, 298 Warden Ave., Scarborough, ON Canada M1N 3A4. Board liaison is John C. Sullivan, W1HHR, Whitney Rd., Columbia, CT 06237; and Hq. liaison is Bob Halprin, K1XA, 225 Main St., Newington, CT 06111.

Public Relations Advisory Committee (PRAC): Dee Logan,* W1HEO, 175 Fairmont Ter., Fairfield, CT 06432; Stephen Mendelsohn, WA2DHF, 64 Maiden La., Little Ferry, NJ 07643; John L. Rouse, KA3DBN, 2703 Bartlett La., Bowie, MD 20715; Gray Berry, W4MGO, 41 Ellsworth Dr., Ormond Beach, FL 32074; Robert A. Scupp, WB5YYX, 648 Marquis Dr., N.E., Albuquerque, NM 87123; J. A. Doc Gmelin, W6ZRJ, 10835 Willowbrook Dr., Cupertino, CA 95014; John H. Brown, W7CKZ, 725 88th Ave., S.W., Olympia, WA 98502; James J. Apsey, K8JA, P. O. Box 28, Sylvania, OH 43560; Michele Bartlett, N1AGD/9, 2109 Branch Rd., Champaign, IL 61820; Reynolds B. Davis, KØGND, 3437 Anaheim Dr., Lincoln, NE 68506; Thomas B. J. Atkins, VE3CDM, 55 Havenbrook Blvd., Willowdale, ON Canada M2J 1A7. Board liaison is Stan Zak, K2SJO, 13 Jennifer La., Port Chester, NY 10573; and Hq. liaison is Andrew Tripp, 225 Main St., Newington, CT 06111.

VHF Repeater Advisory Committee (VRAC):



Then-Secretary of State for Illinois Alan J. Dixon (right) presents Edmond A. Metzger, W9PRN, ARRL Section Communications Manager, one of the new personalized license plates authorized by the Illinois General Assembly. Since this photo was taken last fall, both men's titles have changed! Ed Metzger is the newly elected ARRL director for the Central Division and Alan Dixon is the newly elected U.S. senator from Illinois.

Lewis D. Collins, W1GXT, 10 Marshall Ter., Wayland, MA 01778; Charles Harrison,* K2MZ, MR 179, Oyster Bay, NY 11771; Willem "Van" Van Aller, K3CZ, 7623 Old Washington Rd., Woodbine, MD 21797; Charles Durst, WA4WTX, 5508 Hallmark Rd., Durham, NC 27712; Eilene G. Spiegel, WA5WDW, 2812 Pritchett, Irving, TX 75061; Gordon Schlesinger, WA6LBV, 5364 Saxon St., San Diego, CA 92115; Clay Frienwald, K7CR, 8515 Idelwood Dr., S.W., Tacoma, WA 98498; John R. Weeks, Jr., K8RT, 773 Andover Rd., Mansfield, OH 44907; Jack D. Forbing, K9ISB, 1416 Lakewood Dr., Fort Wayne, IN 46819; Whitman E. Brown, WBØCIX, 14418 W. Ellsworth Pl., Golden, CO 80401; Ronald F. MacKay, VE1AIC, Box 188, Cornwall, PEI Canada CØA 1HØ. Board liaison is Frank Butler, W4RH, and Hq. liaison is Peter O'Dell, AE8Q, 225 Main St., Newington, CT 06111.

VHF-UHF Advisory Committee (VUAC): Joe Reisert, W1JR, 17 Mansfield Dr., Chelmsford, MA 01824; Richard T. Knadle, Jr., K2RIW, 316 Vanderbilt Pkwy., Dix Hills, NY 11746; Anthony F. Souza, W3HMU, P. O. Box 169, Ottsville, PA 18942; Richard M. Jansson, WD4FAB, 1130 Willow Brook Tr., Maitland, FL 32751; Roy L. Albright, W5EYB/N5RA, 107 Rosemary, San Antonio, TX 78227; Louis N. Anciaux, WB6NMT, P. O. Box 82183, San Diego, CA 92138; Russell G. Wieker,* W4WD/7, P. O. Box 16347, Salt Lake City, UT 84116; Fed E. Hartson, WA8ULG, 2444 W. Halbert Rd., Battle Creek, MI 49017; Malcolm M. Bibby, GW3NJY/W9, 990 N. Lake Shore Dr., No. 21C, Chicago, IL 60611; Clair J. Robinson, KØCJ, 5036 17th Ave. S., Minneapolis, MN 55417; J. Leslie Weir, VE3AIB, 42 Cobham Cres., Toronto, ON Canada M4A 1V6; Board liaison is Jay A. Holladay, W6EJJ, 5128 Jessen Dr., La Canada, CA 91011; and Hq. liaison is Bernie Glassmeyer, W9KDR, 225 Main St., Newington, CT 06111.

MULTIPLE TRUSTEESHIPS FOR CLUB STATIONS DENIED

The FCC has dismissed RM-2767, filed by Charles F. Bino, which sought a formal change in the Commission's Rules to provide for multiple trusteeship for club stations. The Commission said it felt that such an arrangement would make accountability for the stations more difficult for enforcement purposes than if the present rule remained in force.

Correspondence

Conducted By Bruce R. Kampe,* WA1POI

TAKE A NUMBER

I am writing this letter to correct a couple of mis-statements made in the December *QST* "Correspondence" column regarding letters about proposed Extra class ssb sub-bands on 40 meters.

I am an Extra class amateur who, by choice, operates 100 percent cw exclusively on 20 and 40 meters. This choice was made after years of increasing chaos and near savagery had been found in the American phone bands. The peacefulness, cooperation and mannerly conduct of cw operators can usually be discerned only by themselves, as their easy, conversational, smooth code runs along at 30 to 40 words per minute, and seems a virtually incomprehensible blur to many who would inquiringly tune across the bands.

As one very much at home from 7000 to 7040 kHz, I find W6WEO's comment of the bottom 25 kHz of 40 meters as "definitely D-E-A-D" an unfortunate one, revealing at least a sad antenna, if not a defunct receiver. W7LYA's comment suggests "we all" would be much happier if the proposed ssb sub-band would be 7000 to 7025 kHz. This reveals the likelihood of an amateur with a death grip on his mike. W2HXF questions that there is some ineffable virtue in the practice of cw. If you consider cw communication a form of art, and take pride in its correct, quick application as a skill akin to piano playing, then there certainly is virtue in the practice of cw.

In closing, I encourage, entreat, admonish all of hamdom to throw that switch to narrow bandwidth and join the fine fellows on the low end of 40. One will find, as I did after 27 years, that there still exists in ham radio that which was, and will always be — but you must be courageous, throw away your mike and look for it. — *William F. Hiller, N7DM, Port Angeles, Washington*

Regarding the 10/7 MHz "problem," here is another proposal. It retains the concept of more 7 MHz phone space in return for exclusive cw at 10 MHz. In my view, this plan has one significant advantage over the Ad Hoc Committee plan. It does not precipitate a *new* class war; that is, General and Advanced cw operators vs. Extra ssb operators in 7075 to 7100 kHz. The plan also allows all classes of U.S. phone in the European phone band, 7060 to 7100 kHz.

The plan was basically derived as follows: The Ad Hoc Committee proposed an additional phone segment of 7075 to 7100 kHz. Thus, the total space allocated to the phone segments on 40 meters would then be 175 kHz, which is 58.3 percent of 40 meters. If the 58.3 percent phone figure is rounded to 60 percent, we are left with 40 percent cw space. Based on this, the good segment (7000 to 7100 kHz) and the bad segment (7100 to 7300 kHz) are allocated 60 percent phone and 40 percent cw, while preserving existing allocations among license classes. Rounding is necessary and was done upward for Novices and downward for Extras.

My plan has two disadvantages. My proposed allocations would not fit certain restricted rigs such as the Heath HW-16 and some of the Headquarters-designed QRP rigs. It also leaves phone operators in other countries, notably Canada, competing with U.S. phone operators.

Incidentally, sharing our good and bad portions of bands may be more necessary in the future where amateurs are required to share bands with other services. — *R. M. Archambeault, AAØV, Kidder, Missouri*

[Editor's Note: Mr. Archambeault's letter included a graphical representation of his band plan, which, unfortunately, could not be reproduced in this column. His plan can be described. The 40-meter band is divided into five sections. Section one extends from 7000 to 7050 kHz, and is a low-end A1 and F1 segment. Extra Class licenses would be permitted 7000 to 7050 kHz, Advanced and General class licensees would be permitted 7005 to 7050 kHz. Novices and Technicians would be permitted 7030 to 7050 kHz. Incidentally, there is another Novice sub-band mentioned later on. Section two extends from 7050 to 7075 kHz and would permit A1, voice and SSTV for Extra and Advanced class licensees. Section three extends from 7075 to 7150 kHz, and would permit A1 and voice for Extra, Advanced and General class licensees. Section four extends from 7150 to 7200 kHz. Like section two, it would permit A1, voice and SSTV for Extra and Advanced class licensees. Section five extends from 7200 to 7300 kHz. Like section one, it is for A1 and F1 only. Extra class licensees would be permitted 7200 to 7300 kHz. Advanced and General licensees would be permitted 7200 to 7280 kHz, while Novices and Technicians would be permitted 7200 to 7240 kHz. Mr. Archambeault has pointed out that his proposal for 7100 to 7300 kHz could be flipped over so that phone would occupy 7200 to 7300 kHz, although he feels that a grouping of all phone allocations together is more desirable.]

NONCOMMERCIAL ONLY

The article "Organizing Amateur Communications for Public Events" in December 1980 *QST* contains excellent guidelines and includes trouble areas to avoid. The author overlooked one very important word of caution, however.

Some overzealous folks in my area, though well intentioned, will at times organize local hams for events that do not qualify as public events. When I hear this happening on one of our local repeaters I will break in to caution against this participation in what might clearly be a violation of Part 97.114 (c). For example, golf tournaments by professionals, Road Rallies for cash prizes, and cross-country motorcycle races for money are not public events. Many such events are conducted by promoters for profit with professional participants. Obviously, if an event is large enough, it can be enhanced by good communication. However, concerning commercial events, it would be more prudent to withhold the services of Amateur Radio and advise the entrepreneurs to seek commercial radio services through their "yellow pages." — *Ron Desautels, KQ6X, Canyon County, California*

A BUNCH AT BOXBOROUGH

I just received my General class Amateur Radio license in the mail from Gettysburg, and am reminded to say thanks for the good assistance of the Boston FCC office. There must have been three or four hundred people taking examinations at the ARRL New England convention last October. This service of the Commission is appreciated — the staff worked long, hard and cheerfully. — *Arthur T. Thompson, KA1ENP, Wellesley, Massachusetts*

A NIGHT AT THE HEARING

There was an antenna case hearing on October 29, 1980, before the Brookhaven, Long Island, Zoning Variance Board concerning W2CZA's 48-foot freestanding tower. The outcome of the hearing is still pending.

I felt this hearing was of great importance to all hams in Brookhaven and was disappointed that only about 50 hams appeared. A busy man like Harry Dannals, W2HD, found it important enough to attend the antenna hearing, and among others, took the stand twice. His action contradicts rumors that the ARRL doesn't like to get involved. — *Kurt Bittmann, WB2YVY, Centereach, New York*

REAL PEOPLE

I really liked Bob Halprin's piece entitled "Meaningful QSOs" ("Operating News," November 1980 *QST*).

Real communication, to me, is more than just the exchange of agreed-upon words and symbols. Rather, it is a communication of experience, your experience, such that the other person has that experience too.

Real communications isn't really all that "far out." All it takes is a little imagination and sensitivity, and a willingness to step beyond the mechanical type of exchange that is common in amateur contacts and in our daily activity with people.

I remember vividly my QSO with a South American amateur who told me about the difficulties of driving through molten lava in a Jeep. I remember a contact with a fellow on a DXpedition to a rare island who was just dying for some Austin Mexican food. These were contacts where the people made themselves available and shared a little of their lives.

Even the quickest, most minimal contact can be satisfying. If you really extend greeting to the other ham, he or she will hear it in your voice, and will be as thrilled to work you as you are to make the contact. This shows how human communication is more than data.

There is some unknown element we strive for in our relations with people. It makes contacts meaningful, and articles such as K1XA's remind me of its importance. — *Bennett Z. Kobb, N5AIF, Austin, Texas*

*Membership Services Assistant

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Introducing The New Form 610

As 1980 drew to a close, the Commission released a new edition of the amateur's (almost) all-purpose application form — the Form 610. The Commission will *not* process amateur applications submitted on the now obsolete Form 610 dated September 1977. Applications *must* be made using the new form dated August 1980. Students of the Form 610 (otherwise known as formophiles) should find the new form easier to work with.

Q. What types of applications must be made on FCC Form 610, Form 610-A and Form 610-B?

A. Amateurs must use the Form 610 for renewal of their primary station and operator licenses, modifications such as change of address or call sign, reinstatement of licenses that have expired within the five-year grace period and requests for new or upgrade license examination.

Club, military recreation and RACES station license renewal or modification applications must be made on FCC Form 610-B. Alien applications for reciprocal operating permission in the U.S. must be made on FCC Form 610-A.

Q. How does one go about the task of completing the form?

A. Complete *Section I* if you're applying either for a new or upgraded license, or renewal, reinstatement or modification of your present license.

Item 1 — First, attach a photocopy (or the original) of your license and/or interim permit. If you've lost the license or permit (or it was destroyed), simply explain the circumstances in the space provided in Item 1. The space to the right of Item 1 is for the FCC examiner's use only.

Item 2 — This item specifies the purpose of the application: new license, renewal, reinstatement, call sign change, name change, address change, station location change or antenna structure change (check 2J to apply for a change in antenna height or location information now on file with the Commission *only* if your answer to Item 9 will be "yes" for the changed structure). Simply check the appropriate box and any corresponding blanks provided to the right of the item. For example, if you're applying for a reinstatement of your license which expired 1 to 5 years ago, you would check box 2C and follow the corresponding arrows to fill in the applicable boxes EXPIRATION DATE and license class.

Important note concerning call signs — Phase III of the amateur call sign assignment system is in effect. Licensees who do not already hold a call sign reflecting their license class may request a call sign change. All call signs are selected by the Commission and requests by amateurs for specific call signs will not be honored. If you already hold a call sign reflecting your license class, you are not eligible for a call sign change unless you are changing your mailing address to a new call sign district. All amateurs have the option of keeping their present call signs under all circumstances, even if moving to another call sign district or upgrading to a higher-class license. The Commission will not change your call sign unless you request it and are eligible for a change. Once the change is made, however, your previous call sign cannot be reinstated. Details on Phase III of the call sign assignment system can be found in "Happenings" in February 1980 *QST*.

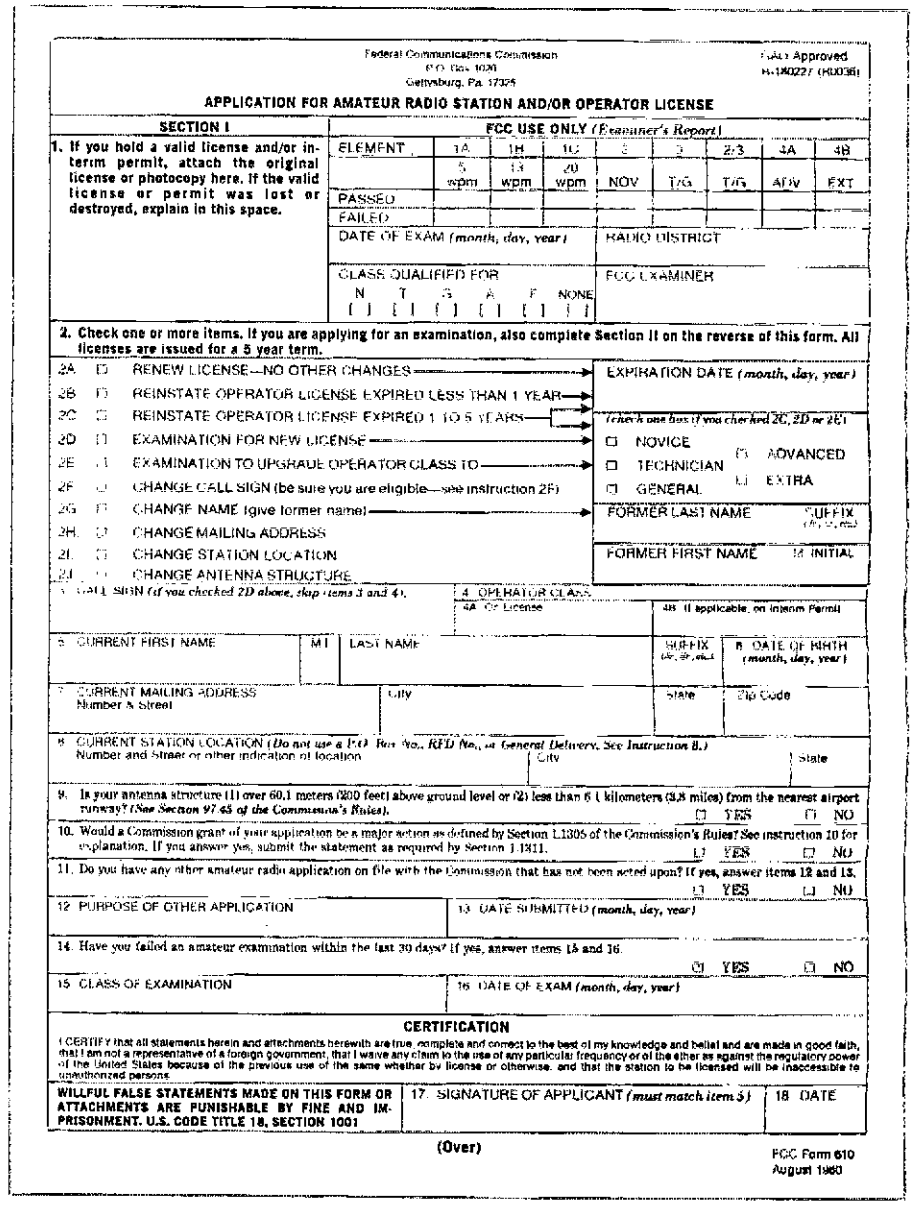
Item 3 — List your call sign if you hold one.

Item 4 — Give your operator class and, if applicable, your operator class listed on your interim permit.

Item 5 — Enter your name and any suffix such as Jr., or III. Remember that your name must agree with your signature in Item 17.

Item 6 — Give your birthdate in the form 12-25-53.

Item 7 — Give your current mailing address. Remember that the address must be in the U.S. or its territories. A postal box, RFD number or General Delivery is sufficient. Keep in mind that you will be responsible for all FCC mail sent to that address.



Federal Communications Commission
P.O. Box 1020
Gettysburg, Pa. 17325

OMB Approved
3060-0216 (3060-0060)

APPLICATION FOR AMATEUR RADIO STATION AND/OR OPERATOR LICENSE

SECTION I

1. If you hold a valid license and/or interim permit, attach the original license or photocopy here. If the valid license or permit was lost or destroyed, explain in this space.

FCC USE ONLY (Examiner's Report)

ELEMENT	1A	1B	1C	2	3	2/3	3A	4B
	5 wpm	13 wpm	20 wpm	NOV	T/G	T/G	ADV	EXT
PASSED								
FAILED								

DATE OF EXAM (month, day, year) | RADIO DISTRICT

CLASS QUALIFIED FOR: N [ ] T [ ] G [ ] A [ ] E [ ] NONE [ ] | FCC EXAMINER

2. Check one or more items. If you are applying for an examination, also complete Section II on the reverse of this form. All licenses are issued for a 5 year term.

- 2A ☐ RENEW LICENSE—NO OTHER CHANGES → EXPIRATION DATE (month, day, year)
- 2B ☐ REINSTATE OPERATOR LICENSE EXPIRED LESS THAN 1 YEAR →
- 2C ☐ REINSTATE OPERATOR LICENSE EXPIRED 1 TO 5 YEARS →
- 2D ☐ EXAMINATION FOR NEW LICENSE →
- 2E ☐ EXAMINATION TO UPGRADE OPERATOR CLASS TO →
- 2F ☐ CHANGE CALL SIGN (be sure you are eligible—see instruction 2F)
- 2G ☐ CHANGE NAME (give former name) →
- 2H ☐ CHANGE MAILING ADDRESS
- 2I ☐ CHANGE STATION LOCATION
- 2J ☐ CHANGE ANTENNA STRUCTURE

(Check one box if you checked 2C, 2D or 2E)
☐ NOVICE ☐ ADVANCED ☐ TECHNICIAN ☐ EXTRA ☐ GENERAL

FORMER LAST NAME | SUFFIX (Jr., Sr., etc.)
FORMER FIRST NAME | M. INITIAL

3. CALL SIGN (If you checked 2D above, skip items 3 and 4).
4. OPERATOR CLASS
4A. Of License | 4B. If applicable, on Interim Permit
5. CURRENT FIRST NAME | MI | LAST NAME | SUFFIX (Jr., Sr., etc.) | 6. DATE OF BIRTH (month, day, year)
7. CURRENT MAILING ADDRESS (Number & Street) | City | State | Zip Code
8. CURRENT STATION LOCATION (Do not use a P.O. Box No., RFD No., or General Delivery. See Instruction 8.) Number and Street or other indication of location | City | State
9. Is your antenna structure (1) over 60.1 meters (200 feet) above ground level or (2) less than 6.1 kilometers (3.8 miles) from the nearest airport runway? (See Section 97.45 of the Commission's Rules). ☐ YES ☐ NO
10. Would a Commission grant of your application be a major action as defined by Section 1.1305 of the Commission's Rules? See instruction 10 for explanation. If you answer yes, submit the statement as required by Section 1.1311. ☐ YES ☐ NO
11. Do you have any other amateur radio application on file with the Commission that has not been acted upon? If yes, answer items 12 and 13. ☐ YES ☐ NO
12. PURPOSE OF OTHER APPLICATION | 13. DATE SUBMITTED (month, day, year)
14. Have you failed an amateur examination within the last 30 days? If yes, answer items 15 and 16. ☐ YES ☐ NO
15. CLASS OF EXAMINATION | 16. DATE OF EXAM (month, day, year)

CERTIFICATION

I CERTIFY that all statements herein and attachments herewith are true, complete and correct to the best of my knowledge and belief and are made in good faith; that I am not a representative of a foreign government; that I waive any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same whether by license or otherwise; and that the station to be licensed will be inaccessible to unauthorized persons.

WILLFUL FALSE STATEMENTS MADE ON THIS FORM OR ATTACHMENTS ARE PUNISHABLE BY FINE AND IMPRISONMENT. U.S. CODE TITLE 18, SECTION 1001

17. SIGNATURE OF APPLICANT (must match item 5) | 18. DATE

(Over)

FCC Form 610
August 1980

*Assistant Manager, Membership Services, ARRL

Item 8 — Give your current station location (it may be different than that of your mailing address in item 7). The station location address must be a specific geographical location, *not* a box number. This address must also be within the U.S., American Samoa, Baker Island, Canton Island, Enderbury Island, Guam, Howland Island, Jarvis Island, Johnston Island, Kingman Reef, Kure Island, Midway Island, Navassa Island, Northern Mariana Island, Palmyra Island, Peale Island, Puerto Rico, Virgin Island, Wake Island and Wilkes Island. Any other location is not within FCC jurisdiction.

Item 9 — Most amateurs will check "no" to this antenna-structure question. For a good review of antenna restrictions see "Washington Mailbox" in October 1980 *QST*. Check "yes" if your antenna structure is over 200 feet above ground level or is less than 3.8 miles from the nearest airport, and submit the required Form 714 with your application.

Item 10 — Most amateurs will check "no" to this major action question. A "major action" is defined in the rules as (a) a new antenna or structure, or an increase in height of an existing structure by more than 10%, which results in a final height of over 300 feet, (b) facilities which are to be located in an officially designated wilderness area, wildlife preserve area or a nationally recognized scenic and recreational area, or facilities which will affect sites significant in American History and (c) construction which involves extensive changes in surface features. If the answer to Item 10 is "yes," you must submit the required Environmental Impact Narrative Statement (EINS) along with your application.

Items 11, 12 and 13 — If you have any other Amateur Radio application on file with the Commission that has not been acted upon (a renewal, for example), answer "yes." Enter the purpose of the other application in Item 12 and the date it was filed in Item 13.

Item 14 — If you've failed an amateur exam within the last 30 days, answer "yes" and give the class of license exam in Item 15 and the date of the exam in Item 16. If the answer to Item 14 is "no" simply disregard items 15 and 16.

Item 17 — Sign the application certifying that your statements are true, complete and correct to the best of your knowledge. Date the application in Item 18.

Q. What does Section II deal with and how is it completed?

A. Section II deals specifically with requests for amateur examinations.

Section II-A is to be completed *only* by a volunteer examiner requesting the written portion of the Novice class exam. The volunteer examiner gives his or her name, operator class, information on whether or not he or she has an application pending action with the FCC, call sign, license expiration date and an address that *must* agree with the mailing address. If the volunteer examiner holds a valid interim permit, a photocopy must be attached to the application. The volunteer examiner certifies his or her eligibility as a volunteer examiner under the rules and the conditions under which the applicant received credit for the code exam (either by passing the exam or by holding a valid FCC Form 845, Code Credit Certificate). If the applicant holds the Form 845, it must be attached to the application. The volunteer examiner signs and dates the application.

Q. And how about Section II-B?

A. Section II-B is to be completed by an applicant requesting an examination for Technician, General, Advanced or Amateur Extra class licensing at an FCC examination point. You should contact the FCC office nearest you for exam schedules, addresses and telephone numbers. If a prior appointment is necessary, send your completed application to the FCC office that will be conducting the exam. The office will in turn notify you of where and when to report for the exam. A word of caution: Do *not* send your application for a field office examination to the Gettysburg FCC office.

If a prior appointment is not necessary, simply bring your completed application with you to the exam point when you appear for the examination.

Q. What is the purpose of Section II-C?

A. Section II-C is to be completed by a physician in the event that you cannot travel to an FCC exam point because of a protracted disability. In cases such as this, the FCC will either send one of their examiners or appoint an examiner to conduct the examination at a location convenient to you (probably your home). The completed application should be mailed to the nearest FCC field office.

Q. Is there anything else I should keep in mind when filing the Form 610?

A. Yes: All applications except requests for examinations by FCC field office examiners must be sent to: FCC, Box 1020, Gettysburg, PA 17325. There are no fees for filing applications. The Form 610, 610-A and 610-B are available from FCC offices or ARRL Headquarters, 225 Main St., Newington, CT 06111.

Q. How do I inquire about my pending application?

A. If you have not received a response from the FCC concerning your application within 90 days, write to the Gettysburg FCC office (address above). Include in your letter a photocopy of your application, or the following information: name and address, birthdate, present call sign and class of license, date of application, volunteer examiner's name (if Novice exam) and Field Office location (if FCC supervised exam). QST

SECTION II EXAMINATION REQUEST

SECTION II-A To be completed only by a volunteer examiner requesting a Novice Class examination

1 VOLUNTEER EXAMINER'S NAME: FIRST | MIDDLE INITIAL | LAST | SUFFIX (Jr., Sr., etc.)

ELEMENT 2 EXAMINATION PAPERS WILL BE SENT TO YOU AT THIS ADDRESS. IT MUST AGREE WITH YOUR LICENSE MAILING ADDRESS. →

2 VOLUNTEER EXAMINER'S MAILING ADDRESS
NUMBER STREET
CITY STATE ZIP CODE

3 OPERATOR CLASS ☐ GENERAL ☐ ADVANCED ☐ AMATEUR EXTRA

4 CALL SIGN | 5 EXPIRATION DATE

6 IF YOU HAVE AN APPLICATION PENDING FOR YOUR LICENSE, GIVE FILING DATE:

7 IF YOU HOLD A VALID INTERIM PERMIT, ATTACH A PHOTOCOPY

CERTIFICATION

I Certify That
1. I am unrelated to the applicant, (i.e. not a spouse, parent, child, stepchild, sister, brother, aunt, uncle, niece, nephew, grandparent, grandchild, in-law, stepbrother, stepsister, stepmother, stepfather.)
2 I am at least 18 years of age.

(CHECK ONE)

☐ I have examined the applicant within the past 10 days and he/she has passed the 5 word per minute telegraphy examination.

☐ I have not examined the applicant since he/she claims telegraphy test credit. The original FCC Form 845, Code Credit Certificate, is attached.

☐ I have not examined the applicant since he/she claims telegraphy test credit. Applicant's statement is attached giving the license number, expiration date, and class of commercial radiotelegraph operator license which qualifies him/her for credit.

8 SIGNATURE (must match item 1) | 9 DATE SIGNED

Section II-B Complete only if you are requesting an examination for Technician, General, Advanced, or Amateur Extra Class at an FCC examination point.

Examinations for other than novice class operator are administered by the FCC field offices in major cities. A prior appointment is sometimes necessary. Refer to the instructions and examination schedule bulletin FO-28 before completing this section.

I REQUEST AN EXAMINATION APPOINTMENT IN. CITY STATE

SECTION II-C To be completed only by your physician if you cannot travel to an FCC examination point because of a protracted disability, and are requesting examination at some other location.

1. LOCATION OF NEAREST FCC EXAMINATION POINT
CITY STATE

2. BRIEFLY DESCRIBE WHY THE APPLICANT CANNOT TRAVEL TO AN EXAMINATION POINT

3. PHYSICIAN'S NAME | 4 PHYSICIAN'S TELEPHONE NUMBER

5. PHYSICIAN'S ADDRESS
NUMBER & STREET CITY STATE ZIP CODE

CERTIFICATION

I certify that I have examined the applicant within the last 30 days and because of the protracted disability described above, have found him/her unable to travel to a Commission examination point.

6 PHYSICIAN'S SIGNATURE | 7. DATE SIGNED

FCC Form 610
August 1980

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

The British Columbia Amateur Radio Instructors

For over two years now, amateurs across Canada have been concerned with the high failure rate on the theory portion of the revised DOC examinations. Here's a story about a group of fellows in British Columbia who looked at the problem and decided to solve it.

It started back in November 1979, when some Amateur Radio instructors from the Surrey, Maple Ridge, Burnaby and Vancouver Amateur Radio clubs met at a local swap meet and pondered reasons for the poor showing on a recent DOC exam. Lou Beaubien, VE7CGE, who supplied the information for this article, recalled, "I was the most inexperienced instructor. I thought it had been my fault." Lou quickly learned that even experienced instructors were having problems. A decision was made to have a meeting at Lou's house the very next Saturday to see what could be done.

That week, all Amateur Radio instructors living within a hundred miles of Vancouver were contacted. Willingly, they gave up their Saturday morning. At the meeting, the first thing the group noticed was that no one was using their radios to discuss training or review exams. That would be changed immediately. The group arranged for Wally Garrett, VE7CJT, who controlled the Tuesday night British Columbia Net, to give the new group some publicity and conduct an on-the-air debriefing session on the recent DOC exam.

That Tuesday, the B.C. Net was alive with ham friends, all offering encouragement to the new group. Many who checked in took a crack at formulating answers for the questions on the recent exam. The evening was a huge success. Best of all, because of the publicity, many students who were still waiting for the results of their exams had been listening in. They eagerly compared their own answers with those offered on the air. Even those who now knew they had failed badly were encouraged, knowing that there were people out there ready to help them learn, and even show them how to formulate a good answer.

The group, which came to be known as BCARI, the British Columbia Amateur Radio Instructors, met again and again, both on the air and in person. Very quickly, the problem of a good training manual came up. ARRL books were excellent, but difficult to use because the level and, in some cases, the sequence, were wrong for the Canadian exams. Besides, the regulations were different. The currently available Canadian manuals seemed to be written in such a complicated way that they were hard for instructors and students to use.

One member of BCARI, Ralph Zbarsky, VE7BTG, had been thinking of producing a new manual. With his teaching experience, an engineering background and a free-flowing writing style, Ralph was a natural. Several chapters had been completed. They were brought in for evaluation. It was the best material the group had encountered! The text was easy to understand — even entertaining at times! The diagrams were clear and up-to-date. Ralph used conventional current flow to explain what was going on. It was "just follow the arrows!"

Ralph subsequently completed and published his book. Last year it was offered to CRRL, and it has since been adopted as the CRRL training manual. But the group took many other initiatives. It enlisted the help of British Columbia Amateur Radio clubs to start a certificate program. BCARI provided certificates to individual clubs for use with their own Amateur Radio courses. These certificates have come to be greatly valued, and at many clubs they are presented with considerable ceremony. It has become a way of welcoming new amateurs into the ranks.

Late last year BCARI members belonging to the Burnaby Amateur Radio Club prepared a set of 600 study questions that any student should be able to handle before attempting a DOC examination. These questions came from various BCARI instructors, the revised DOC examinations, the ARRL *Technician - General Q and A Book*, the Zbarsky *CRRL Canadian Amateur Radio Licencing Manual* and the *CARF Study Guide*. These questions have proved so helpful to students that CRRL and the Burnaby ARC have made an initial printing of several hundred copies in booklet form, for sale and distribution across Canada.

Also late last year, BCARI members of the Burnaby club set up a special accelerated class for students who had tried the DOC exams but failed. Using the Zbarsky book, the study questions and ideas worked out by BCARI members, the students really started to get their tickets. By the end of 1980, 90% of those who had tried the theory were passing — with an average mark of 86%. Now an advanced class has been formed, with 40 students enrolled. Each Monday evening, on 3.750 MHz, the advanced students receive their homework assignments. Questions are transmitted on cw at 15 to 17 wpm, and afterwards they are repeated on voice. Not only the theory but the code speed is improving!

Members of BCARI now find that amateurs all over western Canada are listening in. The homework questions, the post mortems on the latest DOC examinations, and other on-the-air activities have become a great help for amateurs living in remote areas, where there is no club to offer an Amateur Radio course and, perhaps, not even other amateurs nearby to offer encouragement. And the results of the work of BCARI are really starting to show. Several clubs in the greater Vancouver area have experienced growth rates of over 50%. It all shows what can be done when a group of amateurs think positively about solving a problem.

CRRL MEMBERSHIP AND THE RECENT MAILING

CRRL, The Canadian Radio Relay League, remains the largest amateur organization in Canada. As of October 31, 1980, CRRL membership was 5539. This will be changing greatly as a result of the recent CRRL membership mailing. During the first two weeks of December 1980, return envelopes were arriving at Box 7009, London, Ontario, at the rate of about 100 a day. Some of these were renewals, of course, but the majority were new memberships. Along with completed application forms and cheques were many letters expressing enthusiastic support for CRRL, its positive attitude, its many new projects, and its work of carrying on in Canada the traditions and services of the League.

*163 Meridene Crescent West, London, ON N5X 1G3

Some people took the opportunity to ask some very basic questions about CRRL. Yes, if you are an ARRL member, and you live in Canada, you are automatically a member of CRRL. CRRL functions as an independent organization in matters that concern Canadian Amateur Radio, but is also, still, the Canadian Division of the League. That means that if you are a CRRL member, you are also automatically a member of ARRL. There are different ways of thinking about it, but it all adds up to the same thing.

One question that many people asked was, "Why did everyone receive the mailing — even paid-up ARRL-CRRL members?" The answer is that it was cheapest to do it this way. The cost of using a computer to cull out names and addresses of over 5000 League members from the names and addresses of over 20,000 Canadian amateurs on the DOC-supplied mailing list would have been prohibitive. To those of you who are paid-up ARRL-CRRL members, mailing organizers say, "Thanks for your support. We hope that the mailing was of value to you as a source of information, and that perhaps you were able to pass along the material to a friend, perhaps someone studying for his or her ticket, someone whose name and address we would not have had."

NEW APPOINTMENTS

Congratulations to new Assistant Director Gil Frederick, VE4AG and new Public Information Assistant John Gowron, VE4ADS, who received their certificates of appointment from CRRL President Mitch Powell, VE3OT, during Mitch's recent visit to Winnipeg ARC.

CORRECTION

The correct date for the third writing of DOC examinations is June 17, not June 15 as originally reported in December 1980 "Canadian NewsFronts."

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

A Practical Dish Feed for the Higher Microwave Bands

This month I would like to describe a waveguide dish feed developed by G4ALN. It is adaptable for use on any band where rectangular waveguide is used, but is likely to be of most use on the 10-GHz and 24-GHz bands. This feed was originally designed for use with dishes having an f/D ratio of 0.25 to 0.3. Such dishes are often the ones found on the surplus market and are difficult to illuminate efficiently using pyramidal horn-type feeds. Although this feed is designed for somewhat smaller f/D ratios, G3WDG reports good results at 24 GHz using a 0.35 f/D dish and I have had success at 10 GHz with a similar 0.33 f/D dish. The focal length (and hence f/D ratio) of a parabolic dish can be calculated from its diameter and depth using the relationship

$$f = \frac{D^2}{16c}$$

where f is the focal length, D is the dish diameter and c is the depth of the dish as defined in Fig. 1. This formula may be useful in rapidly estimating the f/D ratio of dishes found for sale at flea markets, etc. Dishes with an f/D ratio of less than 0.25 are difficult to illuminate efficiently with easily constructed feeds. The feed described here will certainly give good results with dishes of f/D ratio 0.25 to 0.35 and is probably worth trying with dishes outside of this range, since it is so easily constructed.

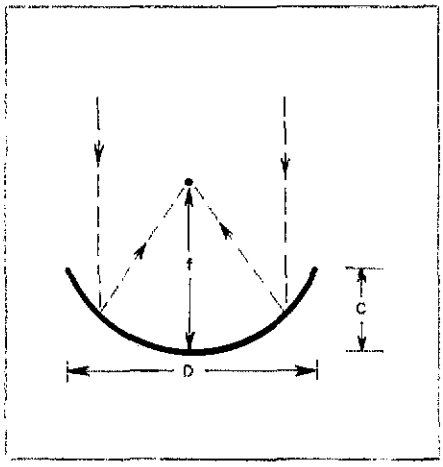


Fig. 1 — Parabolic dish parameters. $f = D^2/16c$ (see text).

Fig. 2 shows the construction of the G4ALN feed. Slots are filed in the broad faces of a squared-off piece of rectangular waveguide, as shown at A in Fig. 2. The slots are $\lambda/2$ long and $\lambda/20$ deep at the intended frequency of use (λ is the free-space wavelength). For example, at 10.368 GHz, where λ = 28.92 mm, the slots would be 14.46 mm long by 1.45 mm deep. A 1 λ-diameter disc is then soldered symmetrically to the end of the waveguide as shown at B in Fig. 2, taking care not to allow solder or flux to get inside the waveguide or the slots. The disc may be made of thin (around .030 in.) brass or copper sheet. The feed is now completed and is ready to be installed through the center of the dish as shown at C in Fig. 2. The method of securing the feed in this position is for the individual to determine! The exact position of the feed for optimum gain should be found experimentally using a weak signal, starting with the disc at the calculated focal point of the dish and sliding it backward and forward for maximum received signal strength. The feed can then be secured in this position.

One final point to note. When the slots (i.e. the broad faces of the waveguide) are in the vertical plane the radiation from the dish is horizontally polarized.

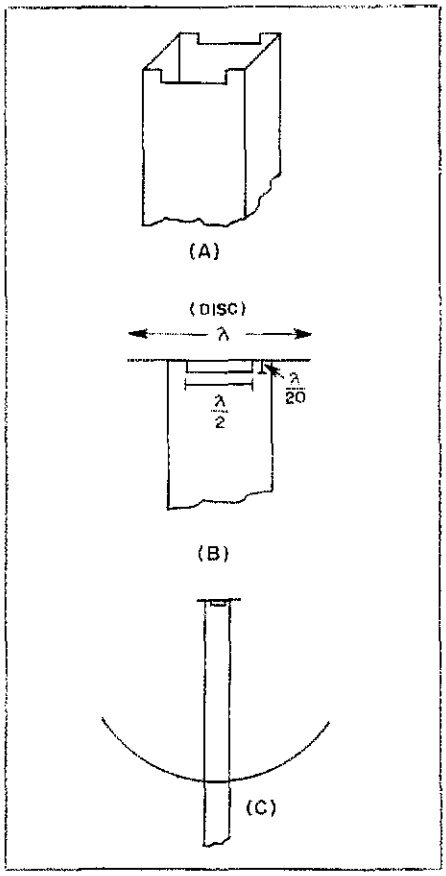


Fig. 2 — Construction of G4ALN feed. Note that the size of the disc (λ) relative to the broad face of the wave guide is exaggerated for clarity. In fact, the broad face of the waveguide is close to λ-wide itself for the waveguides normally used at 10 GHz and 24 GHz (WR-90 and WR-42, respectively).

BANDWIDTH, SIGNAL-TO-NOISE RATIOS AND SENSITIVITY

In the November and December "New Frontier" columns I made reference to the improvement that can be made in received signal-to-noise ratio by reducing the receiver bandwidth, and how to calculate that ratio. I should make it clear that the signal-to-noise ratio referred to is that present at the final-detector stage of the receiver. John Grebenkemper, KA3BLO, has pointed out, quite correctly, that the SNR-vs.-bandwidth relationship does not hold for the *output* of an fm demodulator operating above its threshold.

In contrast to a cw or ssb system where the output SNR of the final detector is the same as its input SNR, the output SNR of an fm demodulator depends not only on the input SNR but also on the deviation of the received signal. For an fm demodulator the output SNR actually improves with increasing deviation of the received signal (thus requiring a wider receiver bandwidth) as long as the SNR at the input of the demodulator is above its operating threshold (typically +10dB). For more information on this subject see Wayne Greaves' article in August 1980 *QST*, page 23.

Whether or not this SNR/bandwidth trade-off is of use to the amateur depends on the goal of the communication system being used. If we wish to have a system capable of detecting and extracting information from the weakest possible signal, and therefore be capable of working the longest paths, then the receiver system must have the narrowest possible bandwidth consistent with the message bandwidth of the signal being received. In this respect the preferred modulation systems are cw, ssb, nbfm and wbfm, in that order.

If on the other hand we wish to have a system capable of producing the best possible output SNR, and signals are expected to be reasonably strong, then wideband fm will be the best choice for the modulation system. The maximum output SNR will be achieved when the receiver bandwidth (and transmitted signal deviation) is widened to the point that the SNR at the input of the fm demodulator falls to just above its operating threshold. One application of such a system might be to provide "snow"-free ATV pictures or a high-reliability data transmission link over short distances.

I hope that this clears up any confusion that may have arisen over this topic. QST

*c/o ARRL, 225 Main St., Newington, CT 06111

Coming Conventions

February 7-8
Florida State, Miami

March 21-22
North Carolina State, Charlotte

April 11-12
Missouri State, Kansas City

April 25-26
Mississippi State, Jackson

April 25-26
West Indies Section, Dorado, PR

May 15-16
Atlantic Division/New York State, Rochester

May 15-17
Pacific Division, Fresno, California

May 16-17
Southeastern Division, Birmingham, Alabama

June 5-7
Northwestern Division, Seaside, Oregon

June 20-21
Georgia State, Atlanta

July 24-26
West Gulf Division, Oklahoma City

ARRL NATIONAL CONVENTIONS

March 13-15, 1981
Orlando, Florida

July 23-25, 1982
Cedar Rapids, Iowa

October 7-9, 1983
Houston, Texas

Hamfest Calendar

[Note: Sponsors of large ham gatherings should check with League headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL hq. for up to two years in advance.]

Colorado: The Grand Mesa Repeater Society will sponsor the second annual indoor Western Slope Swapfest on Saturday, March 7, from 10 to 4, at the Lincoln Park Barn, 12th and Gunnison, Grand Junction. Admission is free. Swapfest tables are $4 in advance. Attractions will include commercial exhibitors, flea market, an auction and prizes. Talk-in on 22/82. For further info send s.a.s.e. to Larry Brooks, WBØECV, 3185 Bunting Ave., Grand Junction, CO 81501 or call 303-434-5603.

***Florida:** The Treasure Coast Hamfest is February 21 and 22 at the Vero Beach Community Center. Many prizes. QCWA luncheon. Admission $3 per family in advance, $4 at the door. Talk-in on 13/73, 34/94, 04/64 and 52 simplex. For info write P. O. Box 3088, Beach Station, Vero Beach, FL 32960.

Illinois: The Sterling-Rock Falls ARS will sponsor Hamfest-81 at the Sterling High School Field House on Sunday, March 8. Advance tickets $2, $2.50 at the door. Large indoor flea market is restricted to radio and electronic items only. Tables available for $5 commercial and $3 others. Doors open at 7:30. Plenty of free parking, including area to accommodate campers and mobile trailers. Plenty of food and many prizes. For advance tickets and tables, write Sue Peters, KA9GNR, 511 8th Ave., Sterling, IL 61081. Make checks payable to Sterling-Rock Falls ARS, and please enclose s.a.s.e. Talk in on 52 and WR9AER 25/85.

Indiana: The LaPorte ARC's Winter Hamfest is Sunday, February 22, on the main floor of the LaPorte Civic Auditorium. Plenty of room and good food. Tickets $2.50 at the gate, $2 in advance. Tables $1. Talk-in on 01/61 and 52 simplex. For more info, write LPARC, Box 30, LaPorte, IN 46350.

***Iowa:** The Davenport RAC 10th annual hamfest is set for March 1 at the Davenport Masonic Temple, 7th Street and Brady (Hwy. 61), from 8 to 4. Tickets $2 in advance, $3 at the door. Tables are $4 each, with a $2 charge for electrical hook-up. Hotel discounts available. Big pre-hamfest banquet Saturday night, with guest speaker Midwest Division Director Paul Grauer, WØFIR, and ARRL SCM. Banquet tickets $8. Paid reservations must be in by February 18. Talk-in on 28/88 and 52 simplex. For advance ticket, dinner and table reservations, write Dave Johannsen, WBØFBP, 2131 Myrtle, Davenport, IA 52804.

Kentucky: The annual Glasgow Swapfest will take place on Saturday, February 28, from 8 to 5 (Central time), at the Glasgow Flea Market Building, located two miles south of Glasgow on Highway 31E, sponsored by the Mammoth Cave ARC. Large heated building with plenty of free parking. One free space with table and chair provided for each exhibitor, additional spaces $3 each. Prizes, free coffee. Admission $2. Talk-in on 34/94. Additional info from WA4JZO, 121 Adairland Ct., Glasgow, KY 42141.

Michigan: The Livonia ARC presents its 11th annual Swap 'n Shop on Sunday, February 22, from 8 to 4, at Churchill High School, Livonia. Plenty of tables, prizes, refreshments and free parking. Reserved table space (12-foot minimum) available. Talk-in on 52 simplex. For further info, send s.a.s.e. (4 × 9) to Neil Coffin, WA8GWL, Livonia ARC, P. O. Box 2111, Livonia, MI 48150.

Ohio: The Mansfield Mid-Winter Hamfest/Auction will be held Sunday, February 15, at the Richland County Fairgrounds, Mansfield. Prizes, auction, flea market. Large heated building. Doors open at 8 A.M. Tickets $1.50 in advance, $2 at door. Talk-in on 34/94. For additional info, advance tickets or tables, send s.a.s.e. to Harry Frietchen, K8HF, 120 Homewood Rd., Mansfield, OH 44906, Tel. 419-529-2801.

***Ohio:** The Cuyahoga Falls ARC's 27th annual Electronic Equipment Auction and Flea Market will be held Sunday, February 22, at North High School, Akron, from 8:30 to 4. Tickets $2.50 at door, $2 in advance. Bring your own tables, or some available for $2 each. Refreshments and prizes. Lots of free parking. Easy access on Tallmadge Avenue off ramp, North Expressway (Rte. 8). Connections to major interstates and Ohio Turnpike. Talk-in on 04/64. Details from CFARC, P. O. Box 6, Cuyahoga Falls, OH 44222 or phone K8JSL at 216-923-3830.

Virginia: The Vienna Wireless Society will hold its annual Winterfest on Sunday, February 22, at the Vienna Community Center, Park Street, Vienna. Doors open at 8 A.M.

West Virginia: The Plateau ARA will hold its third annual hamfest on Sunday, February 15, at the Memorial Building in Fayetteville. Doors open at 9 A.M. Admission $2.50, children free. Flea market tables $2. All activities indoors. Hot food, refreshments, free parking available. Activities include ARRL displays, forums, exhibits, prizes, and women's programs. Talk-in on 19/79 or 52 simplex. For more info, contact Bill Wilson, WA8YTM, 302 Central Ave., Apt. 2, Oak Hill, WV 25901, or Tel. 304-469-9910 or 574-1176.

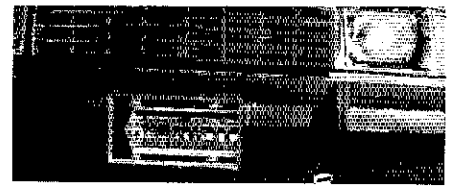
Wisconsin: The Wild Rivers ARC will hold a mid-winter swapfest on Sunday, February 22, from 10 to 3, at the Minong Village Hall, Minong. Admission is $1, tables are free. Talk-in on 28/88 and 52 simplex. For information, contact Roger Doehr, W9DLY, Rte. 5, Box 452, Hayward, WI 54843.

*ARRL Hamfest

Strays

NOW HE KNOWS

☐ Now that we all know who shot J.R., we can learn who helped spread word of the momentous news. As reported in the Hartford (Connecticut) *Courant*, Paul Shafer, KA1CMP, of Bloomfield, Connecticut, heard a call on 20-meter ssb from a South African station, ZS4RN, pleading for the long-awaited piece of information, at 12:30 A.M. the night the episode of "Dallas" appeared on network TV. The paper reported that Shafer "couldn't care less who shot J.R., and had to radio other operators to find out." At 10:30 that morning, Shafer heard a similar plea on 10-meter ssb from DA2BA, who is stationed with the Air Force in Bitburg, West Germany. This time he knew the answer.



It took Bill Bloss, N5DEO, of St. Petersburg, Florida, only 30 minutes to "deface" his new ARRL flag license plate. "It was just what I have been waiting for to display my call sign on," he writes.

VIKINGS COMMEMORATION

☐ The Runestone Radio Club of Alexandria, Minnesota, is planning a special-events operation from Alexandria, Virginia, during a 12-hour period on February 28. Anyone contacting WAØVVM on the hf bands can obtain a special QSL card commemorating the discovery of America by Vikings in 1363 by sending their QSL card to Harold C. Josephs, WBØDDX, 1600 Jefferson St., Alexandria, MN 56308. Return postage will be paid.

GEORGE, WASHINGTON'S BIRTHDAY OPERATION

☐ Commemorative QSLs are available to amateurs who work W7WMO/7 on 28.610, 21.425, 14.295 and 3.950 MHz on February 16 between 1700 and 2400Z. The special operation, which commemorates Washington's birthday, will take place at the town of George, Washington. Send an s.a.s.e. to EuGene Bye, W7WMO, 18 J St., NE, Ephrata, WA 98823.

QST congratulates . . .

☐ Allen J. Wiant, WB1ENO, of Adamsville, Rhode Island, who was elected recently to the state legislature.

☐ Ed Raser, W2ZI, of Trenton, New Jersey, recipient of the Radio Club of America 1980 Ralph Batcher Memorial Award for preserving radio history. A director of the ARRL Atlantic Division from 1946 to 48, Ed operates the W2ZI Historical Wireless Museum in West Trenton.

☐ Stuart D. Cowan, W2LX, of Rye, New York, who has coauthored a new book, *Toward the Conquest of Cancer*. Dedicated to his wife, Pauline, the book deals in part with her struggle with the disease, which claimed her life in 1974.

☐ Jack Mays, K4DMK, of Folkston, Georgia, who has been recognized by fellow Georgians as their "Amateur of the Year." Jack is well known for his services as NCS on the Maritime Mobile Service Net.

☐ Walt Maxwell, W2DU, of DeLand, Florida, on his recent retirement from RCA Corporation. An engineer who developed many of the antennas now used to transmit weather pictures from space, Walt is a well-known author for *QST* and other amateur publications.

How's DX?

A Tropical DXpedition

When my husband Darrell, N6DX, raised the possibility of our going to the South Pacific for the month of September, I knew him well enough to know it was not merely idle speculation. Sure enough, three months later, Darrell, our 12-year old daughter Cindy and I were on our way to the most fascinating adventure of our lives — to date. We planned to spend three days in American Samoa and a week each in Western Samoa, Tonga and Fiji. As an enthusiastic DXer, Darrell's goals were to put these islands "on the map" for 160 and 6 meters and to give a boost to local radio clubs. He contacted the ARRL, sponsors of Project Goodwill, which is a program designed to supply radio kits to local amateurs who otherwise could not afford equipment. They agreed to supply eight of these kits, and movie producer Dave Bell, W6AQ, lent us his new film, "The World of Amateur Radio."

Our first stop was American Samoa. Early the first morning, a Samoan Chief we'd met at our church in California arranged for us to have a meeting with Peter Coleman, the Governor of American Samoa. Darrell's voice trembled as he searched for the right words to explain the reasons for our visit. Slowly, he began to warm up, the familiarity of his subject acting like a balm to his jumpy nerves. He talked about our business — slow-scan television — and its advantages to American Samoa. He said he was a radio amateur and wanted to help interested locals obtain their licenses. Suddenly, with a tiny smile crinkling his face, the governor said: "You know, I've always wanted to become a radio operator." The ice was broken and our mini-DXpedition was off to a rousing start. Unfortunately, time didn't permit our helping this pleasant man obtain his license nor did it allow for any operating in American Samoa.

Our first contact with customs occurred in Western Samoa, our first stop outside the territorial United States. In spite of the efforts of our influential Western Samoan friends, the customs officer would not release any of our radio gear. A letter was obtained from friends in the Samoan Methodist Church stating that the radio gear was secondhand, that it was for Darrell's personal use, and that he promised to take it all with him when he left. Although the gear was finally released, these were anxious moments. Advice to aspiring DXpeditioners: Travel light and avoid taking any new gear with you. Apparently, radio equipment has a suspicious aura to it that immediately triggers the red light for customs officials.

Licensing was no problem in Western Samoa. Before we left the States, Darrell had contacted Phil Williams, 5W1AU, who presented the Post Office with Darrell's amateur license and made application in his behalf. He had his license with the call letters 5W1CF before we left the United States. Because there is no reciprocal agreement between our two countries, they were certainly under no obligation to grant a license.

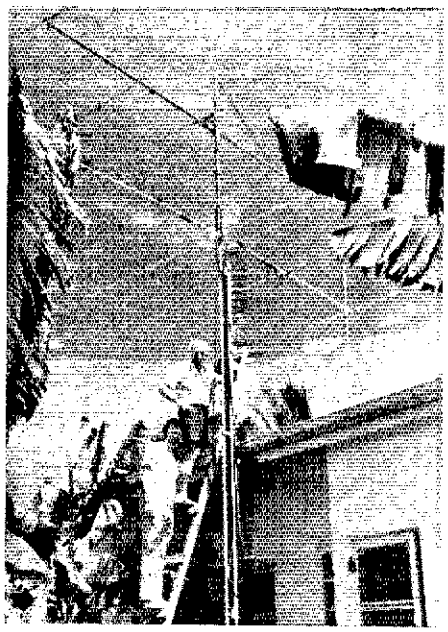
Darrell had taken great care to pack a plentiful supply of tools and spare parts. Because the local ham store was nonexistent and even local hams in scant supply, there were numerous occasions when he was glad to have his well-packed, weatherbeaten trunk. One day a local ham from the Post and Telecommunications came to Phil's house with a broken rig. Darrell pulled out his bag of wonders and within a short time they had it working.

I soon lost count, but Darrell says he made 250 contacts on 6 meters, mostly to JA's but also to a significant number of other stations in the Pacific, and 40 contacts on 160 meters. More enjoyable to me was our new friendship with Aito, Program Director for the local radio station 2AP. Darrell's big chance to go "pro" on the air occurred soon after our first meeting when Aito interviewed both Darrell and Phil on his radio program. To celebrate the occasion, we took Aito, Mark Irwin, 5W1CG, who is a Peace Corps volunteer, Phil and his wife to dinner at the Tusitala Hotel. The evening was an enjoyable albeit strange mixture of exotic food, ham talk and Samoan dancing. Aito's interest in Amateur Radio continued to grow. By the time we were ready to leave for Tonga, he was determined to become the first Samoan to take an amateur examination in Western Samoa.

It was when we arrived in Tonga late one evening that disaster struck. Darrell's antenna box was not on the plane! While Darrell confronted the airline officials, the customs officer cast a suspicious eye on the radio equipment. The antennas were not (and still have not been!) found.

Early the next morning we had the very real pleasure of meeting Joan and Bill (A35WL) Lang. Many satisfying hours were spent in their cheerful home. These senior citizens had spent two stimulating years as volunteers for the New Zealand equivalent of the Peace Corps (VSA). They generously offered Darrell their home and radio shack during nighttime operating hours, and Bill kindly chauffeured him to and from the hotel.

Darrell's operating position as A35DX in Tonga.



Bill Lang, and Darrell install 6-meter beam in Kingdom of Tonga.

Bill took us to the Telephone and Telegraph office where Darrell had applied in advance for a radio license. Although the paperwork had not been signed by the Prime Minister, he was assured, in the spirit of Tongan friendliness, that he could begin operating immediately as A35DX.

The lack of antennas made for some challenging operating. When we arrived I noticed a 5-element, 6-meter beam laying on the ground in the Langs' backyard. It wasn't long before Darrell had it repaired and mounted on a tower. Bill was surprised at the incredible pileup of JA's that resulted because he'd never before heard a signal on 6 meters. Darrell was busy and happy, working approximately 250 stations on that band.

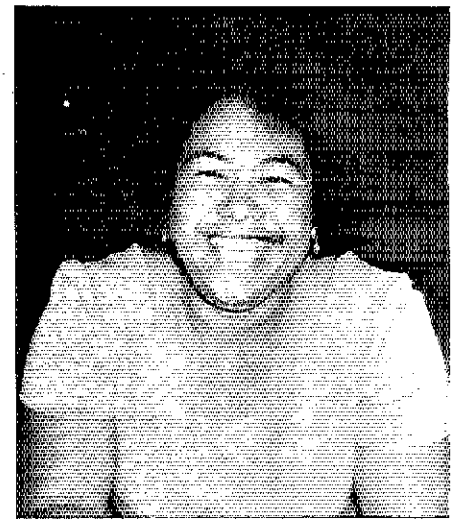
Much as a result of Bill's dedication and patience, ham radio is alive and well in Tonga. He arranged for us to show the ARRL film to the local ham club in a nearby schoolhouse. I chuckled to myself when I noticed a local ham proudly wearing an IARU banner in his bushy hair. Several young girls came, too, wrapped in their umbrellas, accompanying an articulate young Tongan woman named Susana. She is a radio instructor at the local college, a consultant to the Peace Corps, and will soon have the distinction of being Tonga's first woman amateur! As always, the group was enthusiastic, their young voices filling the room with questions as the movie ended.

One drizzly afternoon, Bill and Darrell set out to visit Sione Moile, A35SM, a young Tongan amateur. He was proud to show them his closet-sized *bure*, or hut, with its weatherbeaten boards stuck at random angles on the outside, and on the inside, his 10-watt Project Goodwill station on a mat on the floor. From this humble shack, Sione has already made several hundred contacts from around the world. He was grateful when Darrell bought his abundant supply of IRC's because the Tongan Post Office will not redeem them for stamps.

Sione Moile, A35SM, at operating position in small bure (hut) in the Kingdom of Tonga.

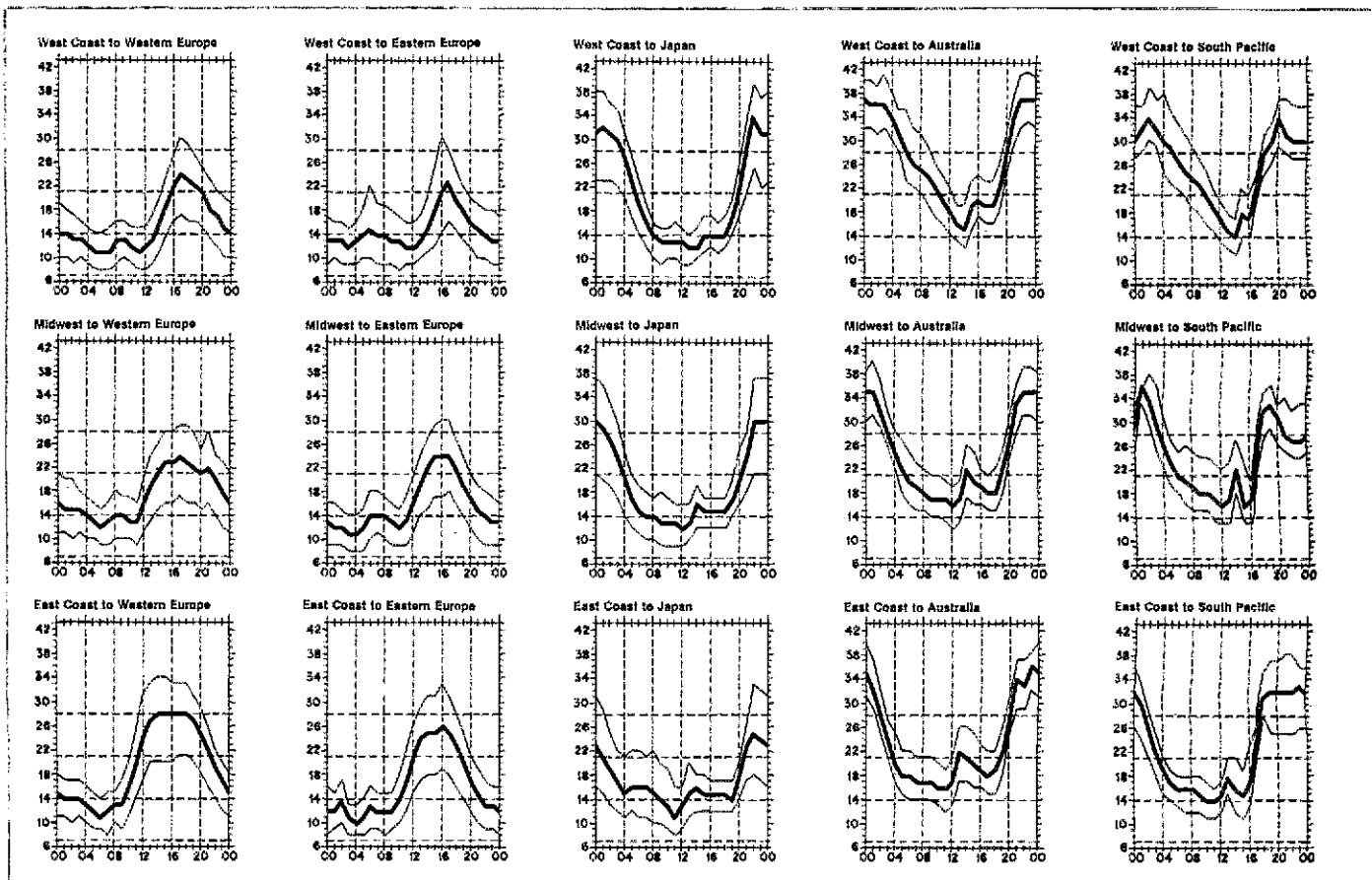
Etuate Kavenga, A35EK, is also active with Project Goodwill equipment. While we were there, however, he accidentally reversed his battery connections and ruined his transmitter. Lack of availability of radio stores makes repairs such as these a real ordeal and can keep Tongan hams off the air for many months. Five other young men have already passed their exam and are not active because of lack of equipment. The three ARRL transmitter kits we left will enable some of them to get on the air.

Certainly the most frustrating days of our trip were spent in Fiji. Darrell had written to the Department of Posts and Communications asking for a license and permission to operate on 160 meters. Although a go-ahead letter was finally obtained, another letter rescinding the permission was dispatched after our departure from the States. The reason given was that a police clearance has not been obtained and further, no American had been granted this clearance for some time. Trying to get to the bottom of the problem, Darrell met with the Director of Special Services Branch of the Central Police Department and learned that U.S. authorities had not responded to their request for information. Ultimately, clearance was granted on the basis of personal letters of recommendation written by Dick Solly, 3D2WR, and Raj Singh, 3D2ER. After three days of negotiation, he was issued the call 3D2DB and was granted permission to operate on 160 meters for the duration of our stay. Since 160 meters is not an amateur band in Fiji, all Darrell's contacts were "first-ever." Darrell spent much of the remaining time operating and meeting with five of the seven active hams in Suva.



Susana will soon have the distinction of being Tonga's first female amateur.

Before we realized it, our month's adventure was at its end. As we gathered our newly purchased baskets, suitcases, garment bags, trunks, passports, radio gear and other



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

assorted paraphernalia for the last time, I reflected that soon a rich nostalgia would replace the brilliance of the past month. Would I return with Darrell on another trip? You bet 'cha! — *Patricia Bevan, Westlake Village, California*

QSL Corner

Administered By Joan Becker

ARRL-Membership Overseas QSL Service

Send outgoing cards to this address: American Radio Relay League, 225 Main St., Newington, CT USA 06111.

This is an "outgoing" service that allows ARRL members to send DX QSL cards to foreign countries at a minimum of cost and effort. While QSLing direct to foreign amateurs is faster, it is also more tedious. Time spent searching for addresses in the foreign *Callbook*, addressing and stuffing envelopes, and mailing could be better spent operating DX. And, the cost of IRCs, airmail postage and envelopes can be prohibitive.

An unlimited number of QSLs may be sent for distribution 12 times per year. The fee is just $1 per pound or portion thereof (155 QSL cards average a pound).

The ARRL-Membership Overseas QSL Service operates *only* in an "outgoing" capacity. To receive QSLs from DX stations, see "The ARRL DX QSL Bureau System," published every other month on this page.

U.S. amateurs may send SWL reports to foreign short-wave listeners. Unlicensed (associate) members may send SWL cards to foreign amateurs. QSL managers: write for details.

Requirements

1) Presort your DX QSLs alphabetically by call sign prefix (A3, AP, C6, CE, F, FG, G, GI, GM, JA, 3A2, etc.).

2) Enclose the address label from the brown wrapper of your current copy of *QST*. This information shows that you are a current ARRL member. Family members may also use the service by enclosing their QSLs with those of the primary member. Include the appropriate fee with each individual's cards and indicate "family membership."

Sightless members who do not receive *QST* should indicate that the QSLs are from a "sightless member."

ARRL-affiliated club stations may use the service when submitting club QSLs by indicating the club name. Club secretaries should check affiliation papers to ensure that membership is current.

3) Enclose payment in the form of a check, money order or cash. Sending large amounts of cash through the mail is not suggested. Please do not send stamps.

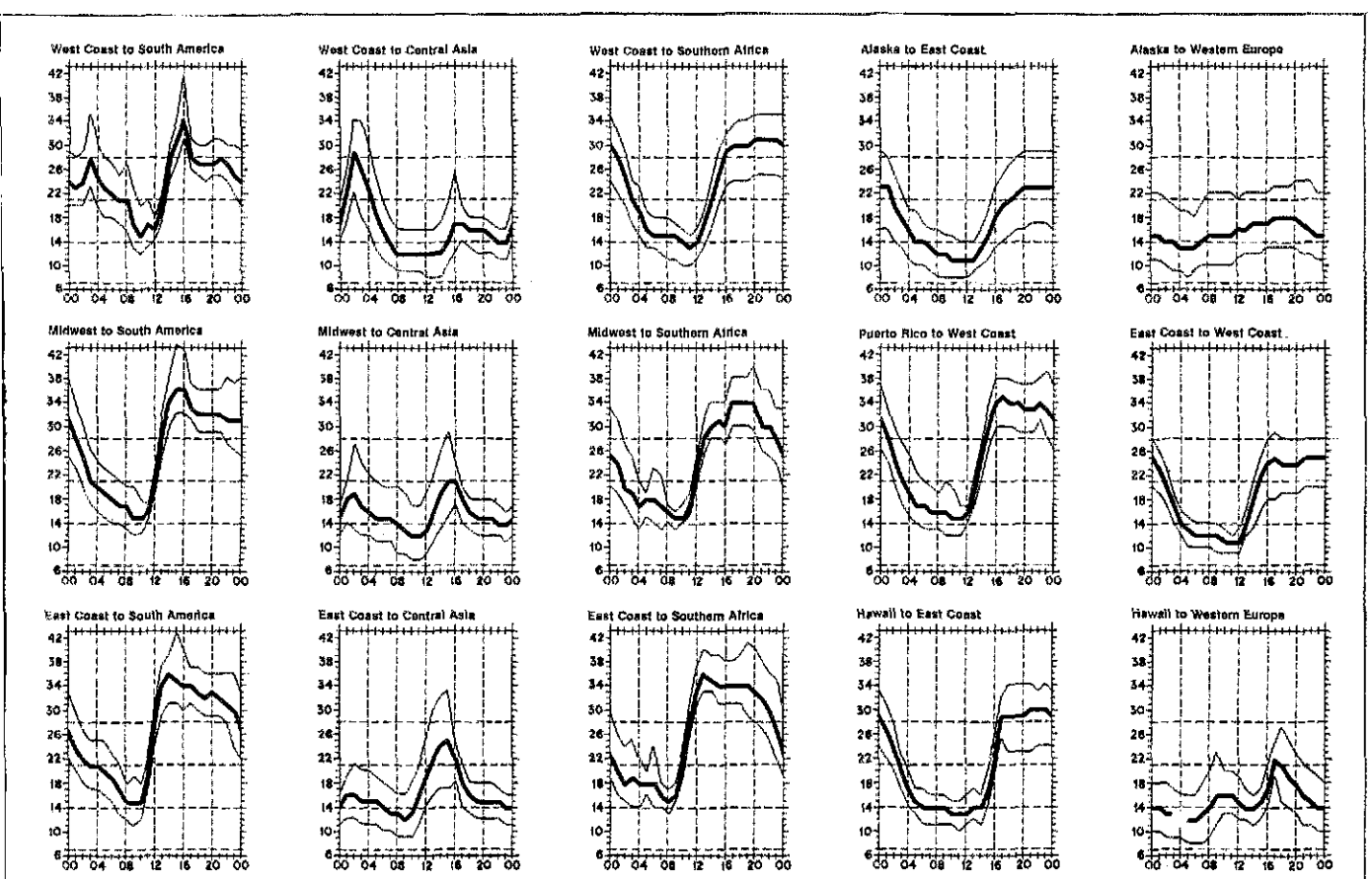
QSL MANAGER VOLUNTEERS

W8INN	AF8D
WAØNAA	N2AWM
KA2EGO	N7AJB

Here is some QSL information for those who would like to QSL direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. Many thanks to W2QL, AA4MI, K1RH, WA1DBR and K2TV for the helpful information.

LX2BQ — QSL direct only with two (2) IRCs. Address: Bonblet Willy, Box 22, Rosport, G-D-Luxembourg. Comments received from the DX station indicate that bureau QSLs and those sent without IRCs will not be answered.

A35VU (DL2RM)
CEØAC (CE3YY)
CT3AB Box 643, Funchal, Madeira 9008
CX2BBN Box 922, Montevideo, Uruguay
ED8MU P.O.B. 879, Tenerife, Canary Islands
FG7BP P.O.B. 97128, Goyave, Guadeloupe
FMØGDE (F6AOJ)
FY7BO P.O.B. 856 Cayenne, French Guiana
FB7KRU P.O.B. 450, Kourou, French Guiana
J3AE (K1EM)
J28A/P P.O.B. 215, Djibouti
J73A (K2TJ)
LU9BAG Guillermo R., Alba Arribenos, 3565 Cap. Fed. 1429, Buenos Aires, Argentina
LU6DWP Box 166, San Martin Correo 9650, Buenos Aires, Argentina
LU5DDR G. Raul, Alba Pte., Derqui 846, Lanus 1824, Buenos Aires, Argentina
OT4OL (ON4OL)
PJ4CR (WB2LCH)
PYØOD (WA4MDS)
PYØDX (WA4VDE)
SU1AL P.O.B. 109, Giza, Egypt
XZ2AD (K3EST)
YC6MA P.O.B. No. 1 MEDAN, Sumatra, Indonesia
ZE1WT P.O.B. AC36, Bwlawayo, Zimbabwe
5NØWNL P.O.B. 3197, Lagos, Nigeria
6W8HL (KB4GQ)
8Q7KK (K2FV)
9G1RT (KB7HB)



lowest curve (optimum traffic frequency, or fot). See January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for February 15 to March 15, 1981, assume a sunspot number of 142, which corresponds to a 2800-MHz solar flux of 186.

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 November 1 through November 31, 1980. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

AP2SA/114 JR2JZR/113 SV2IL/101 WA1ZLD/247 WA3JLD/108 K5NS/108 KD6AP/101 WA7JWC/100 N9ANR/153
DK4ZZ/113 JE3SAE/129 VE3JFS/108 AI2K/160 WB3GXD/125 K5TU/130 N6ZE/101 KA8D/100 WB9JOH/121
DL3HC/157 JHØBDK/102 VE4ADA/118 KG2A/101 WB3JWJ/106 K5VWW/282 W6DSY/108 KB8IO/150 WB9VTG/112
DL3HF/107 LA6OT/269 YU1NSN/203 N2AMS/100 AK4Q/100 N5DU/120 W6LVY/114 KB8JG/109 WD9GIQ/144
DL6GY/101 LA6TW/100 K1OXD/103 W2IFM/102 KA4CZO/104 N5FJ/108 WA6BFG/103 WB8JDM/100 AAØC/101
G3YDX/260 OK3JW/302 KA1BXA/101 W2KVA/151 W4CYT/104 N5MX/102 WA6POZ/103 WB8JSO/172 KØBD/109
HM1SX/182 P29NBF/116 KA1HQ/107 W2LOG/254 WA4OHG/115 W5QLD/110 WB6CDM/135 WB8WIV/101 KØUKO/100
I1APQ/322 SM6ID/261 W1BK/107 WB2OLO/160 WB4RRA/101 W5VCS/100 N7AYK/117 AJ9H/110 WØWJ/110
IØUAV/101 SM7CRL/101 W1III/117 AG3S/118 WD4ILV/104 W5VJW/107 W7SE/113 K9VSO/103 WAØSXV/103
JA1OND/260 SP7AW/126 WA1ZDW/104 AJ3N/108 K5KW/110 WN5MBS/105 W7VCQ/105 KB9BX/119 WBØUVN/117

Radiotelephone

A4XIU/110 IT9WPO/100 SV1IT/110 KA1HQ/107 W2LOG/254 WB3GXD/114 WD4JLI/109 W6FCF/107 W8PCS/104
DK1HG/103 IT9YHR/111 TZ4AQS/101 N1AFW/102 WA2OKC/104 WB3JWJ/103 K5NS/108 W6QWJ/100 KA9CLH/122
DK8II/115 JA1JWP/286 VE3HRC/105 W1BK/104 WB2JGP/103 K4AMC/107 K5VWW/241 WA6IPW/110 KB9AA/108
DK8JS/111 JA1OND/226 VE3KIK/100 W1WKP/100 WB2RQX/104 KQ4M/142 KE5J/118 WA6SLO/105 KB9DD/113
DL2NB/272 JA3BG/134 VP2MO/104 WA1ZLD/227 KB3CV/101 W4OKH/100 KF5X/107 WD6BWO/104 N9ANR/152
EA7BLU/153 KA6WW/103 WP4AFR/101 AI2K/138 KB3GX/101 W4SPR/106 W5QLD/110 N7JS/114 WB9JOH/114
FR7ZN/181 LU4MEE/214 YV1AJ/251 KA2ELW/140 WA3HFL/105 WA4HHG/196 WB5VIY/106 K8HF/104 KAØCLO/101
G3RUR/110 LU7MAJ/164 ZS6LG/117 KB2MD/103 WA3NOJ/111 WA4TNZ/105 WN5MBS/104 KB8BE/114 WØPPF/112
G3YDX/206 LU8MBV/165 6W8AR/154 N2ALD/101 WA3RLJ/111 WB4FTU/230 KB6YC/109 KB8JG/106 WBØUVN/115
I1APQ/322 OK3JW/227 K1PIN/102 W2KVA/100 WA3ZOR/106 WD4EJX/101 KM6N/110 W8NDJ/103 WDØBQP/105
I1SNW/130 SU1AL/103

Cw

DF2HL/110 G3YDX/101 JE3SAE/127 PA2CHM/105 YU1NSN/152 KD4U/107 N6ST/109 W7EDA/105 WD9GIQ/104
DF9FM/110 HB9BFU/110 JA8AYN/201 SM5KAS/106 W2TE/140 WA4OHG/110 W6MUS/100 WA7NXL/102 KØQQ/103
DJ3XD/149 JA1OND/109 KL7HBK/103 TF3YH/126 KA3P/108 K5VWW/183 W6SHP/116 WA8YWR/110 WBØNAA/100
DK7AH/136 JA3BG/131 OK1AXT/104 VE7DRB/106 KA4CZO/103 K6YCM/113 W6YX/101 WB9VTG/111 WDØHSV/101
F5RS/148

RTTY 5BDXCC

DJ1IJ PAØLVB. UB5WF ISØLYN HC1HC VE3XK IG4NX OZ7OP ZL1HY
PY1LW W5SP DL9TJ SP9AKD

Endorsements

Mixed

DF2HL/243 JR1JFO/201 VE7ARB/147 K2SX/251 K4KQ/358 W4QCU/300 N6ST/261 W7MAF/132 AI9R/251
DF6CY/231 JA3BG/322 VE7VX/200 KA2BLI/128 K4KUZ/256 W4RA/279 W6FU/162 W7NP/274 K9FD/282
DJ2MN/283 JH3XGD/130 XE2MX/238 KB2HZ/185 K4MRZ/200 W4TJC/250 W6KH/347 WB7OUL/282 K9QVB/298
DJ8CR/320 JA5ELM/175 YO4WU/303 KB2QN/168 K4PVZ/270 WA4CCP/176 W6SJG/202 K8CX/264 K9WJU/279
DK3SF/317 JA6RIL/280 YS1RRD/315 KB2RZ/204 K4QPR/290 WA4HHG/204 W6SN/340 K8HF/151 N9AMF/225
DL2GV/189 JH6KXG/213 YU2OM/176 W2AK/240 K4TXJ/249 WA4PMU/206 W6YMH/223 K8IA/305 N9AWR/189
DL3BK/350 JH7CUO/129 YU2RTW/308 W2CNQ/326 KA4BFT/227 WA4TLI/310 W6YX/218 K8JRM/200 W9ABA/340
DL7AP/353 JA8DNZ/300 ZL1AMO/320 W2KE/290 KA4GKQ/123 WB4RFZ/280 W6ZS/181 K8MNG/263 W9EQP/306
DL7CT/241 JA8JN/289 ZS6RM/349 W2MP/317 KB4KA/185 WD4IHV/274 WB6MBF/201 K8UE/277 W9MYG/260
DL7HT/255 KP4AM/290 K1MEM/310 W2TE/257 KC4CT/239 AF5M/292 WB6WOK/152 K8WD/250 W9NUD/135
DL7MQ/282 OE1HGW/312 K1OT/271 WA2FUE/241 KC4DY/181 K5AQ/327 WB6YNI/183 KG8V/310 W9TKV/352
DL9TD/161 OH6RA/301 KA1BU/264 WA2VUR/160 KQ4M/151 KB5PO/174 WD6DKG/149 N8AFR/260 WA9EKA/226
DL9TJ/272 OK1FF/357 N1AOZ/204 WA2YEX/207 KV4X/200 N5GM/300 WD6EKO/128 N8BM/290 WA9WJE/321
DLØXX/132 OZ1FAO/147 N1APA/202 WB2HJV/120 N4EF/238 N5IH/255 K7AOZ/280 N8TN/315 WB9TIG/230
EA1BC/336 PY1DH/340 W1GVZ/258 K3UC/254 N4LX/306 W5MJQ/320 K7EG/260 W8KBZ/252 WD9ADB/251
FY7AN/300 SM4AMJ/138 W1GX/334 W3CY/160 W4DZZ/300 W5MUG/327 K7EX/272 W8KKF/269 KØKES/250
G3EGG/128 SM6HTC/251 W1ODY/296 W3NB/306 W4FX/341 WB5YKD/178 K7LJQ/129 W8QWT/319 KBØFZ/253
G3IZJ/250 SMØMC/292 W1SE/160 W3SO/321 W4IQ/296 AJ6V/160 KA7AUH/283 W8RCM/331 NØZA/225
HB9IK/320 SP3DOI/326 W1VV/302 W3TEF/200 W4LF/260 K6DZT/221 N7KA/240 W8ZNH/125 WØJIG/200
HK3YH/216 VE1KG/330 W1XK/214 WB3DNA/261 W4NO/330 K6LPL/277 N7RC/140 WA8WAS/143 WA8JYJ/270
I3LLD/317 VE2AFU/281 W1YN/276 AB4DI/325 W4OMQ/290 K6YCM/307 W7AO/349 WA8YWR/134 WAØVKF/290
I5EFO/263 VE3BGX/224 WA1FCN/205 AB4H/323 W4OWJ/324 KM6N/153 W7FP/280 WB8CSH/171 WBØAFO/151
IT9RAN/240 VE3KIK/198 AA2P/120 AF4K/201 W4PTH/290 N6OZ/280 W7IYW/300 WD8DXG/233 WBØOHI/130
JA1JWP/293. VE4SN/252 K2EXI/126 K4CGV/202

Radiotelephone

CT1AIF/161 I2RSB/225 OZ8EA/250 WA1ZRS/150 K4QPR/286 WA4OIB/202 K6LPL/245 KA7AUH/280 W8QWI/133
CT1VY/162 I2RVW/181 PY2CYK/331 WB1EAZ/164 K4VAA/201 WA4PMU/204 K6SMF/290 N7BES/155 WB8CSH/153
DF2HL/235 I3DSE/290 SM6HTC/210 AG2K/143 K4XG/286 WA4TLI/300 K6SX/289 W7FP/280 WD8DXG/229
DJ3CN/278 I5EFO/263 SMØAJU/329 K2POA/305 KA4BFT/182 WB4KJZ/205 K6YCM/306 W7GQM/176 AI9R/227
DJ7EV/132 I5ZGQ/260 SMØMC/287 KB2HZ/185 KB4KA/183 WD4CWR/184 N6NA/335 W7KTI/250 K9QVB/271
DK3SF/305 I6BPW/202 VE3MC/297 KB2RZ/162 KC4AL/125 WD4GSE/160 W6CN/262 WA7UVO/300 K9ZO/260
DK4CR/206 I7SCA/329 VE4IS/225 W2CNQ/325 KC4BR/195 WD4IHV/253 W6HYG/345 WB7RBO/253 KB9BX/119
F3SG/181 IØCEP/271 VO1CU/317 W2MP/298 KC4CT/239 AF5M/244 W6KBB/250 WB7OUL/272 KB9DU/226
G4IJW/153 IØOLK/305 XE1J/312 K3UC/207 KC4DY/177 K5AQ/314 W6VZZ/250 K8CX/233 N9AMF/221
HC1HC/208 ISØBYR/227 YS1RRD/315 K3ZUF/252 KV4X/198 K5PR/146 W6YX/181 K8ES/222 N9AWR/189
HC1HW/167 JA1BRK/330 YU2OM/169 N3ART/153 N4CSF/121 N5ACD/251 WA6GTU/197 K8JRM/200 WB9YJW/201
HI8XJO/202 JR2XJO/189 ZL1ALE/287 W3DHM/354 W4DZZ/273 N5IH/251 WB6CDM/134 K8WD/250 WD9ADB/251
HK3YH/160 JA6RIL/269 ZP5WU/162 W3IF/301 W4KGH/154 W5EFA/274 WB6VTE/278 KB8IO/150 KØSE/225
HM1SX/187 JA8JN/246 ZS6RM/343 W3WM/232 W4KHW/229 W5GVP/224 WB6WOK/143 N8AFR/260 WØDG/175
I1HAG/297 JY3ZH/284 K1GXU/290 AB4H/312 W4KKP/150 W5MUG/284 K7EX/224 W8ELE/146 WAØLMK/160
I1PHX/294 KL7IYX/131 KA1BU/264 K4KQ/264 W4RA/273 WB5CBJ/240 K7GEX/281 W8KBZ/238 WBØAFO/143
I1XXM/201 KP4AM/280 W1YN/240 K4KUZ/229 W4RNZ/150 WB5RQM/183 K7LJQ/129 W8KKF/268 WBØOHI/130
I2JQL/285 OE3KTA/270 WA1TMN/233 K4LSP/319 W4TJC/250 WB5TXP/149 K7RDH/245 W8NVP/289 WDØBKT/153
I2POW/175 OZ3PZ/319

Cw

DK6IS/152 OZ1FAO/135 K1TG/162 K3UC/164 KA4BFT/126 K5AQ/250 N6OZ/201 K8ZH/263 AI9R/139
DL9TJ/170 SM4AMJ/126 W1YN/226 W3RAB/140 KD4Z/200 K5PR/122 K7EG/121 KB8KW/202 K9QVB/256
JH3XGD/120 SM6HTC/126 K2SX/200 AB4H/245 W4BV/239 W5QKZ/119 K8CX/168 W8KBZ/132 WA9EKA/154
OK3JW/242 SMØAJU/282 KB2FD/160 AB4Z/200 WD4IHV/200 W5SVZ/205 K8HF/120 W8QWI/148 KØKES/235
ON5NT/304 YU2RTW/277 W2MD/235 K4KUZ/190 AA5C/151 AF6D/160 K8SW/175 WA8SAE/183 KBØFZ/187
OZ1BII/135 K1MEM/265 WA2OBB/199 K4XG/168 AF5M/215 N6AXD/120

DXCC NOTES

Annual List Corrections

Mixed, K6CH/355, W7LDC/358; Phone, K7QLC/182, K6EC/332, W3KJ/266, WB8HLI/179, K4DDB/251; Cw, K6MA/180.

In response to voluminous input from the membership regarding the recent growing practice of "forced donations" for QSLs, upon the unanimous recommendation of the DX Advisory Committee, the ARRL Awards Committee has modified DXCC Rule 12 as follows:

12) Operating Ethics:

(a) Fair play and good sportsmanship in operating are required of all DX Century Club members. In the event of specific objections relative to continued poor operating ethics, an individual may be disqualified from the DXCC by action of the ARRL Awards Committee.

(b) Credit for contacts with individuals who have displayed continued poor operating ethics may be disallowed by action of the ARRL Awards Committee.

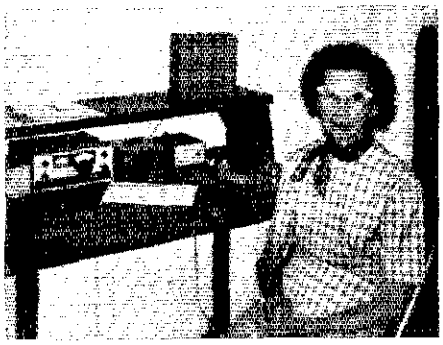
(c) For (a) and (b) above, "operating" includes confirmation procedures.

YL News and Views

Conducted By Jean Peacor,* K1IJV

Such Friends

"Think where man's glory most begins and ends, And say my glory was I had such friends," — *Yeats*



Helen Brown, KA2JWC.

What prompted you to become a licensed radio amateur? The number of answers to that question are in direct proportion to the number of hams in the world. Everyone has a story. Chances are quite good that you didn't just wake up one morning and make the big decision to go after a radio license. Somewhere along the way you were inspired and helped by another, or several others, before earning this special privilege. Would you be licensed today had no one helped?

Radio clubs with their many theory classes are providing the inspiration for increasing numbers to become licensed in today's world. In such cases, not one but several hams give freely of their time hoping to see you succeed. Your success is their reward. There is currently a unique class in that 14 YLs are attending. The class will continue until all are licensed. The rewards will be great for many.

W2CHI — Elmer

William Fairclough, W2CHI, felt rewarded enough to write when Helen Brown of Blairstown, New Jersey received her Novice ticket. What's so unusual? Helen is 75 years young.

Instruction for Helen began at "ground zero" in October 1979. She became licensed in July 1980. Her call is KA2JWC. Code was no problem but, oh, that theory. It took Helen two tries on the written exam. When her license came through, she had really earned that piece of paper.

As a young girl, Helen lived in a rural area of Pennsylvania. She used to take her lunch to the railroad station, sit on a bench and listen to the clicking of the sounder. Fascinated then, she can actually do it now. She plays both classical piano and the organ and feels that Amateur Radio will provide additional enjoyment during her golden years.

With further help from Bill, she's on the air with an HW8 hoping among her many contacts perhaps to meet others in her age group. She lives with her brother Don who is 72. Bill has already marked Don as his next "victim." All of this proves that age has no barriers. This Elmer is 71.

Yeats was so right — "the glory is in having such friends."

A YL FROM PISCATAQUIS

"Do you know Leona, W1YPH?" Nine out of 10 letters received relating to the YL column ask that question. On the air? The same question. It's that last name, Peacor, that prompts the inquiries. We both have it.

Leona and OM Kay Peacor, W1GAG, live in Dover-Foxcroft, Maine, Piscataquis County. Kay has been a ham for more than 60 years. It was at his suggestion that Leona started studying radio theory back in the early '50s. Their three sons had grown up and the time was ripe for a new challenge. Her mind had been geared to handcrafts prior to this. How thrilled they both were when she took and passed her General exam in March 1953, three months after Kay's suggestion.

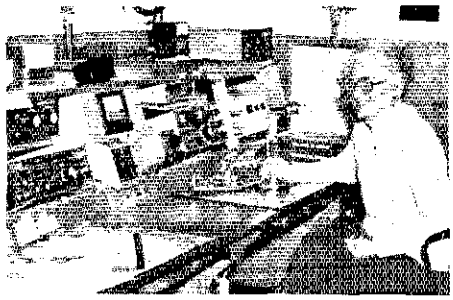
The first day that Leona touched a key as W1YPH, she was astonished to find she could be heard around the world. She has never ceased to be amazed by it. She's added up quite a few on the air hours as a result, all of which have produced another fine and avid cw operator. For her, there's nothing quite as satisfying as a good cw rag chew whether it be with an Old Old Timer, a new Novice, a neighbor, or faraway DX. After enjoying the QSOs, Leona finds the follow-up QSLs, notes and pictures things to be treasured. When you live in Piscataquis County, this entire process makes your world seem smaller.

Leona keeps up-to-date records since working toward awards is another aspect she enjoys. She has 179 countries confirmed toward DXCC as well as 220 other awards to date. She is also active in many cw contests. All this, and she still finds time to do beautiful handwork.

Leona is a charter member of Women Radio Operators of New England (WRONE) and past Membership/Net chairman. She has acted as NCS of WRONE's Yankee Lassie Net and their cw net. She has served as first District Chairman of YLRL. In 1974, she upgraded to Advanced class under Kay's fine tutelage once again.

Oh, the question? Do I know Leona? I do indeed. So does my OM, K1IJU. We call her "mom."

*Country Club Dr., Monson, MA 01057



Leona Peacor, W1YPH.

SCHOLARSHIP RECIPIENTS

The 1980 Young Ladies Radio League Scholarship has been awarded to Ann Waines, KA8CSM, of Shelby, Ohio. This annual scholarship is funded by YLRL and administered by the Washington, DC Foundation For Amateur Radio (FAR). YLRL is very proud to have Ann as scholarship winner this year.

Ann graduated from high school with an A average and is now a junior at Ohio Northern University majoring in Electrical Engineering with a Computer Science option. She is vice chairman of the student chapter of IEEE.

Ann's home is on a farm in Crawford County, Ohio. She became interested in Amateur Radio through a 4-H club in high school. She holds a General class license and is active on 80-, 40- and 20-meter cw.

Two other YLs were recipients of scholarships administered by the Foundation this year. Kitty Hevener, WB8TDA, won the Chichester Scholarship and Maureen Porter, KA0BSR, was awarded the QCWA Scholarship.

Kitty is a senior at Peabody College in Nashville, Tennessee majoring in elementary education and special education for the visually impaired. She was graduated as class valedictorian from the West Virginia School for the Blind, Romney, in 1977. She maintains an A average at college while keeping busy with Amateur Radio and volunteer work for mentally retarded adolescents. She is on the Council for Exceptional Children. She first became a Third Class commercial ticket holder and upgraded to Amateur Radio in 1974. Her favorite mode is cw and she is an active member of traffic nets.

Maureen was married shortly after graduating from high school and undertook the raising of a family. Later she went back to school to complete her education. Interest in Amateur Radio led to her Novice license in 1978. She upgraded almost immediately and now holds the Advanced class.

These YLs won three of the seven scholarships administered this year by FAR. They were selected from over 60 applicants from 31 states. Competition for FAR scholarships is open to all radio amateurs holding a General class or higher license. QST

Ann Waines, KA8CSM, YLRL scholarship recipient.

The World Above 50 MHz

Conducted By William A. Tynan,* W3XO

Controversy Over Selection of a Worldwide Locator System

The subject of a worldwide locator system has been addressed twice before in this column. In September 1979, the current European "QTH Locator System" was described along with an explanation of why it cannot be extended to worldwide use. Also included were descriptions of several systems which might be usable globally. Only a few comments were received following publication of the September 1979 column. Most of the ones that did come in indicated a misconception of the primary purpose of a locator system. This is not surprising, as we in North America have not had the 20 years' experience with such a system that the Europeans have.

As an indication of this lack of appreciation of how a locator system can be beneficial for a variety of purposes, many letters simply asked "What's wrong with latitude and longitude?" Of course, the obvious answer is, "nothing — if the intent is to designate discrete points on the earth's surface. This is what one must do if the intent is to calculate the exact distance between two stations, for example, in determining records. I have been collecting geographical coordinate data on the Standing Box forms for several years and expect to continue whether or not agreement is reached on a worldwide locator system. Geographical coordinates are fine for the purposes for which they are best suited. However, geographical data is not particularly easy to transmit over the air. For one thing there is no universal agreement on format. Some use East and West Longitude. Some use East only, while others use West only. We, who are accustomed to tracking amateur satellites, number longitude west from the Greenwich Meridian. On the other hand, some of the early orbit data received from Government sources was based on counting the other way. I can attest to the confusion which that caused.

Complete geographical definition of a location to one minute accuracy requires the transmission of a minimum of 10 characters (11 if the longitude is greater than 100 degrees). For my QTH located at 76 degrees 58 minutes west and 39 degrees 5 minutes north, I might send W7658N3905. Surely, a shorter means of sending such data would be helpful, particularly if it should become commonplace to exchange it during routine QSOs as it has in Europe.

The other drawback with the use of geographical coordinates is that, while they are excellent for defining points, they are not particularly good for defining areas. Except for measuring distances very accurately, most Amateur Radio applications involve defining an area (like a country, state or county).

These are the kinds of things that we collect, but they are artifacts of Man's gerrymandering and hence not very regular in shape or size. Some have suggested that we use counties for vhf/uhf contest multipliers. However, many U.S. and Canadian counties have names that are quite long and complicated and hence not very easy to get across under the weak-signal conditions frequently encountered on the bands above 50 MHz. What would be ideal would be a simple, easy-to-transmit, straightforward designation for regularly shaped slices of the earth's surface that could be used as collectables and contest multipliers, especially on the higher vhf and uhf bands. A locator system provides such a capability. What sort of locator system? Aye, there's the rub! One that can be used worldwide would seem like a good idea. After all, our vhf/uhf bands are not local any more. Moonbounce and other weak-signal techniques have taken care of that.

The September 1980 column described a locator system proposed at a meeting of European VHF Managers (we don't have such people over here). It retains the one- by two-degree blocks used in the old QTH Locator System but is usable worldwide. In that column I urged support of this proposal, not because I am particularly fond of one- by two-degree blocks but because I was convinced that such a breakdown would be necessary if European vhf hams are to be convinced to go to the new system. So many of them have amassed impressive totals of one- by two-degree blocks and qualified for hard-to-get awards based on them, that it would take a lot of persuading to convince very many to change to another system which uses a different size division.

Since the September 1980 column appeared, however, I have received a number of critical comments. In addition to those wondering what's wrong with longitude and latitude, many questioned the use of one- by two-degree blocks rather than one- by one-degree squares employed for the past several years in the ARRL UHF Contest. In addition, questions have arisen as to why letters are used in these locator systems rather than only numbers. Note that my exchange in the UHF Contest is 7639. This, or course, designates a one- by one-degree square but does not, in itself, provide an unambiguous designation of a single area in the world. To do this, I would have to send something like W76N39 to distinguish my square from the other three with the same numbers. While it's true that the chances of working some of these corresponding squares on the bands above 50 MHz may be remote, we should remember that the goal is to create an unambiguous worldwide system. There's always moonbounce where it is physically possible to work anywhere in the world. The only barrier making this difficult is the lack of stations in the right places. There hasn't been much maritime mobile EME operation yet, but who knows? Besides, if the vhfers come up with a good worldwide locator system, the inhabitants of the "DC bands" may decide to start using it, too. Incidentally, the large divisions, referred to as "fields" in the system proposed by the Region 1 VHF Managers and designated by the first two characters of the locator code, might make appropriate information to exchange during EME QSOs. The fact that they are letters rather than numbers facilitates this.

Some indications have been received that not everyone in Europe is wedded to the existing one- by two-degree blocks. Some are even cool, to any locator system, even after 20 years in which the present QTH Locator System has been in general use. As with any other subject, nothing is ever unanimous. There is also the possibility of some sort of compromise in which squares would be one by one degree but those electing to do so could lump squares together in groups of two to form "blocks" which would be equivalent to the blocks in the present system. This approach might solve the problem with respect to preservation of existing awards.

What is urgently needed now are constructive inputs from the readers of this column. First, reread the September 1979 and September 1980 columns. Remember that the main function of a locator system is not to pinpoint the exact location of the station being worked. Maybe the name "locator system" is a misnomer and is causing some confusion. A locator system serves more to provide a shorthand method of designating a station's area. When precision down to the mile is necessary, geographical coordinates should be used instead. A good locator system should unambiguously define in which of many blocks, or squares, drawn on the earth's surface a station is and hence can serve as a basis for activity-stimulating awards, as well as provide equitable multipliers for use in various contests. Decide how you feel about one- by one-degree divisions vs. one- by two-degree divisions. What about the use of letters versus numbers, or perhaps a combination of the two? Remember that not only are letters shorter to send on cw but they can be used to count as high as 26 using a single character. With numbers, 10 is the limit before one must go to two characters. If letters are used, what about the inclusion, or deletion, of I and O? How much confusion among the uninitiated would their use generate?

These are some of the controversies that have arisen over the subject of locator systems. There is also the view which holds that we don't need any type of locator system. Since it would appear that the VHF/UHF Advisory Committee (VUAC) is the logical body to study this matter and make a recommendation, send your thoughts along to the VUAC member for your call area or to Bernie Glassmeyer, W9KDR, who is Headquarters liaison. He will see to it that copies of your comments are sent to all of the members. Try to respond as quickly as possible, as there will be another meeting of European VHF Managers in England this April. It would be well if a North American view could be aired at that time.

TNX. Your help is appreciated.

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

1-1/4 Meter Standings

Columns list call, U.S. state, number of U.S. states and call areas worked. Call areas are the 10 U.S. call areas, plus KL7 and KH6 plus VE and XE call areas plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico.

K1FO	CT	19	8	K2CBA*	NY	19	7	K3IUV	PA	12	4	W5FF*	NM	9	8	WB8BKC	MI	13	6	W@SD	SD	9	5
K1PXE	CT	18	6	K2DNR	NY	15	6	W3RUE	PA	11	6	W5HN	TX	8	4	K8AXU	OH	12	7	W@VB	MN	7	3
W1JR*	MA	17	9	W2CRS	NY	14	5	W3IP	MD	11	5	K5JL	OK	7	4	K8HWW	MI	11	6	WA@QLP	SD	4	2
W1YTW	ME	14	8	W2SEU	NY	13	5	K4LHB	VA	13	6	WB6NMT*	CA	10	6	K9HMB	IL	23	10	KC@W	ND	3	1
W1HDQ	CT	13	5	K2YCO	NY	11	5	N4CD	VA	9	4	W6WSQ	CA	6	4	WB9SNR	IL	14	9	VE2YU		8	3
W1QXX	MA	13	5	W2PGC	NY	10	7	W3IY/4	VA	8	5	W7JF	MT	8	5	K9KFR	IN	11	6	VE2HW		5	2
K1JIX	MA	12	4	WA2FUZ	NY	9	4	K4GL	SC	6	2	K7NII	AZ	8	4	WB@TEM	IA	16	6	VE3AIB		10	8
W1GXT	MA	10	4	W3UJG	MD	15	8	K4IXC	FL	5	3	W7CNK	WA	6	3	W@PW*	CO	14	6	VE3EMS		10	7
W1AZK	NH	10	3	W3HMU	PA	13	4	K5FF*	NM	16	9	K7ICW	NV	4	2	K@DAS	IA	12	6	*Indicates some states worked via EME			
K1BFA	MA	10	3	WA3JUF	PA	12	5	W5RCI	MS	10	5	W8IDU	MI	15	7								

ON THE BANDS

6 and 4 Meters — Maybe it wasn't a fluke! Last month's column carried a special flash announcing an historic vhf achievement. The Atlantic Ocean had been spanned on a frequency higher than 50 MHz without the use of moonbounce. VE1ASJ had successfully completed a 6-to-4 crossband contact with G4BPY. But would it ever happen again? The answer was not long in coming. On the morning of December 7, Andy was at it again, this time working G3COJ, G4ENB and G4ENA/A, the three Gs transmitting near 70.1 MHz. This time VE1ASJ reported the signals to be "quite good" as opposed to the earlier session in which G4BPY's signal was 439. It appears that 6-to-4 trans-Atlantic contacts may be possible more often than we may have thought. The summer Es season could hold the key to more such QSOs with many more stations than a single well-located VE1.

Remember the times last summer that the ZB2VHF beacon was heard along the East Coast? I'll have more to say about how we should go about looking for some of this very exciting form of vhf DX in a month or so. In the meantime, those who wish to play a part in the quest for more 6-to-4 contacts should begin by equipping themselves with a good 70-MHz receive converter. Microwave Modules has such a converter. I have one of these. Otherwise one could build a converter using the 6-meter design from the ARRL *Handbook*, and making appropriate changes of crystal and tuned circuits. It might be well not to use 28 MHz for the i-f, however, as feedthrough from 10 meters may confuse things. That band is likely to be open at the same time if Es is the mode of propagation. A better choice might be 29 MHz where activity is less and cw activity is essentially nil, or possibly 144 MHz, feeding the converter into a multimode 2-meter rig. I'll have more to say about antennas as well as other thoughts in the next few months.

These epic 6- to 4-meter contacts were not the only excitement the tonosphere had in store. On November 27 about 0930Z G4BPY, followed closely by G5KW/A and G3COJ, completed crossband 10- to 6-meter contacts with VK6OX in Western Australia operating on 52 MHz. Thus to G4BPY and G5KW go the honors of accomplishing the first crossband WACs. G3COJ still needs South America to complete his. Then, in mid-December, western Europe was again the focal point of 6-meter DX. On the mornings of both the 13th and 14th around 0900Z, Hong Kong station VS6BF was received. On the 14th, he was joined by VS6FX. Crossband 10-to-6 contacts were completed by a number of UK stations including G4BPY and GW3MHW. In addition EI6AS and PA@RYS made 6-meter two-ways with the Crown Colony. G4BPY reported that on the second morning, VS6BE's signals peaked 40 dB over S9!

Returning to late November, I5TDJ provided a good percentage of the excitement just before Thanksgiving. Of course, VE1AVX had already worked him on the 17th. Piero's 50.319 MHz beacon was heard by a number of U.S. East Coast stations on the 25th. The following day, it was in again but much weaker. That was too much for N3AHI. Jim put in a phone call to Italy and Piero raced home from work. N3AHI followed by this conductor at about 1615Z. Soon the skip lengthened and WA5IYX and other 4s and 5s made the grade also. I5TDJ's 50.020 MHz signal was significantly better in San Antonio than here, running 579 at WA5IYX's QTH. The best I could give was a 229. Marginal as it was, this has been one of my most exciting contacts so far this Fall. I5TDJ worked an even dozen stations that memorable day.

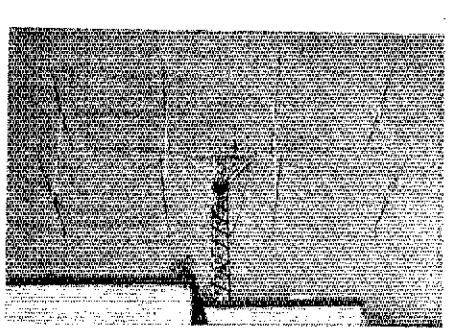
Despite the very noteworthy contacts reported above, November certainly was a better month than December has been to date. This is being written on the evening of the 14th. The sheer volume of outstanding contacts made in November makes it impossible to list even a small percentage of them. Many reports of /Ss into the West Coast serve as one example. Although November 1980 was probably not as good as the same month a year earlier, in terms of length and intensity of openings, it was more productive from the standpoint of activity and distribution of paths open. One example is turned in by K8WKZ. In six days between the 10th and the 16th, Dave accomplished that long-sought goal that many of us have yet to achieve: WAC. Contacts with ZS6LN, JA7QVI, VY1CM, DL3ZM/YV5, ZL2KT and EI9D did the trick. Wow! In the midst of all of this international DX activity, the principal game for many remains WAS, and the most-needed state seems to be Hawaii. KH6IAA has been filling that void for many. In the process, AJ satisfied his own WAS craving by working several West Virginia stations on November 29. He thus becomes the second KH6 to work all 50 states on 50 MHz. KH6NS accomplished the feat last year. One of KH6IAA's West Virginia contacts was WD8QDA. Steve is a farmer and must sandwich his 6-meter DXing between the many chores necessary to running a large spread. He does have lots of room for antennas, however. Despite the other calls on his time, Steve still managed to log over 2100 6-meter QSOs between February 28, 1978 and November 11, 1980. In the last 20 days of November alone, he came up with 153 contacts. There are certainly many 6-meter WAS holders who are indebted to the dedication of WD8QDA for that hard-to-get West Virginia QSO and QSL. Another tenacious 6-meter operator is N6CT. Bruce sends along a copy of his log which, among other things, lists QSOs with 101 JAs during the last three days of November alone! I am sure the Japanese operators appreciate his taking time to work them as there are still many over there who have yet to work the U.S.

To show that F2 is not all that is going on, WP4ACV fills us in on TE doings down Puerto Rico way. During one such session on November 22 beginning at 0022Z he contacted PY1ABK, PY1WSK, PY1AUX, and CX8BX.

To top it off, this is the winter Es season. This has brought a number of good openings to the VE1 and VO1 as well as the Gulf Coast area from here in the mid-Atlantic states. At about 1730Z December 13, this conductor caught a nice E opening to Puerto Rico and the Virgin Islands. A very pleasant QSO was had with W1HOY/KP4. It was especially nice to hear Helen going strong again after her recent illness. The other stroke of luck was running into VP2VGR for a new country: Quite a surprise.

Let's hope that there is plenty more DX to report next month. So far, so good!

2 Meters — Too late for inclusion in last month's column (it did appear in "League Lines," however) was the news of the first non-U.S. 2-meter WAS and the first all-EME WAS. SM7BAE accomplished this by working K@ALL in North Dakota. It couldn't happen to a more deserving vhfer. How many times have I heard of someone working SM7BAE for his first DX moonbounce contact? Kjell has been a very active 2-meter EMEer and has always had an outstanding signal and a good set of ears! From the other end of the historic QSO, K@ALL writes that he and WB@AUM worked through the evening of November 22 in freezing rain to put up the array of four Boomers. Initial results were disappointing as signals were quite marginal. Replacing the 8214 coax with 7/8-inch Heliax just prior to the schedule on the 24th did the trick. Signals were much improved and the QSO was completed without difficulty. Congratulations to both Ron and Kjell for a job well done.



The 2-meter EME antenna at I2MBC. The station is a group effort by I2SXZ, I2ZFN, I2SVA and I2MBC. Eight 16-element F9FTs make up the array.

This is being written in the midst of the Geminids, so I won't have reports on this major shower until next month but VE3FKX has sent along a note on his success during the Leonids, which occurred in mid-November. Rolf picked up his 32nd state by working KC@Y, formerly WB@BVC of Wichita, Kansas. You can bet he's plugging away as I write these lines to bag a few more new ones.

From College Park, Maryland, WA3SXH writes that he can't quite make it to the 8s with his barefoot IC-251 and indoor beam built on a broomstick, although he has heard some. Come the warmer months, Jay promises to emulate W3EP/9 and take to the countryside with his pickup truck, a 160-watt amplifier and 64-element array. He is also interested in 23 cm and has some equipment including a 6-foot dish. Portable operation is certainly the answer for many vhfers frustrated by apartment living or similar handicaps.

70 cm and Down — I am indebted to the newsletter put out by AJ Katz, K2UYH, for the following information. Incidentally, this publication was formally called "The 432 EME Newsletter." Now, because of the increasing interest and activity on 23 cm and even expected operation on 13 cm, the name has been changed to "432 and Above EME News." This change definitely reflects the new direction that many in the World Above 50 MHz are taking. While the bands from 6 meters through 70 cm are all gaining in popularity, nevertheless more and more are expending increasing effort on the higher bands. The January Newsletter notes that the SK2GJ group from northern Sweden solved some of the problems experienced during their October 23-cm tests in time for their planned session in late November. One problem was lack of a working moon-tracking program. This necessitated aiming the 32-meter (105-foot) dish by hand. With a beamwidth of less than one-half degree, this meant repointing the antenna every 30 seconds for eight hours. Nevertheless, despite this handicap, they worked PA@SSB, G3WDG, G3LTF, VE7BBG, W6YFK and DJ4AU. By November 28, with a tracking program up and running, they added SM@DFP, SM6CKU, DI8QI., LX1DB, F9FT, K4QIF, K2UYH, VK5MC and possibly others. K2UYH reports their signal to be 12 dB above noise in a 3-kHz bandwidth of his location. The "23 cm moonbounce for everyone" sessions are not necessarily at an end. More tests are possible late this spring or sometime in the summer. Maybe by that time more 23 cm stations will be ready to take advantage of this rare opportunity. "The New Frontier" for March will carry a description of what will be needed to participate.

Alaska is often a hard state to work on any band. Now providing that elusive slot in WAS lists is KL7WE. Thanks to the loan of an amplifier by W1JR, Tim has provided contacts to W5FF, W1JR, W6ABN, K3NSS and KA@Y. After a QRT during December for getting married and a shift of QTH, he should be back on by the time this appears.

K5FF reports that on November 23, she made what is probably the first YL-to-YL EME QSO when she worked I5MSH, with Lina I5UNA at the key. They had set up a sked to accomplish this first, and it paid off. Signals were so good that they were able to exchange names as well as the usual rudimentries. Immediately following this, Lee received a call from DL7QY and worked him without difficulty. This was a particular thrill as many stations had not been able to work DL7QY, whose array consists of only four Yagis.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

N1AHQ, Fred F. Chellis, Concord, MA
W1BMH, George Chandler, Boston, MA
W1BWN, Ellsworth H. Peak, Saugus, MA
WB1EAO, Alexander S. Goodland, Needham, MA
W1HSO, Edwin A. Knowlton, Stonington, ME
W1LRZ, William D. Truland, Farmingdale, ME
W1MOK, Myles W. Brennan, Chicopee, MA
K1NTS, Roger A. Jones, North Attleboro, MA
W1OUP, Omar G. Simmonds, N. Abington, MA
WA1VDY, Ernest M. Gordon, Old Lyme, CT
ex-K1VHH, True L. Sleeper, Sherman Mills, ME
WA1VNT, Edwin N. Salmon, Killingworth, CT
WB2EAO, Michael Rasky, Secaucus, NJ
WA2JCZ, Marvin Sarkin, Fayetteville, NY
WA2ONB, Abraham Z. Cutler, Cherry Hill, NJ
WA3IFV, Earl R. Jordan, Philadelphia, PA
W3KN, George B. Weed, Wyncote, PA
W3NBP, Bryce M. Fulks, Carnegie, PA
W3PMY, John F. Nordine, Columbia, PA
K3QCL, Guy W. France, Vandergrift, PA
WA3RCD, John W. Burket, Jr., Wayne, PA
K3SDW, Joseph Stasko, Coraopolis, PA
K3WNL, Fred B. Burdge, Williamsport, PA
WA4ABZ, Nelson J. Donahue, Aiken, SC
WA4BSQ, Charles H. Imel, Culpeper, VA
AA4C, Clarence A. Few, Mobile, AL
WA4DHS, Fred C. Horne, Clearwater, FL
WA4DQQ, Herbert G. Anderson, Rome, GA
WA4FCD, Hollis Graves, Jacksonville, FL
KA4GST, Herman L. Forbes, Jr., Chesapeake, VA
W4GWF, Robert M. Hope, Loxahatchee, FL
K4HA, Wray A. Gillette, Ft. Lauderdale, FL
K4IJP, William J. Powell, Dothan, AL
W4LIZ, R. Dick Thompson III, Tarboro, NC
WB4KHZ, Nicholas H. Lean, Jr., Fayetteville, NC
W4LA, William E. Wood, Spruce Pine, NC
(Formerly of Miami, FL)
KB4LV, William K. Markey, Tampa, FL
W4MJI, John M. Adkins, Port Charlotte, FL
W4MLF/ex-W3RSC, Russell W. Moore, High Point, NC
W4PDA, Johnnie "Doc" E. Moberly, Richmond, KY
W4POF, Barnard C. Ullom, Talbot, TN
K4PYK, Thomas C. McConnell, Kingsport, TN
WD4RVY, Isiah Battle, Jr. Phenix City, AL
W4SN, Stacy W. Norman, Charlottesville, VA
*WB4WBP, John C. Criner, Jr., Nicholasville, KY
W4YYI, Robert E. Jagoe, Owensboro, KY
W5ACU, Everett D. Craig, Lindale, TX
WD5AIR, Edward F. Lavin, Houston, TX
W5CS, Daniel M. Moon, Houston, TX
WB5DDQ, Victor D. Ezell, Saucier, MS
W5FB, Harold H. Clarke, Hazen, AR
WD5FVD, Ivan L. McCreary, Midwest City, OK
WA5GCY, Raymond J. Reuss, Athens, TX
N5GO, William D. Eckelkamp, Eufaula, OK
WD5GXG, Arthur E. Harrington, Hitchcock, TX
W5HF, Frederic K. Spies, Little Rock, AR
WA5KBR, Robert Douglas Beasley, Pascagoula, MS
W5PNG, Richard G. Patterson, Ardmore, OK
W5SUW, Herbert L. Scales, San Antonio, TX
W5UX, Robert W. Carr, Jr., Burnet, TX
W5VIM, Raymond T. Lowder, Arlington, TX
K6BDC, Louis A. "Tommy" Thompson, Santa Barbara, CA
WB6DVO, Gordon Bowser, Santa Barbara, CA
KA6ELI, Dorothy D. Nickles, Sacramento, CA
K6FW, Charles S. Chapman, Tracy, CA
W6GZZ, Verrice D. Wilson, Los Angeles, CA
K6OHG, John D. MacGillivray, San Francisco, CA
WA6OMR, Samuel G. Read, Chula Vista, CA
W6TLD, Bryan B. Basinger, Simi Valley, CA
W6TQF, Gerald O. Martin, Fontana, CA
K6TRY, William C. Holley, San Jose, CA
W6WL, Donald S. Jackson, Palm Desert, CA
K7AV, Vincent M. Sullivan, Selah, WA
W7GLT, Virgil Stiegelmeyer, Show Low, AZ
W7HEB, Alvin R. Brown, Casper, WY
KA7HOV, Louis L. McCoy, Tucson, AZ
W7IOG, Charles W. "Dinty" Moore, Green Valley, AZ
W7JWU, George A. Benson, Glendale, AZ
K7KFP, Charles W. Frazer, Aberdeen, WA
W7KYY, Robert R. Nance, Spokane, WA
W7LVZ, Vincent O. Nordahl, Seattle, WA
WA7NDO, Harold R. Pruett, Butte, MT
K7VFR, Raymond E. Gillett, Spokane, WA
W7WDZ, Ralph G. Gasparotti, Ocean Park, WA
*W8AOV, Wayne L. Faith, Montpelier, OH
N8BTN, Carl F. Ahrendt, Sr., Dayton, OH
WA8CCO, Dr. Ralph F. Northheller, Rochester, MI
W8DPU, Kenneth B. Peck, Port Huron, MI
WB8GKN, Mario Mariucci, Iron Mountain, MI
K8HWK, Graydon R. Landis, Union Lake, MI
WA8IIE, Joseph E. Benoit, Lincoln Park, MI
WA8IUD, Morse E. Thomas, Canton, OH
W8IHJ, Henry L. Thiebaud, Gnaden Hutten, OH
WD8ILB, Danny Sampley, Greenwich, OH
W8IZ, Charles D. Birget, Jackson, MI
W8KNN, Kenneth E. Henderson, Lexington, MI
W8NKJ, Alphonso H. Furget, Detroit, MI
WB8ORS, Kenneth L. Keith, Lima, OH
W8SVI, William G. Ingling, Fairborn, OH
W8TDB, Pauline Thiebaud, Uhrichsville, OH
W8UQD, Charles R. Grace, Owosso, MI
W8WII, Arthur W. Zimmer, Pontiac, MI
W8WRL, Ralph M. McQuade, Columbus, OH
W9ACW, Morris E. Winn, Brazil, IN
N9AVS/ex-W9EGH, Fergus E. Mackain, Goshen, IN
W9BYI, Orland B. Banning, Elkhart, IN
KA9CUX, Walter T. James, Chicago, IL
W9DUQ, Hilbert F. Haut, Cecil, WI
W9FMI, Van I. Bowman, Fort Wayne, IN
K9FOV, William Harris, Lafayette, IN
W9GKO, William L. Tress, Pound, WI
WD9IDY, J. Harold Jacobsen, Mt. Vernon, IL
K9IXI/ex-W5HYS, Julius S. Morgan, Highland, IL
W9ISV, Joe J. Thomas, Rockville, IN
K9JTQ, Glen R. Harvey, Tangier, IN
W9KVM, James R. Langston, Indianapolis, IN
W9LGG, Clark E. Winchester, Roanoke, IN
K9ODH, Arthur G. Wakeman, Neenah, WI
W9ORN, Wake F. Harriman, Fort Wayne, IN
K9QFD, Louis J. Ross, Rushville, IN
WB9UYZ, Charles D. Jeffries, Jr., Wilmington, IL
W9VEZ, John Disch, Chicago, IL
K9YYB, Asaph C. V. Elston, Lancaster, WI
WØBYE, John R. "Bob" Doran, Denver, CO
WDØDXK, William J. Hoffman, Moberly, MO
WBØFEB, Clarence H. Nelson, Faribault, MN
WØIZK, Harold C. Hammer, Des Moines, IA
WØRPF, Earl Drange, Zimmerman, MN
WBØUWF, Paul A. Kowalski, Vergas, MN
WAØZYT, Wes Hood, Pueblo, CO
VE1YO, Angus D. MacDonald, Dartmouth, NS
VE2AFM, Charles Coorsh, Outremont, PQ
VE3AEX, Percy Sparkes, Brooklin, ON
VE3AZV, William E. Warburton, Oshawa, ON
VE3EIY, Albert B. Willis, London, ON
VE3NP, Max A. Boag, Newmarket, ON
VE5ADR, Leslie I. Groome, Regina, SK
VE5RZ, Joseph V. Richmond, Prince Albert, SK
EI3IZ, Patrick Conway, Co Westmeath, Ireland
TG9SY, Sender Cupersmith, Colonia Altanura, Guatemala

*Life Member, ARRL

Note: All Silent Key reports sent to Hq. must include the name, address and call of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

February 1931

☐ In his editorial, K. B. Warner recounts the changing conditions on the ham bands 160 through 20 meters. Some scientists think there might be an 11-year solar cycle tied in to these changes, but it is mere speculation — short-wave communication is only 7 years old!

☐ Irving Weston, W1BHB, and Ralph Benton, W1CU, of the Boston Radio Inspector's office, tell "How Uncle Sam Checks Your Frequency." A 30-kc. crystal, certified by the Bureau of Standards, is held to less than 0.1°C in an oven and drives a string of multivibrators to give check points and harmonics of 30, 90, 60, 1.0 and 0.1 kc. Two battery-powered receivers cover the range 100 to 30,000 kc. Most of the observations are of b.c. and commercial stations, but occasional sorties into the ham bands have resulted in several license suspensions.

☐ In "Further Notes on the Zeppelin Antenna," Don Edmundo Respoli, IIMM, describes an experimental method for finding the correct length of the radiating portion of a Zepp antenna system. To use series tuning on both 40 and 20 meters, an additional 5-meter length of feed line, strung around the shack, is clipped in place for 7-Mc. work. (Parallel tuning must have been a later development!)

☐ Howard Chinn, W1AXV-W1XP, describes "A New Type of Peaked Audio Amplifier" he uses in his receiver. A series-tuned circuit is connected across the plate load resistor of the first audio stage, and the grid of the second stage is connected to the junction of the CL circuit. Bandwidth is varied by changing the plate load resistor. To facilitate experimentation, the RLC section is plug-in, and an audio transformer is plugged in for 'phone reception.

☐ Charles Seymour, W9FMN, describes "An Electrically-Operated 'Bug'" key, using a buzzer-connected delay-type telephone relay and a "sideswiper" paddle. The key gives any length strings of dots, and manual dashes. (In the same issue, the cheapest Vibroplex is $17!)

☐ In his I.A.R.U. column, Clint DeSoto uses a photograph sent in by San Francisco SCM Clayton Bane, W6WB. The picture, from Asamura, J3CR, shows the I.A.R.L., *17* in all!

25 Years Ago

February 1956

☐ Dean Pfost, W7KOT, tells how to build "The Ash-Tray Mobile." It is a 6AQ5-2E26 75-meter r.f. section that replaces the ash tray in his Chevy. The modulator is built on a 2 × 4 × 6-inch chassis that mounts under the dash.

☐ Jo Jennings, W6EI, gets "High Stability in a Crystal-controlled VFO" for his sideband rig. The secret is to use two "rubberized" crystals at 7722 and 11,530 kc., to give a heterodyne range of 3801 to 3813 kc. A single ganged control for the two dual capacitors across the crystals causes one oscillator frequency to increase as the other one decreases.

☐ In a timely Technical Topic, George Grammer, W1DF, tells about "Linear Amplifiers for A.M." and why they're great for sideband but mostly a waste of power on a.m. (Oh, that villainous carrier!)

☐ Lew McCoy, W1ICP, describes "A Complete 6146 Economy Transmitter" for a.m. and c.w., 80 through 10 meters, crystal or VFO. Mac packs a lot of features into the rig, including differential keying and, best of all, a price tag of $90 for all the parts.

☐ Campbell, W1CUT, and Goodman, W1DX, show crystal-controlled converters for 7, 14, 21 and 28 Mc., designed to work into a receiver that tunes the 80-meter band.

☐ "A Rugged 28-Mc. Coaxial-Antenna Design" by Steve Horvath, W8PVC, is intended for good general-coverage operation and QSOs with mobile stations. The upper half of the antenna is a quarter-wave whip, and the skirt is made of 3-inch diameter aluminum tubing. — *Byron Goodman, W1DX*

ARRL International DX Contest Awards Program

The list below indicates the categories for which plaques will be awarded in the 1981 ARRL International DX Contest. Thanks to the many clubs and individuals who have made this awards program possible.

W/VE Phone

Single Operator

All Bands	Frankford Radio Club
1.8 MHz	ARRL
3.5 MHz	Gary Firtick, K1EB/W1EBC
7 MHz	David Thompson, K4JRB/K5MDX
14 MHz	Richard Loehning, N9ACP and Mark Michel, W9OP
21 MHz	Hamfesters Radio Club, W9AA
28 MHz	Roy and Kathryn Tucker, N6TK/AA6TK
QRP	Rockford Amateur Radio Assn.

Multiop-Single Transmitter

Mid-Ohio Contest Club

Multiop-Multi Transmitter

Buffalo Area DX Club

W/VE CW

Single Operator

All Bands	Frankford Radio Club
1.8 MHz	W1TX Roy Fosberg Memorial — Connecticut Wireless Assn.
3.5 MHz	Northern Illinois DX Assn.
7 MHz	DX Awards Guide — WØYBV
14 MHz	Neena — Menasha ARC
21 MHz	Willamette Valley DX Club
28 MHz	Mike Badolato, W5MYA
QRP	Hollywood ARC

Multiop-Single Transmitter

Mid-Ohio Contest Club

Multiop-Multi Transmitter

W4IZ Hollis Graves Memorial — North Florida ARS

DX Phone

Single Operator

World	North Jersey DX Assn.
Africa	John Farrington, WA1TQP
Asia	Lafayette ARC & Acadiana DX Assn.
Europe	Murphy's Marauders
North America	Chod Harris, VP2ML
Oceania	Ray Stone, W5RBO
South America	Roy and Kathryn Tucker, N6TK/AA6TK
1.8 MHz	Arkansas DX Assn.
3.5 MHz	Robert Peterson, W3YY
7 MHz	KN6M Contest Machine
14 MHz	Don Wallace, W6AM
21 MHz	Worldradio
28 MHz	Mike Badolato, W5MYA
QRP	William Shepherd, K3WS

Multiop-Single Transmitter

World	Delta DX Assn.
Africa	Indy DXers
Asia	Kansas City DX Club
Europe	K8LSG Roger DeBusk Memorial
North America	Lynn and Rosie Lamb, W4NL/KA4S
Oceania	Carl Smith, WØBWJ
South America	Liga Columbiana de Radioaficianados

Multiop-Multi Transmitter

World	Gloucester County ARC — Southern New Jersey
Asia	Mike Badolato, W5MYA
Europe	Grosse Pointe Farms DX Assn.
North America	Southeastern DX Club

DX CW

Single Operator

World	North Jersey DX Assn.
Africa	San Diego DX Club
Asia	Sonoma County Radio Amateurs
Europe	Clarke Greene, K1JX
North America	Pete Grille, W6RTT
Oceania	Ray Stone, W5RBO
South America	Alamo DX Amigos — San Antonio
1.8 MHz	Arkansas DX Assn.
3.5 MHz	Earl D. Merry Memorial (W8KI donor)
7 MHz	Art Boyars, K3KU
14 MHz	Bencher, Inc.
21 MHz	Southern New England DX Assn.
28 MHz	West Jersey Communications Products
QRP	AJ7S — Nashua ARC

Multiop-Single Transmitter

World	Texas DX Society
Africa	Red Stick DX Assn.
Asia	Red Stick DX Assn.
Europe	South Florida DX Assn.
North America	The K5RC Multiop Crew
Oceania	KN6M Contest Machine
South America	Mike Badolato, W5MYA

Multiop-Multi Transmitter

World	QRZ DX
Asia	Colorado Contest Conspiracy
Europe	George Schultz, WØUA, and John Brosnahan, WØUN
North America	Ventura County ARC, K6MEP

SPECIAL

Scandinavian Award (Top Scandinavian Country aggregate)	John Lindholm, W1XX

Single Operator

Combined score (Phone & CW):

World	Yankee Clipper Contest Club
W/VE (to the op.)	National Contest Journal
Japan	Northern California Contest Club
Poland	Rich Assarabowski, K1CC

DX:

Caribbean (resident)	Arturo Gigante, Jr., HI8GB
Europe — 3.5 MHz (cw)	South Florida DX Assn.
Europe — 3.5 MHz (phone)	Gale Steward, K3ND
Middle East (cw)	Herb Twitchell, W6BL
Republic of South Africa (phone)	Bill Jennings, K1WJ
Israel (cw)	Martin Hartstein, N6WW
Israel (phone)	Martin Hartstein, N6WW
Japan (cw)	Randy Thompson, K5ZD, and Tom Morrison, K5TM
Japan (phone)	Western Washington DX Club
Japan — 21 MHz (cw)	Jess Guaderrama, W6LEN
Dominican Republic (cw)	Jose Barcelo, HI7UP
Dominican Republic (phone)	Jose Barcelo, HI7UP
Australia (phone)	Armond Noble, N6WR (ex-VK9AM)

W/VE:

Low Power (top both modes)	Ken Bolin, W1NG
Low Power (cw)	Wireless Institute of the Northeast
West Coast Big Gun (14 MHz West of Mississippi)	Larry Pace, N7DD
Reciprocal Operator (Foreign in W/VE)	Amateur Bilingual Radio Operators and DX
Canada (cw)	CANAD-X
W4 (cw)	Jan and Joy Middleton, WB4CKY
Texas (cw)	Dennis Motschenbacher, KA5CHW
California (cw)	Southern California Contest Club
California (phone)	Dave Bell, W6AQ
W8 (phone)	Livonia ARC
WØ (phone)	AK-SAR-BEN RC

Multioperator

Caribbean (cw)	YASME Foundation
Caribbean (phone)	W5QBM Joe Johnston Memorial
DXpedition (cw)	John Minke, N6JM

W/VE Club

Unlimited (50+ entries)	ARRL
Medium (less than 50 entries)	ARRL
Local (3-10 entries, live within 20 miles)	ARRL
Most Improved Club (points per entry)	Steve Place, WB1EYI

Results, 1980 IARU Radiosport Championship

75 Zones, 111 member societies, 1501 entries and one IARU.

By Tom Frenaye,* K1KI

Interest in the IARU Radiosport Championship continued to grow in 1980 with another increase in overseas participation. W/VE participation did drop slightly, making the overall total of logs received add up to 1501.

Since the 1979 contest four new members have joined the IARU — Montserrat Amateur Radio Society (VP2M), Federation de Radioaficianados de Cuba (CO), Radio Society of The Gambia (C5) and Solomon Islands Radio Society (H4). Add to that the successful IARU performance at the World Administrative Radio Conference in Geneva late in 1979 and you will agree that the IARU continues to effect very positive steps for Amateur Radio worldwide.

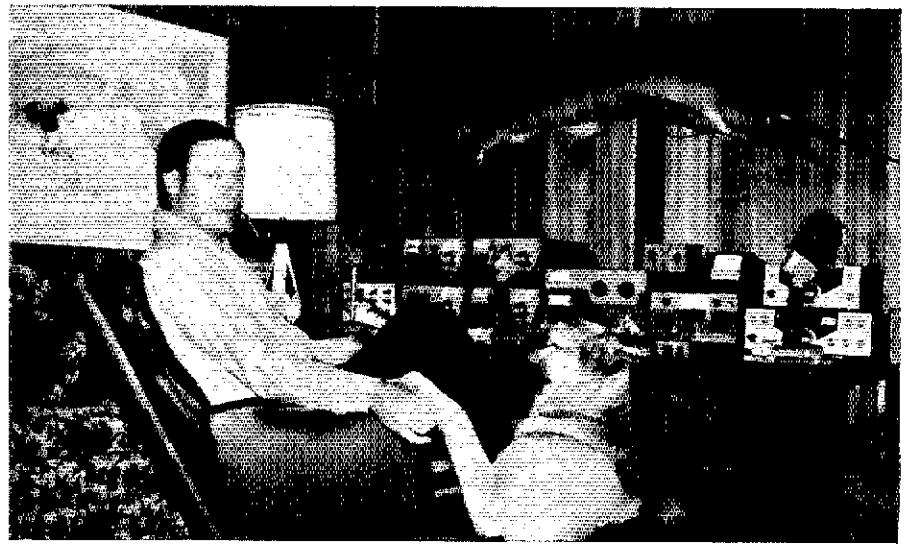
As in the past, 15 and 20 meters continued to be the bands with the most activity. The most successful scorers relied on 15 and 20 for the bulk of their QSOs, while making sure to spend a significant amount of time on the other bands to ensure a good multiplier total. With multipliers worth the equivalent of 10 or 15 QSOs, the time spent to dig out the weak ones on 10 meters or the signals hidden by QRN on 80 meters really does pay off.

New world records were set by ZL1ADI (phone + cw), LU8DQ (cw) and KH6XX (multioperator). The KH6XX crew made good use of 24-hour a day propagation to Japan or North America and some very good multiplier hunters to set a record that may stand for several years to come.

Hope you're making plans for the 1981 contest — July 11 and 12!

A 50-foot wire in a palm tree was all that W4YOK/C6A needed to give many a QSO from the Bahamas.

*Assistant Communications Manager, ARRL



ZL1ADI broke his old world record in the 1980 contest to remain the king in the mixed mode category.

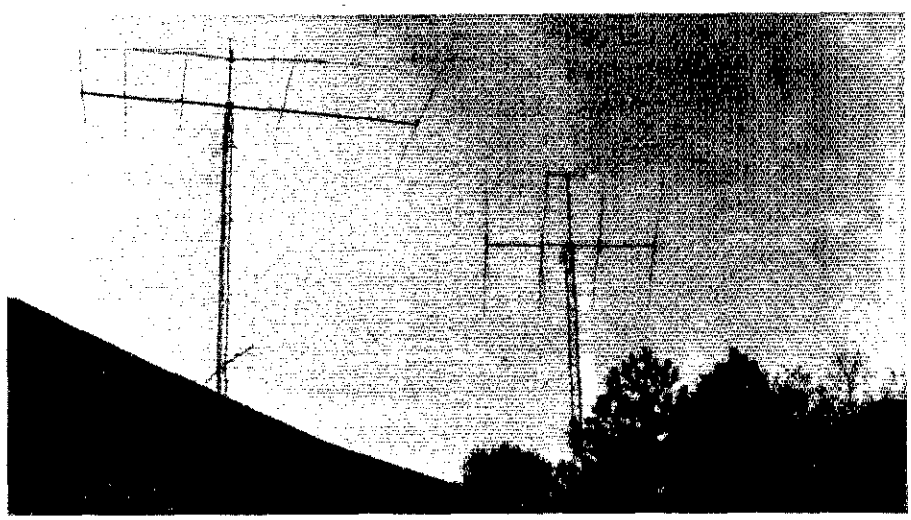
Top Ten — World (Score, QSOs, Multipliers)

Single operator (phone + cw)		Single operator (cw)	
*ZL1ADI	2,078,964-2698-158	*LU8DQ	1,634,720-2420-136
RX1DZ	1,775,472-2916-141	UP2NV	1,249,952-2242-134
UB5MCS	1,611,124-2863-116	G3FXB	1,059,050-1952-118
**K5TM(K5ZD)	1,367,660-2803-140	**K1KI	1,036,035-1505-161
AH2E	955,536-1942-102	HH2VP(N4XR)	1,029,480-2154-115
RZ2ACA	945,969-1692-141	OZ1LO	925,184-2071-104
UA6LFX	898,101-1892-111	K6LL/7	832,755-2138-103
UY5OO	804,760-1753-110	RW3HV	812,490-2015-106
AD1S/5	781,942-2057-101	K7NHV	777,606-1812-109
N5JJ	733,821-1801-111	K5TA	771,498-1636-117
Single operator (phone)		**Multioperator**	
K7RI	1,264,208-2654-121	*KH6XX	5,071,845-5613-183
VE7CC	1,106,722-2744-113	EY2B	2,977,794-4196-171
AG7M	947,262-2313-113	UK2PCR	2,470,360-3655-151
DL8PC	786,670-1716-97	HG6V	2,400,252-3915-139
OZ5EV	778,590-1849-90	NP4A	2,106,874-3878-154
N5IH	768,509-1919-101	UK4WAR	2,106,506-3165-154
HP1XRK	713,084-2312-94	EY2P	1,945,144-3655-134
WA6HCI	681,700-1791-100	**W6RDF	1,766,848-2911-152
KØVUW	646,680-1589-120	UK1AAA	1,742,391-2778-147
K6SVL	585,342-1708-93	UK5MAF	1,657,630-2949-130

*New world record
**New U.S.A. record

SOAPBOX

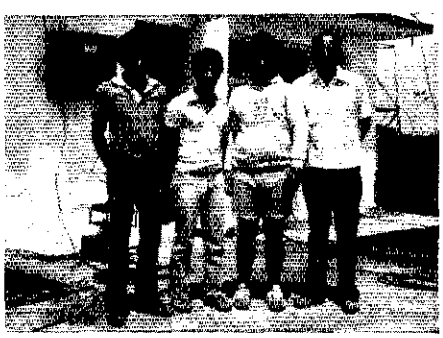
The middle of the summer is not such a good time for a world contest. The mut is too high at night and too low during the day. I am sure that it is impossible to win from the northern hemisphere. It was a lot of fun to climb 45 meters high at night to repair my monster quad. (UP2NV). Everything went great until it came time to do the duping . . . Next year we are using a computer for sure! (WD6CZR). Happiness is calling CQ and having JT1AN reply. It is even nicer with JT1BG responds to the very next CQ. (AA8S/WB8JBM). Bands were lousy from HP-land . . . High noise level . . . Join us on the IARU Region II Net Mondays at 2300 Z on 14265 kHz. (HP1GD). Positively the best contest going. This year's contest was no exception. (WD6EEQ). To me, Radiosport is tailor made for "little pistols". We all have a chance. The 250 QSOs and 50 zones achievement level awards are nice too. (KX4H). WOW, am I glad that this one's over. What a drag. Not many stations to work and then the bands weren't really that hot. (WD8KXN). Special thanks to the hundreds of zone 6 and 8 stations I worked for being worth three points instead of one point!! (K5TA). My first try at cw only . . . things were great for the first six hours then the band conditions turned to "typical summertime" from Maine. Ten meters never opened up, 15 was so-so, and 20 was good. If it weren't for 20 meters, I would have closed down and gone fishin'. . . . I'd like to see this contest moved from the summer months — unless someone would like to donate an air-conditioner for the shack, which doubled as a sauna with the SB-220 cookin'. (WA1PDG). Unfortunately, this proved to be the worst year, propagation-wise. This year it seemed like the 5 and 6 land stations were in the best stateside location for the contest. . . . I am a sophomore at NCSU in Raleigh, NC. I am very glad that there are a few large contests during the summer when I have free time and school is out. (N4AY). This contest is second only to CW Sweepstakes for me. Really enjoy the large number of QSOs that can be made with a modest station. (KA5CHW/AA5Y). My pet peeve is stations that "CQ" for long periods of time without leaving enough time for folks to answer . . . I run full break-in so I could hear them CQing again by the time I had sent the first letter of their callsign. (KA2CGV). Got hit by ol' Murphy in a new way this year — the TH6-DXX was *too* high (120 feet). It worked fine into 1A land, but not as well as it should have worked into Europe. I was consistently beaten into Europe by a local with 6 elements at 40 feet. (WB2SJG/W2CXM.)



N5AN teamed up with W5WMU for an 11th place finish worldwide (no. 2 W/VE) with the help of this nice set of antennas.

Top Scores — W/VE

Single operator (phone + cw)		Single operator (cw)	
K5TM(K5ZD)	1,367,660	K1KI	1,036,035
AD1S/5	781,942	K6LL/7	832,755
N5JJ	733,821	K7NHV	777,606
W2CXM(WB2SJG)	723,732	K5TA	771,498
W2SZ(N2ALK)	660,894	W5VX	639,058
Single operator (phone)		**Multioperator**	
K7RI	1,264,208	W6RDF	1,766,848
VE7CC	1,106,722	N5AN	1,571,472
AG7M	947,262	N4WW	1,528,360
N5IH	768,509	W6YX	1,416,063
WA6HCI	681,700	W3LPL	1,373,043



The 5th-place multioperator score came from NP4A this year. Left to right are Cheito, KP4EHP, Ruben, NP4AZ, Gugui, KP4O, and Pedro, NP4A.

Multiplier Leaders (Total, 1.8 MHz, 3.5, 7, 14, 21, 28, vhf)

Phone + cw								Phone							
ZL1ADI	158	7	21	27	39	35	29	K7RI	121	1	8	11	40	44	16 1
RX1DZ	141	7	13	24	37	38	20 2	KØVUW	120	2	7	23	32	35	17 4
RZ2ACA	141	—	15	19	35	47	25	VE7CC	113	1	7	14	41	35	13 2
K5TM	140	2	10	19	44	40	24 1	AG7M	113	1	8	9	46	37	12
UB5MCS	116	2	8	10	36	37	23	N5IH	101	1	1	10	38	36	11 4
Cw								**Multioperator**							
K1KI	161	1	13	27	49	43	28	KH6XX	183	5	13	29	50	48	35 3
LU8DQ	136	3	17	25	34	32	25	EY2B	171	6	13	24	47	51	30
UP2NV	134	7	12	15	38	38	23	UK4WAR	154	3	10	24	43	47	27
G3FXB	118	3	13	16	32	39	15	NP4A	154	5	12	23	40	43	28 3
K5TA	117	—	11	23	34	36	12 1	W6RDF	152	5	10	24	43	42	25 3

UA1OSM, Serge (left) and XYL UA1OSA, Lyuba, helped many people work UA1PAL, Slava, who spent most of 1980 in Franz Joseph Land. Serge is chief of the UK1OAA QSL bureau, helps with FJL QSL chores and is an active DXer. Slava made several hundred QSOs from Graham Bell Island to give many DXers a new country during the 1980 IARU Radiosport Championship.

Scores

Scores are listed by ITU zone, then by country within that zone. The line score (example — DM3BF 211,919-803-73-B) indicates the call sign used, total score, number of contacts, number of ITU zone multipliers, and entry class. The entry class letters are A — single operator, mixed mode; B — single operator, cw only; C — single operator, phone only; D — multioperator, single transmitter.

Almost too late

Zone 28

Hungary

HA4XH 542,295-1147-103-A
HA7TM 130,208- 705- 57-A
HA8WU 79,815- 294- 31-A
HA5HM 5925- 122- 17-A
HA8UB 384,276-1096- 93-B
HA8EK 351,624- 994- 92-B
HA2MN 48,748- 435- 28-B
HA9DU/9 31,720- 162- 14-B
HA9DD 22,649- 180- 39-B
HA6NQ 18,190- 335- 17-B
HA8DU 15,290- 181- 22-B
HA5KDB 12,450- 146- 25-B
HA9LA 9462- 129- 19-H
HA5JK 3576- 93- 12-B
HA2MG 3766- 106- 14-B
HA3PT 1448- 63- 8-B
HA3HE 806- 37- 7-B
HA3NU 756- 40- 7-B
HG6V(6 ops) 2,400,252-3915-139-D
HA5KI(6 ops) 1,055,760-2386-106-D
HA1KSA(6 ops) 351,440-1135- 80-D
HA5KND(6 ops) 308,133-1091- 73-D
HA2KR(6 ops) 284,040- 969- 72-D
HA8KA(4 ops) 266,000- 972- 70-D
HA8KQX(HA8I BY WH,ops) 261,360- 869- 80-D
HA3KNA(6 ops) 152,220- 615- 60-D
HA5KJD(3 ops) 87,124- 518- 46-D
HA1KSL(2 ops) 62,129- 329- 51-D
HA7KLJ(2 ops) 52,299- 340- 39-D
HA9KLE(4 ops) 41,887- 275- 37-D
HA2KMG(2 ops) 27,936- 215- 36-D
HA5KAA(3 ops) 17,765- 257- 19-D

Zone 1

Alaska

AL7Z 387,002-1258- 77-B
KL7AF 237,188- 686- 86-B
KL7HBK 182,354- 642- 73-B

Zone 2

British Columbia

VE7IQ 66,833- 332- 53-A
VE7IN 47,418- 319- 42-A
VE7CMK 554,610-1451-105-B
VE7EFI 27,811- 294- 29-B
VE7CC 1,106,722-2744-113-C
VE7AWT 108,927- 533- 57-C

Zone 3

Manitoba

VE4XK(VE3MHI,VE4s RM VV) 924,880-2468-110-D

Saskatchewan

XJ5AAD 18,354- 291- 21-B

Zone 4

Quebec

VE2FU 414,960-1233- 80-B
VE2DU 465,140-1978- 65-C

Ontario

VE3GCE 129,883- 416- 71-A
VE3FEA 13,760- 108- 32-A
VE3DAP 87,854- 400- 62-B
VE3CXL 21,515- 90- 65-B
VE3DLR 92,728- 339- 67-C
VE3KIK 80,840- 470- 40-C
XL3LON 58,506- 367- 42-C
WA2KGN/VE3 36,324- 253- 36-C

Zone 6

W6

East Bay

K6XO 326,424-1028- 87-A
K6CSL 11,186- 248- 34-A
KF6R 116,171- 526- 59-B
WB6GPT 73,476- 498- 39-B
K6ATV 23,946- 136- 39-B

Los Angeles

AI6Z 94,842- 425- 66-A
KB6RO 84,111- 498- 53-A
K6GO 29,036- 259- 34-A
N6ZZ 151,365- 631- 65-B
KE6B 124,845- 860- 41-B
N6AA 39,852- 158- 54-B
K6SVI 585,342-1708- 93-C
W6CN 184,984- 668- 76-C
W6GNS(WB6RXW,opr) 126,630- 753- 54-C
WA6YCL 3728- 69- 16-C
W6NXB 1080- 40- 9-C

Orange

WA6LFF 52,152- 429- 41-A
AC6H 59,383- 428- 43-B
N6PF 43,624- 140- 76-B
AA6DP 34,308- 275- 36-B
KN6C 17,160- 228- 24-B
KA6DSM 30,874- 221- 43-C
WB6JMS(+WD6EWC) 166,796- 530- 92-D

Santa Barbara

WA6ZYG 99,764- 640- 49-A
WA6VNN 94,563- 475- 57-A
N6MA 68,880- 469- 41-A
AI6B 31,160- 225- 40-A
WB6DNN 20,576- 202- 32-A
K6ELQ 234,396- 871- 68-B
W6MUL 14,448- 71- 48-B
WA6NHB 118,080- 519- 64-C
N6AFI 12,480- 115- 32-C
W6ABI(W2KVA,N6MB,oprs) 460,175-1490- 79-D

San Diego

N6KW 57,456- 335- 48-B
WA6VNR 29,422- 171- 47-B
W6TPC 86,088- 352- 68-C
W6KBD 990- 19- 10-C
W6HOH(K6XT,N6s ND RM, WA6DBC,oprs) 1,766,848-2911-152-D
KA6E(+N6AMD,WB6s BVS TKU,WD6s CZR HCO) 645,072-1968- 89-D

San Francisco

WD6EEQ 520,893-1577- 93-A
WB6SRM 129,480- 665- 65-A
K6LRN 17,550- 139- 45-B
N6QC 48,420- 319- 45-C
WB6VGY 18,612- 181- 36-C

Santa Clara Valley

K6RU 71,346- 383- 47-A
N6NF 38,950- 383- 50-A
WB6DSV 23,200- 210- 29-A
KB6G 154,156- 609- 68-B
KB6TM 26,664- 278- 24-B
W6PRI 294- 21- 7-B
WA6HCI 681,700-1791-100-C
N6QW 162,108- 662- 76-C
W6BJB 22,092- 218- 23-C
KN6K 10,904- 126- 29-C
W6YX(N3ER,AA6s G UO, K6XO,N6IG,W1ARR,W6SZN, WA6ITV,oprs) 1,416,063-3041-121-D

San Joaquin Valley

WB6YKY 130,268- 648- 58-C
WD6FLB 90,644- 396- 62-C

Sacramento Valley

W6SX 337,722-1115- 86-B
N6JM 10,830- 67- 38-B

W7

Arizona

WA7NXL 28,006- 235- 38-A
K6LL/7 832,755-2138-103-B
WA7YUL 13,338- 159- 26-C
K7KH(+WB7PST) 382,522-1193- 89-D

Idaho

K7NHV 777,606-1812-109-B

Montana

W7JYW 238,656-1078- 66-A
K7CPC 45,400- 341- 40-B
N7ANT 5520- 88- 23-B
W7TVN(+N7AMZ) 169,656- 793- 64-D

Nevada

WB7VVH 20,336- 204- 31-C

Oregon

KB7JY 55,484- 305- 57-A
W7YAQ 200,687- 629-101-B
W7TC 115,778- 591- 61-B
K7KJM 59,696- 290- 52-B

Utah

N7IE 3315- 67- 13-B

Washington

W7LUR 4978- 106- 15-A
K7WA 123,234- 516- 69-B
W7BUN 38,816- 327- 32-B
KA7BVZ 9240- 94- 28-B
W7KJ 82000- 77- 25-B
K7RI 1,764,208-2654-121-C
AG7M 947,262-2313-113-C
WA7PVE 91,250- 594- 50-C
WB7RFC 26,715- 235- 39-C
K7RS 6908- 104- 22-C

Wyoming

WA5YTX/7 4200- 66- 20-B
KB7M 2124- 30- 18-C
KA7FYS 288- 16- 8-C

Zone 7

W5

Arkansas

WA5SOG 36,080- 200- 40-A
K5VGB/5 10,496- 104- 32-B
W5EIJ 268- 9- 6-C

Louisiana

K5KLA 281,814- 821- 78-B
W5WG 100,230- 450- 65-B
W5WJB 42,625- 352- 55-B
K5LVZ 45,600- 272- 48-C
N5AMA 9889- 110- 31-C
N5AN(+W5WMU) 1,571,472-3220-144-D
KA5CTZ(+WD5EAE) 84,762- 569- 51-D

Mississippi

K5YPV 31,507- 150- 49-A

New Mexico

K5JW 131,712- 530- 64-A
K5TA 771,498-1636-117-B
WD5IOM(+KA5DIU) 24,948- 373- 22-D

Northern Texas

W5VGX 423,536-1070-103-A
W9PL/5 309,012-1358- 66-A
K5FUV 216,720- 761- 80-A
WB5PIP 146,240- 650- 64-A
WB5KTD 101,916- 590- 57-A
KA5Q 29,601- 287- 33-A
K5NW 569,541-1383-111-B
K5HM 120,384- 628- 72-B
N5AIL 112,293- 443- 63-B
WB5TYQ 89,676- 527- 47-B
WB5PKH 38,016- 319- 36-B
W5QF 31,770- 177- 45-B
AF5K 485,776-1371- 97-C
K2SCU/5 137,232- 648- 72-C
KI5K 107,416- 540- 58-C
KB5UIT 88,087- 470- 59-C
KB5HP 87- 11- 3-C
KB5RH(+N5BET) 259,315-1310- 61-D
WB5PIL(+KA5AVQ) 184,049- 811- 67-D

Oklahoma

AD1S/5 781,942-2057-101-A
N5CG 332,442-1279- 69-A
KØJPX/5 156,128- 514- 82-B
W5KI 98,690- 446- 71-B
W5AS 46,464- 331- 44-B
NØIN/5 6024- 73- 24-B
N5IH 768,509-1919-101-C

Southern Texas

KSTM(K5ZD,opr) 1,367,660-2803-140-A
N5JJ 733,821-1801-111-A
K5KG 601,656-1616-106-A
N5BA 24,548- 236- 34-A
WD8DKJ/5 11,400- 128- 30-A
W5VX 639,058-1764- 98-B
AA5Y(KA5CHW,opr) 588,714-1495-107-B
WA3OVC 160,576- 747- 64-B
W5NR 13,237- 127- 31-B
K5DX 112,380- 566- 60-C
WA5AFG 107,380- 494- 65-C
WA5IYX 71,604- 478- 51-C
KA5HRU 21,681- 275- 27-C
KA5BNU 353- 109- 16-C
W5AC(K5GN,WB5s PYI ZDP, WD5s DLZ FFH,oprs) 1,225,034-2437-142-D
KB5FU(+N5AF,WB5LVL) 205,438-1021- 59-D

W0

Colorado

WBØYMO 30,636- 227- 36-A
ACØS 76,187- 403- 47-B
AAØE 3388- 40- 22-B
KBØKQ 26,988- 256- 39-C

Iowa

WØWP 419,055-1113- 91-A
WDØFGY 26,691- 323- 31-A
WBØNSF 47,752- 296- 47-B
WBØUCP 31,760- 264- 40-B
NØBB 26,772- 177- 46-B
AEØR 19,152- 124- 38-B
WØPPF 65,340- 348- 54-C
WDØEIF 34,787- 199- 43-C
WØEJ(+WBØs PYD ZIN) 673,400-1774-100-D
WBØWOM(+NØPZI) 258,960-1234- 65-D
NØAN(+WDØERH) 221,408- 865- 68-D

Kansas

KØCS 239,704- 800- 76-C

Minnesota

KØBR 70,800- 364- 59-B
AFØQ 36,540- 265- 42-B
KBØC 48,096- 340- 36-C
WBØYMI 20,162- 201- 34-C
WDØAQY 2982- 69- 14-C

Missouri

WDØCPS 56,100- 278- 66-A
NØAOK 601,536-1693- 96-B
WDØAUT 59,627- 280- 57-B
WA3UPH 7531- 151- 17-B
KØVUW 646,680-1589-120-C
ACØN 98,542- 434- 58-C
NØBKH 12,330- 129- 30-C
WAØITU 4199- 100- 13-C
WBØUXI(+ABØs W X,KBØs U X, KCØB,KØs BRO QBV UAA VBU) 693,690-1818- 95-D

Nebraska

WBØSJE 22,626- 294- 27-A
KØGND 88,886- 558- 49-C

North Dakota

KØRJL 34,944- 242- 42-C

South Dakota

NØSD 84,810- 508- 55-C
WAØARZ 39,952- 322- 44-C
WDØEMB(+WDØCXU) 211,380-1128- 60-D

Zone 8

W1

Connecticut

WB1FVQ 149,547- 514- 79-A
WB1ADR 124,740- 708- 54-A
WA1KQX 37,536- 172- 46-A
WIBWS 33,592- 146- 52-A
WB1CRI 3297- 41- 21-A
K1KI 1,036,038-1505-161-B
K1CC 70,850- 321- 50-B
KN1DPS 69,768- 499- 34-B
AK1B 44,536- 278- 38-B
W1CNU 29,896- 195- 37-B
WB1GHK 12,925- 191- 25-B
WA1FCN 9666- 121- 18-B
WIHUE 6- 3- 2-B
W1VH 59,241- 307- 49-C
KING(+WA1TFF) 553,962-1383-102-D
W1OD(+AA2Z,WB2JBA, VE1BXC) 352,640-1062- 79-D

Eastern Massachusetts

W1WLW 167,769- 683- 63-A
WB1DFV 134,850- 572- 62-A
AG1C 71,424- 292- 62-A
W1ZK 46,767- 210- 51-A
WA1YVT 10,125- 98- 27-A
N1EE 56,835- 369- 39-B
WB1ANT 46,848- 317- 48-B
AB1J 11,950- 63- 50-B
WA1KSF 11,487- 121- 21-B
AD1C 8043- 135- 21-B
AA1Q 48,195- 346- 45-C
KA1CXC 9990- 138- 27-C
K1UA(+N1AU) 111,044- 381- 64-D

Maine

K1SA 91,234- 379- 58-A
N1AFC 11,476- 150- 19-A
N1ATN 4223- 61- 14-A
WA1PDG 84,088- 438- 46-B
N1RC 15,776- 206- 29-B
KA1CVM 53,508- 320- 42-C

New Hampshire

W1END 34,768- 158- 53-B
WA1NPZ 60,300- 358- 45-C
WA1RGP 47,520- 286- 44-C

Rhode Island

AF1Q 511,035-1357- 93-A
K1ZRS 18,928- 137- 26-A
WA1KIP 17,622- 255- 22-A
K1JA 193,842- 490- 89-B

Western Massachusetts

AI1S 293,463- 814- 81-B
WB1HIH 56,550- 431- 50-B
N1AOX 5206- 86- 19-C
W1YK(K1s TK UR,oprs) 21,840- 208- 30-D

W2

Eastern New York

W2SZ(N2ALK,opr) 660,894-1628-111-A
WB2THN 43,865- 299- 45-A
N2AZS 17,750- 213- 34-A
K2MN 1488- 28- 12-A
K2QF 79,089- 457- 41-B
WB2XLL 19,008- 150- 27-B
W2GUP 12,272- 184- 16-B
WD5BCK/2 7580- 111- 20-B
KB2MG 81,090- 486- 45-C
WA2RNX 20,664- 170- 36-C
WA2KLV 20,196- 152- 34-C
K2OY(+WA2STM) 429,180-1237- 92-D

Northern New Jersey

AC2U 366,694-1170- 83-A
KC2X 59,015- 310- 59-A
KA2BZS 15,180- 188- 33-A
WA2PQU 12,847- 161- 29-A
K2VX 10,400- 104- 26-A
WB2MCB 9996- 84- 34-A
WB2GZC 2983- 56- 19-A
KA2ACM 61,880- 555- 40-B
AF2L 53,499- 326- 47-B
K3CW/2 6920- 100- 20-B
WB2FGZ 6400- 91- 20-B
K4BNC/2 33,337- 161- 53-C
N2BNC 14,310- 130- 30-C

N.Y.C. - Long Island

N2GC 74,790- 411- 54-A
KA2CWJ 43,720- 339- 40-A
K2SX 71,040- 342- 64-B
WB2ITR 303,924-1010- 76-C
WB2QEU 139,920- 592- 66-C
KA2GNJ 61,245- 405- 45-C
N2ALD 29,855- 327- 36-C
KA2CLQ 29,537- 302- 33-C
KA2CUG 11,774- 144- 24-C
WA2SEL 10,422- 138- 27-C
KA2HIH 4300- 83- 20-C
K2RO 864- 40- 8-C
WB2TCQ(+KA2CIW,WB2RNT) 263,466- 891- 82-D
KA2BYQ(+WA2WBI) 252,822- 925- 87-D

Southern New Jersey

WA2OOS 314,076- 943- 84-A
K2BK 166,085- 695- 58-A
N2CQ 10,647- 126- 21-B
K2HPV 10,440- 121- 24-B
WA2PAT 49,770- 290- 45-C
WB2UAX 10,528- 99- 32-C
KB2OA 6708- 73- 22-C
AE2V(+WB2AOL) 30,100- 267- 35-D

Western New York

W2CXM(WB2SJG,opr) 723,732-1534-123-A
KA2CDJ 15,640- 164- 34-A
W2FTY 170,181- 678- 81-B
W2EUI 54,180- 314- 45-B
WA2RXB 22,678- 202- 29-B
WA2EYA 19,920- 163- 30-B
KA2CGV 13,020- 146- 30-B
WA2ZRK 11,996- 450- 54-C
KB2KN 51,744- 298- 44-C
WA2PHA 42,450- 227- 50-C
WA2SFS 11,550- 115- 30-C
WB2VFC 5038- 63- 22-C

W3

Delaware

WB3GXD 78,948- 420- 54-C
AC3T 11,700- 88- 30-C

Eastern Pennsylvania

W3ARK 179,588- 592- 68-A
KA3AAE 31,283- 257- 41-A
W3EAN 16,530- 117- 30-A
KA3EEX 10,314- 193- 18-A
K3DYX 1632- 26- 16-A
N3RT(N3ATQ,opr) 357,282-1252- 69-B
K3FD 189,428- 642- 71-B
KA3AKY 32,253- 217- 39-B
N3KR 6386- 96- 31-B
W3CEI 1725- 42- 15-B
K3SF 43,740- 321- 38-C
K3ND 34,336- 137- 58-C
K3RH 31,005- 157- 53-C
WA3DMH 13,000- 110- 25-C
WA3YTI 7176- 85- 24-C
W3ETB 1520- 88- 16-C
WB3BGA 378- 25- 6-C
N3AIU(+N3BEJ,WB3KWE) 122,980- 622- 65-D

Maryland - D.C.

WA3VPL 36,056- 341- 51-A
W3ICM 55,400- 308- 50-A
N3RL 36,292- 231- 42-A
N3AXA 6578- 122- 17-B
K3VY 34,787- 225- 43-C
WA3YKR 836- 20- 11-C
W3LPL(WA3UXU,WD4AXM, N4II,oprs) 1,373,043-2199-151-D
K3EST(+WB3JRI,WB4SGV) 1,169,280-2248-140-D
W3FG(+KB3TS) 141,548- 602- 82-D

Western Pennsylvania

WB3AXN 167,902- 740- 67-B
K3GT 18,183- 131- 29-B
W3CV 2945- 33- 14-B
WB3IFT 38,580- 445- 25-C
K3QMR(+WB3s KKX LEC) 316,812-1102- 69-D
W3SGJ(+K3NPX,KA3CNP, KB3IQ,N3AZZ,N3BDV, WA3BVY,WB3FKC,WB3KAF) 62,640- 381- 90-D
KA3BMU(+WB3KMS) 29,543- 178- 39-D

W4

Alabama

N4CCT 144,720- 668- 74-A
K4ZGR 94,968- 431- 65-A
WB4ASV 87,932- 314- 76-A
WD4JXF 44,591- 409- 43-A
WD4PZN 14,840- 103- 40-B

Georgia

AA4GA 199,633- 803- 79-A
W4GTS 7898- 125- 22-A
K4BAI 161,670- 727- 58-B
AA4U 48,972- 311- 44-B
W4GLS 16,224- 116- 39-B
WA4BFA 119,951- 507- 71-C
WD4LRB 63,120- 289- 60-C
WD4PRL 36,613- 323- 41-C
WD4NAE 7035- 75- 21-C
KV4L(+KB4HZ) 501,921-1581- 93-D

Kentucky

WA4QMQ 238,048- 862- 86-A
KC4IZ 356,178-1185- 87-C
WA4KUW 28,476- 200- 36-C

North Carolina

AA4NC 599,862-1546-102-A
N4UH 421,452-1277- 93-C
N4ZC(N5TR,opr) 257,472- 650-108-C
KQ4M 89,250- 424- 51-C
N4AYJ 39,035- 377- 37-C

Northern Florida

KB4CD 133,170- 496- 69-A
N4FY 8700- 135- 20-A
N4CYY 6509- 103- 23-B
WD4PFT 4352- 90- 16-B
KW4T 325,688-1219- 88-C
W4WIJ 22,338- 267- 34-C
N4WW(+AA4NA,K4s EFZ HGU, KB4s BU ZU,KZ4M,N4s EF SA, WA4DRZ,WB4YFF) 1,528,360-2747-152-D
WA4NKA(+N4BLN,WA4ZIL, WB4NIT,KA4s OGQ OQS) 292,000-1267- 80-D

South Carolina

WA4TNI 9920- 102- 31-A
N4ZG 101,530- 538- 55-B
K4FJ/4 55,000- 440- 44-B
KX4H 79,662- 303- 66-C

Southern Florida

N4BP 286,888-1565- 62-A
K4LQ 155,679- 598- 97-A
K4KUZ 44,748- 344- 73-A
WB4TDH 187,204- 683- 68-B
WA4OML 72,855- 389- 45-B
W4KO 17,020- 117- 37-B
KA4MBC 63,327- 349- 57-C
W4LPD 63,327- 349- 57-C
WB3HVS/4 55,182- 407- 51-C
W4LFGI 37,168- 272- 46-C
WB4CKY 8750- 104- 25-C

Tennessee

KA4AHU 4012- 79- 17-A
AA4AK 313,216-1044- 89-B
KA4R 50,196- 274- 47-B
WI4HUT 50,127- 510- 49-C
WB4PHW 4380- 62- 20-C

Virginia

AA4M 332,010- 877- 90-A
WA3NGL/4 179,856- 702- 72-A
K4RDU 62,496- 295- 56-A
K4PQL 608,765-1378-108-B
N4DW 354,420-1221- 90-B
K5OGU/4 176,526- 758- 63-B
W4OLL 72,450- 248- 67-B

K4I PF 16,896- 148- 32-B
AG4D 1344- 148- 7-B
W3YY 279,300-1002- 84-C
WB4PIQ 82,894- 351- 62-C
N4BDM 15,808- 156- 32-C
KG4F(+K4s ITV MLC,KM4Z,
W4RPU,WA4s KYS OGV OHG
QYK,WD4s AGO EKA)
281,856-1030- 74-D

W8

Michigan

AC8Y 383,128-1322- 83-A
WD8ECT 41,480- 313- 40-A
WD8KXN 34,080- 352- 40-A
K8CC 366,201-1007- 99-B
K8SIA 36,462- 156- 59-B
WB8RUQ 2268- 52- 14-B
N8RW 1600- 26- 16-B
N8BKF 63,653- 311- 53-C
K8ZZU 51,376- 262- 52-C
KB8RT 6615- 100- 21-C
K8HSB 1854- 74- 9-C
K8LF(+AA8U,AI8D,K8MJZ,
KA8AEE,KB8UF,KD8B,WB8s
ALP RRC,WD8s BDK DSV SBJ,
oprs) 871,696-2009-112-D
K8OT(+AE8W,K8TU,KA8s ETH
JZV,WD8s JRU RIN)
112,840- 534- 56-D

Ohio

WB8JBM(AA8S,opr)
355,110- 958- 95-A
W8UPH 53,768- 343- 44-A
WD8MOV 42,287- 215- 49-A
W8FN 246,488- 764- 88-B
WB8KKI 207,750- 798- 75-B
WD8LLD 155,868- 688- 62-B
KA8CQI 25,480- 173- 40-B
WB8VPA 166,060- 512- 95-C
WB8ZJY 105,644- 559- 49-C
K8EF 85,400- 417- 56-C
N8ATR 68,172- 367- 52-C
KA8DAN 20,718- 205- 37-C
WD8MCH 22,311- 147- 37-C
WD8DVX 20,520- 160- 38-C
W8DXT 12,900- 136- 30-C
N8BJU 9352- 90- 28-C
KA8HAX 4521- 65- 23-C
WB8MJS 3248- 71- 16-C
K8UFW 600- 25- 8-C
K8AZI(+K8NZ,W8s HSK KIC,
WD8IVL) 980,529-1921 129-D
AC8E(+K8MR,KB8SX,WD8ALG)
661,814-1829- 99-D
K8URE(+WA8EEA,N9AG)
598,728-1404-114-D

W9

Illinois

WD9IIX 395,663-1146- 97-A
WD9DCL 324,858-1124- 87-A
KW9NHY 63,261- 220- 71-A
W9QWM 57,383- 255- 57-A
K9NR 41,355- 291- 45-A
AA9F 2106- 31- 18-A
N9AUZ 175,084- 706- 74-B
W9QA 170,190- 613- 62-B
WD9DBC 109,260- 589- 60-B
K9UQN 46,535- 333- 41-B
KA9EAT 29,268- 296- 38-B
W9REC 3020- 41- 20-B
AK9N 1188- 35- 12-B
KB9OF 143,028- 936- 58-C
KB9AW 45,540- 302- 55-C
WD9HMQ 30,732- 256- 39-C
WD9IRV 28,864- 204- 41-C
N9LE 25,840- 232- 34-C
W9BAH 11,914- 95- 37-C
WD9AEV 3213- 41- 21-C
K9SD(+K9s BGL DZY FD HWU,
K9FU,VE3CDP)
931,672-1936-127-D
K9HDE(+K8KIX,W9TG,WB9s
IWN VJE) 624,438-1506-113-D
AJ9D(+KA9CQM,N9AU) 605,
576,810-1796- 87-D
AA9D(+WD9FBQ)
404,640-1131- 80-D

Indiana

W9MOK(W4JKC,opr)
37,160- 225- 40-A
K9CLO 318,420-1029- 87-C
W9RF 138,805- 504- 71-C
K9JS 31,347- 199- 43-C
N9BNB(+KA9L,N9AYC)
25,000- 237- 40-D

Wisconsin

N9AW 66,352- 451- 52-A
WB9YLR 99,495- 527- 55-B
AJ9K 4365- 61- 15-B
WD9GRI 28,336- 246- 44-C

United Nations Hq.

4U1UN(N2KW,DJ6LV,oprs)
46,764- - 36-D

Zone 9

Maritime - Newfoundland

VO2CW 201,690- 664- 81-A
VE1BNN 91,213- 491- 54-A
VO1CA 8967- 99- 21-A
VE1ANU 109,296- 413- 69-B
VE1AXT 53,508- 312- 42-B
VE3EZU(1 141- 11- 3-B
VE1CCC 179,035- 853- 61-C

Zone 10

Mexico

XE1VV 244,617-1102- 67-A
XE1FN 8280- 172- 15-A

Zone 11

Bahamas

W4YGK/C6A
53,718- 365- 42-B

Haiti

HH2VP(N4XR,opr)
1,029,480-2154-115-B

Dominican Republic

HI8LC 31,413- 239- 37-A

Panama

HP1AC 48,363- 272- 47-B
HP1XRK 713,084-2312- 94-C
HP1GD 24,149- 215- 31-C

St. Lucia

J6LIR 101,400- 788- 40-C

Virgin Islands

NP2AE 39,179- 398- 29-C

Puerto Rico

KP4V 608,760-1596- 95-B
NP4A(+KP4s EHP O,NP4AZ)
2,106,874-3878-154-D

Montserrat

VP2MX 131,600-1049- 40-C

Zone 12

Ecuador

HC2BW 49,364- 242- 41-A

Colombia

HK1AMW 238,260- 724- 66-B

Venezuela

YV4BOU 28,380- 265- 22-B

Zone 13

Brazil

PT7ZMG 58,800- 338- 35-C
PT2ZAE(KA3DYD,opr)
30,712- 280- 22-C

Zone 14

Argentina

LU8DQ 1,634,720-2420-136-B
LU9EIE 4284- 56- 17-B
LU9FAZ 4011- 53- 21-B

Zone 15

Brazil

PY2BZD 65,246- 345- 38-B
PP2ZDD(W2LE,I,opr)
68,953- 265- 53-C
PY1NEZ 66,794- - 26-C
PY1DHN 47,683- 235- 41-C
PY1BKA 1450- 29- 10-C

Zone 18

Norway

LA9HW 143,073- 648- 63-A
LB8CA 51,110- 448- 38-B
LA2Q 4522- 82- 17-B
LA4YW 7880- - 10-B
LA2ZN 10,800- 179- 18-C

Finland

OH3WS/4 54,648- 321- 46-A
OH8PI 714,122-1690-106-B
OH1VR(OH3HC,opr)
616,200-1430-104-B
OH2PM 605,495-1371-109-B
OH6MM 134,100- 592- 60-B
OH6RC 82,198- 309- 73-B
OH9VM 29,543- 277- 31-B
OH7SQ 25,330- 208- 34-B
OH3NM 23,576- 195- 28-B
OH2BVM 13,175- 175- 25-B
OH7NW 12,738- 148- 33-B
OH6DC 11,529- 136- 21-B
OH3KS 10,212- 112- 21-B
OH8LB 7080- 73- 24-B
OH2VZ 6318- 51- 26-B
OH2BUT 5168- 81- 17-B
OH6CS 1911- 104- 7-B
OH7XT 602- 18- 7-B
OH2XK 553- 17- 7-B
OH4MW 9400- 97- 25-C
OH1HX 435- 19- 5-C
OH7XE 75- 7- 5-C
OH1AF(OH1s EH HS HX,
OH7TC,oprs)
512,017-1646- 89-D

Aland Islands

OH1KA/OH0
68,877- 431- 37-A
OH1KB/OH0
30,844- 289- 22-C

Denmark

OZ1CTK 288,880- 846- 80-A
OZ1BLD 17,143- 163- 41-A
OZ1LO 92h,184-2071-104-B
OZ5KU 99,624- 407- 56-B
OZ7BW 80,768- 330- 64-B
OZ1FAO 53,766- 289- 58-B
OZ1PGS 45,696- - 51-B
OZ4HW 45,669- 390- 39-B
OZ5M 29,068- - 24-B
OZ6YJ 28,956- 202- 38-B
OZ1BII 26,670- 200- 35-B
OZ1CCB 17,325- 114- 35-B
OZ1DKG 11,115- - 15-B
OZ5GY 10,824- 119- 22-B
OZ1FXZ 6061- 95- 19-B
OZ2NU 4280- 58- 20-B
OZ3XH/A 3984- 55- 24-B
OZ8E 1298- 32- 11-B
OZ5Ev 778,590-1849- 90-C
OZ2BM 17,120- 102- 40-C
WB3LIF/OZ 3706- 54- 17-C
OZ1T 2320- 35- 16-C
OZ6EI 810- 20- 9-C

Sweden

SM0DJZ 196,295- 602- 83-A
SM6FKF 62,556- 299- 52-A
SM7TV 11,956- 103- 28-A
SM5GMG 168,238- 617- 61-B
SM6HCJ 15,562- 134- 31-B
SM0BDS 12,168- 121- 24-B
SM7CZC 12,104- 82- 34-B

Zone 19

European R.S.F.S.R.

RX1DZ 1,775,472-2916-141-A
UA1ZBP 107,640- 701- 45-B
UA1AGL 71,630- 586- 38-B
UA1ZWW 54,520- 368- 40-B
UA1ZZ 51,240- 394- 35-B
UA1NBD 34,868- 426- 23-B
UA1CAX 140,994- 596- 63-C
RX1DJ 45,936- 461- 29-C
RZ1AET 26,378- 338- 22-C
UK1AAA(UA1s AFN ALA ANA
ARF,UW1AE + 1 opr)
1,742,391-2778-147-D
UK1ZAM(UA1s ZCX ZDW,
oprs) 250,604-1118- 62-D
UK1OAZ(3 oprs)
1770- 53- 10-D

Zone 20

Asiatic R.S.F.S.R.

UA9XAB 115,122- 584- 42-B
UA9KAN 34,423- 261- 29-B
UA9XWU 50,148- 324- 31-C
UK9XAJ 9248- 176- 17-C

Zone 21

Asiatic R.S.F.S.R.

UA9LU 67,408- 326- 44-B

Zone 23

Asiatic R.S.F.S.R.

UA9QWB 188,430- 715- 66-C
UK9QAA(UA9s QBB QDL
QWN,oprs) 450,216-1440- 72-D

Zone 27

France

F6FBQ 72,756- 544- 36-A
F8TM 41,350- 209- 50-B
F6GCP 23,454- 288- 18-B
F9RB 23,165- 135- 41-B
F6DMQ 351,177-1286- 61-C
F6DZU 242,498-1380- 58-C
F8WE 222,215- - 49-C
F6FHA 25,056- 201- 32-C
F6FNA 8257- 91- 23-C

England

G3XTT 55,977- 273- 47-A
G3FXB 1,059,050-1952-118-B
G3ESF 151,280- 694- 62-B
G2VJ 24,090- 106- 33-B
G6NK 14,935- - 23-B
G4JBH 3393- - 13-C

Scotland

GM3RAO 177,331-1208- 49-C

Belgium

ON4FD 339,882-1164- 74-B
OT6FT 329,742- - 63-B
OR6NW 160,440- 695- 56-B
OR4XG 127,456- 563- 56-B
OR5KL 31,050- 286- 25-C

Netherlands

PA0IJM 154,608- 603- 48-A
PA3AIC 93,760- 333- 64-A
PA0INE 68,085- - 51-A
PA0DIN 70,395- 341- 57-B
PA3AGA 53,664- 320- 48-B
PA0UV 31,606- - 39-B
PA0LOU 10,670- 113- 22-B
PA0TA 5814- 71- 18-B
PA3AEB 39,585- 287- 35-C
PA0MIR 8120- 97- 28-C
PA3AMO/A 1520- - 8-C
PA0NRD 728- 32- 7-C

Zone 28

Federal Republic of Germany

DK8NG 435,390- -115-A
DF2RG 14,508- 125- 31-A
DL1RB 40,219- 261- 37-B
DF3QN 27,388- 194- 41-B
DJ4EV 24,576- - 48-B
DL8BAB 19,632- - 24-B
DL1TH 10,064- 123- 17-B
DL7SP 7648- - 16-B
DL1YA 3876- 36- 17-B
DL1AM 304- 8- 8-B
DL8BC 786,670-1716- 97-C
DK8FS 491,475-1389- 75-C
DF9YY 166,528- - 32-C
DF3QL 126,522- 781- 54-C
DF6VE 75,350- 353- 50-C
DF0BV(DL1MAJ,opr)
19,132- 362- 36-C
DF4YG 31,570- - 41-C
DK8AX 19,285- 155- 29-C
DL5BAO 11,258- - 26-C
DF4UT 7656- 106- 24-C
DA1MV 6750- 77- 18-C
DJ6QD 1755- - 13-C
DA2BS(DA1s FN MH QR,
DA2WC,oprs)
60,672- 336- 48-D

Switzerland

HB9DX 46,124- 251- 52-B
HB9AGH 6447- 71- 21-B
HB9ASJ 7686- 124- 21-C

Italy

I1ZYR 39,160- - 44-A
I7PXV 240,942- 913- 78-B

Bulgaria

LZ1EP 19,695- 177- 39-A
LZ1MH 18,942- 293- 33-B
LZ1FJ 7260- 230- 11-B
LZ1NG 4338- 51- 18-B
LZ2AG 295- 27- 5-B
LZ1KDP(3 oprs)
451,176-1486- 88-D
LZ2KRR(LZ2s AF IF)
61,750- 257- 65-D
LZ2KKZ(2 oprs)
14,679- 223- 21-D
LZ1KSP(3 oprs)
11,560- 177- 17-D
LZ2KRZ(2 oprs)
4972- 130- 11-D

Czechoslovakia

OK2BLG 576,180-1287-110-A
OK2YAX 505,680-1212- 98-A
OK1AVD 250,987-1021- 91-A
OK2KR 302,252- 801- 97-A
OK2UAS 264,106-1002- 74-A
OK3CMZ 178,857- 821- 63-A
OK3TMF 105,825- - 51-A
OK2QX 81,192- 289- 68-A
OK1KZ 73,425- 392- 59-A
OK2SWD 26,466- 267- 33-A
OK2ABU 24,187- 355- 19-A
OK2BEI 17,094- - 21-A
OK3EA 6475- 63- 25-A
OK1AZI 3680- 64- 16-A
OK2KVI 3332- 65- 17-A
OK2YN 2080- 50- 10-A
OK2BWH 276,548- 968- 94-B
OK1FCA 220,224- 814- 74-B
OK1AGR 153,270- 519- 78-B
OK1CIJ 101,949- 481- 51-B
OK1DIE 99,288- 432- 56-B
OK2SGW 70,967- 330- 53-B
OK2BCJ 49,664- 218- 32-B
OK1MKU 43,569- 239- 47-B
OK3YCA 39,415- - 45-B
OK3EC 24,416- - 28-B
OK1MWN 20,272- 186- 28-B
OK1MZO 17,528- 174- 28-B
OK1MAA 15,900- 210- 20-B
OK3CWA 12,369- 154- 21-B
OK2PBG 10,488- 93- 24-B
OK2PFL 8398- 122- 19-B
OK3KIC(OK3COO,opr)
8341- 114- 19-B
OK2LN 7650- - 18-B
OK1AHQ 7518- 106- 21-B
OK1AOU 7125- 188- 15-B
OK3IF 5780- 69- 20-B
OK1AIA 5720- 64- 20-B
OK1AKS 5265- 75- 15-B
OK3TAY 4370- - 19-B
OK1DAV 4320- 40- 24-B
OK3CDN 3864- 84- 14-B
OK1OFK 2264- 57- 8-B
OK1DLD 2168- 129- 8-B
OK1JOJ 1864- 67- 8-B
OK1AOR 1350- 54- 8-B
OK1DCL 1320- 62- 8-B
OK3CEL 1253- 77- 7-B
OK3CAU 640- 26- 8-B
OL3AXS 435- 45- 5-B
OL3BBN 420- 42- 5-B
OL3AXZ 320- 32- 5-B
OK2BKR 548,190-1395- 90-C
OK2BPT 115,640- 449- 61-C
OK1DKS 54,468- 278- 51-C
OK2BQL 39,856- 204- 47-C
OK2BSA 20,724- 126- 33-C
OK3YK 20,468- 211- 34-C
OK3KXK 10,584- - 28-C
OK2SP5 8463- 91- 21-C
OK2PEQ 1940- 44- 10-C
OK1KSO(Multiop)
1,416,547-2565-121-D
OK3VSZ(Multiop)
944,000-2088-118-D
OK2KZR(Multiop)
699,562-1652-109-D
OK1KCU(OK1AGN + 2 oprs)
622,350-1694- 90-D
OK1KRQ(OK1s AYQ DLF IWJ,
oprs) 330,330-1185- 78-D
OK2KMR(Multiop)
253,541- 973- 71-D
OK1KTW(Multiop)
138,603- 652- 47-D
OK1KPA(OK1s AFC MHI ZL,
oprs) 111,896- 405- 71-D
OK3KXR(Multiop)
81,266- 471- 53-D
OK3KXC(Multiop)
36,900- 584- 44-D
OK3KYR(Multiop)
78,016- 418- 54-D
OK1KOK(Multiop)
17,867- 107- 49-D
OK1KCF(Multiop)
2424- 53- 12-D
OK2KCC(Multiop)
1842- 32- 13-D

Poland

SR8GWI 82,797- 696- 33-A
SR7AWA 56,712- 332- 51-A
SP5FM 55,880- 246- 55-A
SR9IGY 35,784- 413- 24-A
SP5EEC 11,316- 123- 23-A
SP9JDZ 8640- 93- 20-A
SR9AKD 4230- 49- 18-A
SR9HWN 2112- 44- 16-A
SR5JTF 149,760- 624- 65-B
SR5JTR 130,628- 442- 68-B
SP9BBH 67,176- 308- 54-B
SR6PEB 63,178- 330- 53-B
SP7DTP 54,296- 322- 44-B
SP4PBI 48,316- 306- 47-B
SP9CVY 24,737- 272- 29-B
SR9CAV 20,664- 169- 28-B
SR3HC 18,796- 150- 37-B
SR4BY 10,080- 222- 15-B
SP7AW 6888- 64- 28-B
SP5LGT 5687- 220- 11-B
SP7ENU 3936- 68- 18-B
SP8HXN 2592- 85- 9-B
SP9DH 510- 38- 6-B
SP4GFG 12- 4- 1-B
SR9PRO 96,252- 493- 52-C
SP9PEZ 79,518- 401- 58-C
SP7KTF 17,006- 266- 22-C
SP6IHE 10,479- 107- 21-C
SP1GHW 10,055- 110- 25-C
SR9FLY 8184- 128- 22-C
SP6ECA 7448- 66- 28-C
SP4CLX 6454- 105- 14-C
SP9BLF 4176- 50- 18-C
SP7FQI 2972- 36- 14-C
SP5LHK 840- 30- 8-C
SR9KET(SP9s CXX EPF FKQ
HMF HNB,oprs)
935,064-2010-111-D
SR6PAZ(SP6s DIL DVP FJG
HEK,oprs) 476,109-1279-107-D
SP9KMM(SP9s DUV IJX,oprs)
92,590- 583- 47-D
SP4KKQ(Multiop)
10,906- - 19-D
SP9KAJ(Multiop)
790- 72- 5-D

Greece

SV0AR 84,804- 503- 37-A
SV0AU 20,070- 548- 19-B
SV0BF 11,256- 178- 28-B
SV0BI 234,780- 919- 60-C

German Democratic Republic

Y37UF 175,210- 779- 70-A
Y55ZD 79,704- 415- 54-A
Y23RJ/A 57,145- 334- 55-A
Y47XN 56,212- 344- 46-A
Y31ZE 21,735- 163- 35-A
Y31WI 20,955- 177- 33-A
Y53SA 17,982- 242- 27-A
Y24GE 8820- 90- 30-A
Y22WF 8162- 94- 22-A
Y31OA 5956- 88- 16-A
Y31TM 4655- 57- 19-A
Y32ZF 2595- 55- 15-A
Y59ZF 1090- 28- 10-A
Y62QN 637- 31- 7-A
Y41VG 204- 21- 4-A
Y31ZF 239,232- 736- 89-B
Y51ZE 169,556- 621- 76-B
Y22UB 150,599- 504- 73-B
Y47LN 137,500- 693- 55-B
Y56ZA 128,368- 524- 71-B
Y31XA 120,640- 503- 69-B
Y46XL 41,952- 234- 48-B
Y21XC 26,424- 157- 36-B
Y23CM 25,818- 146- 39-B
Y23UA 20,736- 190- 27-B
Y22JA 19,764- 129- 36-B
Y24EA 7680- 56- 30-B
Y23TL 6820- 91- 22-B
Y23HJ 6028- 72- 22-B
Y26TL 4720- 74- 16-B
Y23JA 2240- 44- 14-B
Y63WI 1441- 43- 11-B
Y23MA 1400- 44- 10-B
Y32WN 963- 33- 9-B
Y45SA 136- 16- 4-B
Y49ZL 39- 3- 3-B
Y24NO/A 131,355- 620- 45-C
Y41ZH 48,150- 272- 32-C
Y27FN 38,212- 289- 41-C
Y54VA 21,070- 161- 35-C
Y56XA 19,652- 184- 34-C
Y38WA 13,856- 124- 32-C
Y38YE 12,768- 118- 28-C
Y39XH 8470- 138- 22-C
Y26HO 6886- 85- 22-C
Y44XF 2926- 71- 14-C
Y24NG 2624- 49- 16-C
Y23HN 1896- 40- 12-C
Y31RN 1235- 31- 13-C
Y76WN 1080- 51- 8-C
Y53WL 39- 5- 3-C
Y342C(Y22s BC HC,Y44s VC
XC,oprs) 292,383- 927- 91-D
Y39ZF(+Y39XP)
286,765- 908- 83-D
Y67ZL(Y26EI,Y67XI,,oprs)
217,840- 830- 80-D
Y39ZA(Y39s PA QA,oprs)
138,480- 846- 60-D
Y35ZK/P(+Y33LK,Y35ITK
YK) 131,841- 674- 57-D
Y36ZH(Y36XH,Y44YH,oprs)
16,576- 193- 32-D

Romania

YO6KEC(YO6EX,opr)
13,770- 164- 27-A
YO4KCC 10,336- 232- 19-A
YO8BSE 8101- 194- 16-A
YO9AGI 5928- 132- 13-A
YO9BGV 57,473- 699- 67-B
YO9AFY 55,842- 774- 52-B
YO3CR 48,778- 203- 58-B
YO6EZ 36,346- 302- 34-B
YO3JG 25,000- 183- 40-B
YO3BYF 4032- 90- 16-B
YO3BAP 3445- 115- 13-B
YO9HP 1078- 54- 7-B
YO3BIZ 385- 31- 5-B
YO7AUU 71,040- 36- 15-C
YO7APM 2580- 60- 15-C
YO4KRC(2 oprs) 80- 22- 2-D

Yugoslavia

YU2OG 447,048-1430- 84-A
YU7AJD(YU7ORS,opr)
77,055- 402- 55-A
YU7OQL 318,432-1013- 93-B
YU7SF 213,831- 900- 69-B
YU4PH 97,584- 565- 48-B
YU5FAM(YU5XRP,opr)
89,411- 500- 53-B
YU1NZW 18,645- 164- 33-B
YU3TCM 17,394- 162- 26-B
YU3TXB 83,421- 713- 39-C

I.T.U. Geneva

4U1ITU(K3KWJ,opr)
980- 23- 10-A

Zone 29

European R.S.F.S.R.

UA6LFX 898,101-1892-111-A
UA3VDS 186,965- 916- 61-A
UK3DCT(UA3DQZ,opr)
148,740- 757- 60-A
RZ3AAH 144,074- 516- 81-A
RZ3AEZ 119,040- 558- 60-A
UA4FCL 88,398- 439- 54-A
UA6AJG 86,286- 317- 73-A
UA3VFI 66,303- 412- 53-A
UA4CM 48,105- 300- 45-A
UA3TCF 41,172- 340- 41-A
UA4FDJ 32,472- 310- 36-A
UA4LM 30,828- 362- 28-A
UA4FDE 23,640- 266- 30-A
UA3DAT 20,700- 288- 25-A
RZ3DFG 15,846- 278- 19-A
UA3TAM 15,500- 259- 25-A
UA6AKT 242- 14- 11-A
RW3HV 812,490-2015-106-B
RZ1AHZ 338,800-1153- 80-B
RZ3AQL 216,611-1085- 67-B
UA3QGO 158,235- 524- 77-B
RZ3AFQ 139,873- 814- 61-B
UA4CK 136,604- 681- 71-B
UA3SBW 126,720- 738- 60-B
UA1QBE 111,048- 805- 62-B
RZ3AGF 105,948- 753- 54-B
RZ3AHF 104,037- 878- 43-B
RZ3ABI 84,778- 428- 46-B
UA3HH 82,810- 628- 49-B
UA3VAO 82,740- 391- 60-B
UA6LAH 68,004- 313- 56-B
UA4NGJ 66,330- 526- 45-B
UA4NED 65,518- 639- 34-B
UW3MW 60,390- 440- 45-B
UA4LAW 50,572- 348- 47-B
UA3ESN 49,842- 396- 39-B
UA4YAB 47,488- 483- 32-B
UA3QGC 46,800- 302- 48-B
UA3QAI 43,218- 322- 48-B
UW6OE 40,552- 392- 37-B
RZ3ACJ 39,524- 274- 38-B
UA3LCC 38,745- 281- 45-B
UA6AJO 37,485- 348- 35-B
UA6LFQ 36,036- 298- 42-B
UA3EY 35,490- 119- 70-B
UA5AAGP 35,454- 391- 43-B
UW3EK 33,642- 259- 42-B
UA4CFC 31,388- 305- 38-B
UA4YBG 29,450- 310- 31-B
UA3QBC 27,616- 255- 32-B
UA1QDB 25,632- 279- 32-B
UA3UAD 24,780- 276- 30-B
UW6MA 24,060- 243- 30-B
UA4CEG 21,360- 302- 30-B

UA4MX 19,642- 264- 23-B
UA3LBE 18,950- 314- 25-B
UA3YAD 18,720- 337- 20-B
UA6ADV 17,706- 270- 32-B
UA3DAL 12,096- 252- 18-B
RV3HD 10,335- 260- 15-B
UA4PAL 3568- 107- 21-B
UA1AUA 7969- 318- 13-B
UA6LLI 7800- 138- 20-B
RX1BC 6048- 130- 16-B
UA3UCP 5914- 271- 12-B
UA6ALV 5136- 145- 12-B
UA4NEP 2268- 159- 9-B
UA1DF 552- 22- 6-B
RX1CS 6- 2- 1-B
UA6LO 233,046- 819- 66-C
UA3QDW 219,164- 838- 68-C
RX1MU 95,680- 572- 46-C
UA3TN 80,388- 383- 63-C
UW3RR 60,741- 365- 51-C
UA4CO 54,802- 296- 53-C
UA6UDB 38,961- 297- 39-C
RX3HR 28,868- 301- 28-C
RW3DH 27,756- 365- 27-C
UA3QBI 19,320- 283- 20-C
UV3CS 14,768- 219- 23-C
UW3DZ 738- 92- 9-C
UK3AAC(UA3s AGX AMW, + 1 opr) 1,477,845-2942-123-D
UK6APA(UA6s APP APH APW ARX,oprs) 1,411,162-2862-118-D
UK4FAV(UA4s FBL FCM FCR + 1 opr) 1,327,000-2573-120-D
UK3DAU(UA3s DJN DKF DRB + 1 opr) 670,135-1765-101-D
UK3ABC(3 oprs) 385,915-1351- 79-D
UK6XAA(6 oprs) 355,023-1388- 81-D
UK3DAH(3 oprs) 314,510-1108- 70-D
UK4LAZ(UA4s LAJ LBQ + 1 opr) 191,142- 858- 74-D
UK4ABW(UA4s ADG AJB, UW4AK,oprs) 181,597- 864- 61-D
UK6ACN(UA6s ACG AFN + 1 opr) 154,280- 876- 58-D
UK3DBG(2 oprs) 102,312- - 42-A
UK3DBV(UA3DPD + 2 oprs) 66,682- 471- 34-D
UK3EAZ/P(UA3ECM + 2 oprs) 33,189- 342- 37-D
UK6PAA(3 oprs) 32,747- 701- 18-D
UK6HCZ(UW6FC,UA6s HJU HKP) 23,687- 273- 29-D
UK3QAX(3 oprs) 20,250- 300- 27-D

Kaliningrad

UA2FCB 89,298- 430- 66-B
UA2FBM 54,650- 316- 50-B
UA2EC 74,307- 360- 51-C

White R.S.S.R.

RZ2ACA 945,969-1692-141-A
RZ2DQ 145,210- 554- 70-A
UC2ACU 230,280-1163- 60-B
UC2WBL 62,606- 473- 46-B
UC2AFI 62,400- 506- 40-B
UC2WBM 19,082- 273- 29-B
UC2QAI 640- 34- 8-B
UC2AFA 86,733- 607- 50-C
UC2AFE 57,984- 505- 38-C
RK2AAB(3oprs) 323,922-1202- 81-D
UK2WAF(3 oprs) 82,300- 477- 50-D
UK2ABI(2 oprs) 2835- 135- 21-D

Lithuania

UP2OM 679,272-1944- 83-A
UP2BCS 46,389- 327- 47-A
UP2NV 1,249,952-2242-134-B
UP2BAR 600,064-1473-106-B
UP2CF 231,064-1008- 68-B
UP2BCW 105,248- 724- 44-B
UP2PAP 53,345- 325- 47-B
UP2BZ 40,774- 399- 37-B
UP2BFE 26,619- 141- 57-B
UP2BDX 18,144- 280- 27-B
UP2DT 4984- 229- 16-B
UP2BF 4508- 151- 14-B
UP2BBF 2844- 52- 18-B
UP2PBM 2532- 111- 12-B
UP2ND 76,776- 482- 42-C
UP2AV 40,131- 372- 39-C
UP2BCD 25,232- 200- 38-C
ET2B(UP2s BAS BAV BAW BBB PCW PX,oprs) 2,977,794-4196-171-D
UK2PCR(UP2s BBX BCR BDF BEG BEY BGF,RP2BE1,oprs) 2,470,360-3655-151-D
UY2P(UP2s BCL BFA,oprs) 1,945,144-3655-134-D
UK2BAS(UP2PAJ + 1 opr) 474,553-1481- 79-D
UK2BBM(2 oprs) 59,832- 732- 36-D
UK2BCO(3 oprs) 19,945- 289- 25-D
UK2BAT(2 oprs) 6809- 326- 11-D
UK2BBQ(2 oprs) 3024- 136- 9-D

Latvia

UQ2GDM 179,872- 635- 88-B
UQ2IF 40,800- 232- 51-B
UQ2QCP 16,700- 203- 34-B
UQ2GAG 14,664- 280- 17-B
UQ2GGS 11,440- 213- 22-B
UQ2QI 9008- 217- 16-B
UQ2GID 4304- 100- 16-B
UQ2AP 100- 5- 4-B
RQ2GGI 644- 35- 7-C
UK2GJL(UQ2GDT + 1 opr) 323,652-1176- 84-D
UK2GBL(UQ2QN + 1 opr) 209,100-1257- 50-D
UK2GDZ(UQ2GBQ + 1 opr) 45,325- 323- 35-D

Estonia

RU2QD 519,338-1550- 97-A
RU2RCU 219,040- 932- 80-A
UR2RSA 237,992-1016- 71-B
RU2RDQ 149,270- 884- 55-B
UR2RKS 63,602- 473- 49-B
RU2CR 21,141- 359- 27-B
UR2RHK 1390- 57- 10-C
RU2DU 1090- 34- 10-C
UK2RDX(UR2RRJ + 4 oprs) 678,720-1710-105-D
RT2O(UR2s AW RER RHR RJR,oprs) 149,379- 888- 91-D

Ukraine

UB5MCS 1,611,124-2863-116-A
UY5OO 804,760-1753-110-A
UB5IIA 305,860-1006- 82-A
UY5YB 135,168- 603- 64-A
UB5HCU 124,824- 492- 67-A
UB5KBF 118,668- 644- 58-A
UB5ECH 107,855- 612- 53-A
UB5QCK 48,950- 316- 55-A
UB5EAX 39,676- 435- 38-A
UB5WAL 36,704- 270- 37-A
UY5WU 36,487- 368- 31-A
UB5ABY 17,440- 276- 26-A
UB5CI 13,856- 129- 32-A
UB5JIM 672,066-1615-112-B
UB5LAY 636,008-1609-107-B
UB5ZAL 447,012-1130-108-B
UB5MFT 156,378- 745- 67-B
UY5TE 88,990- 585- 55-B
UB5EAL 52,108- 391- 52-B
UB5EDM 79,250- 615- 50-B
UB5IAN 65,676- 543- 43-B
UB5QFE 59,755- 395- 45-B
UY5ZI 52,358- 378- 47-B
UB5SBM 47,039- 466- 37-B
R2SUBI 45,144- 268- 38-B
UB5LJD 42,108- 391- 52-B
UB5ZBF 38,850- 277- 42-B
UT5HP 34,956- 346- 36-B
RZ5UDH 30,192- 332- 24-B
UB5HN 29,772- 271- 36-B
UB5CAZ 28,812- 313- 28-B
UB5HEM 27,584- 295- 32-B
UB5QAU 22,828- 256- 26-B
UB5EEP 22,092- 305- 28-B
UB5FFG 21,948- 288- 31-B
UB5QHC 20,688- 284- 24-B
UT5PI 18,316- 271- 19-B
UB5QAH 16,540- 363- 20-B
UB5ZFB 14,079- 279- 19-B
UB5GBF 12,276- 211- 22-B
UB5FBV 9216- 361- 12-B
UB5VK 8441- 109- 23-B
UB5HEK 4563- 96- 13-B
UB5HI 3675- - 15-B
UB5MDI 586,478-1591- 79-C
UB5HDX 108,066- 487- 62-C
UB5ABJ 31,560- 334- 24-C
UB5ABK 29,214- 235- 27-C
UB5MFR 13,550- 188- 25-C
UK5MAF(UB5s MDC MNM MOA MNX MUV,UY5LK,oprs) 1,657,630-2949-130-D
UK5IAZ(5 oprs) 1,206,733-2476-121-D
UK5UDX(UA4LAR,UB5RCA, + 2 oprs) 915,678-1602-107-D
UK5WAA(UB5s WAL WCJ + 1 opr) 292,312-1060- 72-D
UK5DAA(UB5s DBC DCC YK, oprs) 142,496- 728- 61-D
UK5QBE(3 oprs) 117,150- 570- 50-D
UK5JAK(3 oprs) 87,278- 882- 34-D
UK5MCO(3 oprs) 86,853- 596- 51-D
UK5IAI(3 oprs) 73,186- 673- 37-D
UK5ZAC(3 oprs) 60,582- 361- 46-D
UK5DAD(3 oprs) 46,180- 384- 40-D
UK5VAA(2 oprs) 27,828- 294- 36-D
UK5QBK(3 oprs) 21,000- 260- 28-D
UK5QAD(2 oprs) 19,136- 270- 26-D
UK5FAD(3 oprs) 13,104- 158- 24-D

Moldavia

UO5AP 187,120- 811- 80-B
UO5OWC 148,614- 741- 62-B
UO5OBD 29,975- 366- 25-B
UO5OCL 4410- 106- 14-C

Azerbaijan

UD6CN 36,738- 283- 39-B
UD6DKW 15,399- 169- 29-B
UK6DAJ(UD6FA + 2 oprs) 100,932- 699- 52-D

Georgia

UK9XAN/UK6(UA9XS + 2 oprs) 55,440- 374- 44-D

Armenia

UG6GAE 28,314- 297- 26-A

Zone 30

European R.S.F.S.R.

UA4HAU 40,300- 203- 52-A
UA4WWF 38,941- 459- 37-B
UA4HAN 7425- 67- 27-B
UK4WAR(5 oprs) 2,106,566-3165-154-D
UK4WAB(2 oprs) 239,428-1298- 68-D

Kazakh

UL7PBY 178,632- 490- 82-A
UL7TA 19,456- 252- 16-B
UK7OAA(UL7s OAA OAM OE, oprs) 133,950- 804- 57-D

Turkoman

UH8HAI 78,738- 334- 33-A
UH8BAK 15,764- 240- 17-B

Uzbek

UI8BI 264,312- 961- 72-B
UI8ADR 59,232- 434- 32-B
UI8AFA 27,302- 285- 22-B

Tadzhik

UJ8JCQ 46,527- 265- 39-A

Asiatic R.S.F.S.R.

UW9WB 681,560-1378-110-A
UA9AGQ 64,732- 404- 34-A
UA9AED 53,775- 256- 45-A
UA9AKJ 37,740- 260- 30-A
UA9FER 12,906- 160- 18-A
UA9SAX 287,144- 715- 88-B
UA9NN 271,810- 751- 77-B
UA9CGL 97,200- 466- 45-B
UA9CM 73,224- 280- 54-B
UA9AFG 60,025- 359- 35-B
UA9CJU 40,664- 373- 23-B
UA9FGJ 35,104- 225- 32-B
UV9DO 34,936- 290- 24-B
UA9ADE 18,522- 273- 14-B
UA9LBM 18,135- 127- 31-B
UA9CBR 5954- 98- 13-B
UA9LAW 1368- 105- 8-B
UA9SQW 2121- 78- 7-B
UA9SHO 296- 16- 4-B
UA9CBO 90,024- 442- 44-C
UA9CFC 52,632- 260- 43-C
UK9SAY(2 oprs) 233,360- 755- 64-D

Zone 31

Kazakh

UL7QF 343,018-1136- 79-A
UL7BAA 165,400- 760- 50-B
UL7GAV 85,008- 406- 46-B
UL7EAR 55,224- 301- 39-B

Asiatic R.S.F.S.R.

UA9UTF 130,168- 932- 53-A
UA9OCI 332,800-1101- 65-B
UV9PP 330,179-1092- 73-C
UK9YAU(3 oprs) 162,552- 703- 52-D

Zone 32

Mongolia

JT1AN 95,304- 538- 44-C

Asiatic R.S.F.S.R.

UA0SAU 711,180-1899- 90-A
UA0WAS 377,195-1273- 65-B
UA0ACM 338,120- 922- 79-B
UA0AG 174,058- 630- 58-B
UA0SCP 272,993-1257- 59-C
UA0ABK 116,910- 486- 54-C
UK0SBB(2 oprs) 43,396- 278- 38-D

Zone 34

Asiatic R.S.F.S.R.

UA0LEO 139,724- 573- 52-A
UW0LI 109,395- 388- 65-A
UA0CCW 263,662-1016- 74-C

Zone 35

Asiatic R.S.F.S.R.

UK0ZAB(UA0s ZBF ZBW ZCS,oprs) 565,950-1315- 98-D

Zone 36

Canary Islands

EA8JL 12,024- - 24-C

Zone 37

Spain

EA7XQ 283,935-1040- 69-B
EA3AVV 102,438- 486- 54-B
EA2HW 54,225- 368- 45-B
EC2CS 13,972- 250- 14-B
AN2CR 9175- - 29-B
EA3GF 2896- - 16-B
EA3AIN 532,575-1603- 81-C
EA4HD 47,080- 307- 40-C
EA7AFV 25,828- 273- 22-C
EA4SA 11,454- - 23-C
EA7AKN 5838- - 14-C
EA3AYK 3990- 113- 10-C
ED2QI 2912- - 14-C
EA3ARX 564- 30- 6-C
EA7ATE 350- 10- 7-C
ED7DV(+EA7s AJX BGW) 111,769- - 49-D

Ceuta

EA9GT 192,288- - 48-B
EA9JG 175,801-1105- 53-B

Gibraltar

ZB2EO 13,608- - 27-B

Zone 39

Israel

4Z4NUT 161,340-1106- 30-B

Zone 41

Chagos

VQ9DM 384,404-1135- 68-C

Sri Lanka

4S7TK(JA1ELY,opr) 451,422-1265- 93-C

Zone 44

Korea

HM5OC 27,508- 302- 23-B
HM1PW 393,832-1546- 76-C
HL9TZ(WD5FTT,opr) 213,698- 980- 59-C
HM1SN 10,764- 276- 13-C
HM1RF 6709- 271- 7-C

Hong Kong

VS6JR(WA4UAZ,opr) 81,900- 405- 52-B

Zone 45

Japan

JA2YKA(JA4UDP,opr) 503,118- 902-121-A
JA1YAD(JH7SJH,opr) 403,290-1035- 90-A
JH6DOG 269,192- 742- 77-A
JH2FFR 227,503- 615- 83-A
JG3UNB 177,996- 498- 91-A
JG1IGX 139,370- 541- 78-A
JA9SQO 118,473- 479- 91-A
JH7UJN 86,258- 326- 59-A
JA7RPC 80,850- 283- 66-A
JA4ESR 78,650- 302- 55-A
JA3AA 72,027- 301- 53-A
JA6BIF 72,012- 246- 68-A
JH7CUO 66,468- 286- 58-A
JH7AJY 53,470- 259- 55-A
JA9BMS/1 42,030- 321- 30-A
JA1EF 20,100- 104- 50-A
JH7CSU 15,820- 108- 35-A
JA7FMZ 8480- 61- 30-A
JA9CWJ 344,344- 841- 68-B
JG1MM 214,776- 657- 72-B
JA7CUU/1 208,302- 702- 89-B
JA9NFO 127,280- 398- 74-B
JR2IEG 90,381- 405- 47-B
JG3IUA 88,245- 505- 37-B
JA7UFZ 86,020- 361- 55-B
JH7BRG 76,860- 441- 45-B
JH2JEV 67,860- 266- 58-B
JH2GYH 60,536- 400- 62-B
JR3WXA 60,204- 258- 58-B
JH1BCY 58,883- 258- 53-B
JA1OP 44,217- 191- 51-B
JE2KPM 43,364- 251- 37-B
JA3JF 39,960- 163- 54-B
JA1DFQ 33,495- 203- 35-B
JH1MTR 31,248- 137- 48-B
JH1KRX 30,238- 137- 34-B
JH3WKE 21,600- 100- 50-B
JH2ANI 18,144- 111- 36-B
JE1CHJ 15,827- 132- 19-B
JA8DOB 14,476- 110- 28-B
JE1TSD 7231- 55- 29-B
JA9GTM 5530- 48- 29-B
JA2DJN 4590- 56- 17-B
JA4FMA 2240- 34- 14-B
JA1BDI 580- 24- 5-B
JA1DCO 45,954- 372- 27-C
JF1JLW 36,084- 292- 31-C
JA2QUO 35,211- 253- 33-C
JA7FWR 34,540- 144- 55-C
JK1AVR 31,275- 302- 25-C
JH1UUT 30,720- 265- 30-C
JF2PXM 28,080- 285- 26-C
JH9ALB 16,218- 123- 34-C
JA8DIY 15,704- 117- 26-C
JA6EFT 12,984- 117- 24-C
JA6PL 10,632- 101- 24-C
JH7JDB 7291- 86- 23-C
JA2UJK 5780- 119- 10-C
JM1IFB 5130- 93- 18-C
JA4EFL 4807- 84- 19-C
JA9GZ 3818- 43- 18-C
JH4XAE 3604- 50- 17-C
JA9BUN 2210- 28- 17-C
JA1JGP 1980- 30- 14-C
JR4ISK 1204- 35- 12-C
JM1CPA 324- 12- 9-C
JA1AAT 259- 9- 7-C
JK1IQW 90- 6- 5-C
JH1FJK 33- 3- 3-C
JF2LTH 27- 5- 3-C
JA7YAA(JH7s CUO UJN WTC,JR7s OMD SEI,oprs) 2,024-1650- 99-D
JA7YCQ(Multiop) 437,197-1358- 73-D
JA3YKC(JE3MAS,JG3EMB, JI3ANR,JH4AJU,JH4WER, JA5MOU,JR6JNF,oprs) 35,786- 327- 86-D
JA2YEF(JE2LDO,JF2s ACB GNY,JR2UWA,oprs) 346,788-1019- 76-D
JA2YKZ(JA2s IVK MGE SGI, JF2PHW,JH2s AFT BDT,oprs) 183,768- 600- 68-D
JA4YBU(JR4s BVS DKN,oprs) 144,364- 517- 68-D
JA6YAI(JE6s DVH RBJ RNB, JR6GAG,oprs) 26,375- 295- 28-D
JH3YBV(JG3s CUU ESs,oprs) 670- 25- 10-A

Zone 48

Kenya

5Z4YV(JA2KLT,opr) 82,593- 291- 57-A

Zone 49

Thailand

HS1ABD 481,752-1460- 72-B
HS1ALP 51,244- 306- 46-C

Zone 51

Papua New Guinea

P29CH 99,788- - 52-C

Zone 54

Indonesia

YB8ACL 345,809-1160- 61-C
YB2SV/9 192,540- 654- 60-C
YB2CR 192,444- 669- 58-C

Singapore

9V1TL 203,232- 690- 73-B

Zone 56

New Caledonia

FK8CL 134,784- 491- 54-B

Zone 59

Australia

VK2DEW 15,288- 114- 28-A
VK3AEW 137,760- 545- 84-B
VK1GM 4342- 68- 13-C
VK5OU 1222- 20- 13-C
VK2PBU 272- 14- 4-C

Zone 60

New Zealand

ZL1ADI 2,078,964-2698-158-A
ZL1AZV 562,170- 977-117-B

Zone 61

Hawaii

KH6CP 56,644- 250- 49-B
W9VS/KH6 54,309- 260- 43-B
KH6XX(+N6KT,WA8VEF) 5,071,845-5613-183-D

Zone 62

Western Samoa

5W1BZ 83,230- 297- 58-B

Zone 64

Guam

AH2E 955,536-1942-102-A

Mariana Islands

AH0A 293,370- 851- 70-B

Zone 65

Wake Island

KH6GB/KH9 139,893- 561- 51-C

Zone 66

Ascension Island

ZD8TC 150,710- 436- 70-B

Zone 75

Franz Joseph Land

UA1PAL 229,140-1001- 60-B

Check Logs

AC9E,AD7T,AK7J,CX7BF, DA3GE,EA2OP,FK8DO, JA1ATB,JR7DXE,K6VMN, LA7XB,LA8CJ,LZ1HY,LZ1XX, LZ2CC,L72KEF,N4KGI, WN4KKN,opr)N6UW,OH1EC/8, OH1EH,OH7KJ,OK1MAW, OK2BNK,OK2BUJ,OK3CSL, OK3TOA,OM7AM,OZ1JKW, PT2BW,SM5BDV,SM6AYM, SM9FSM,SM9IX,SM9JOQ, SP2AGM,SP2FUA,SP2ZT, SP3IOF,SP4HKN,SP5BR, SP5ENA,SP5IYV,SP7ICE, SR3BY,SR3XR,SR6DMJ, SR7EOA,SR9MSC,SR9LPY, RM3O,RT5BN,RU2RKN, RZ2BF,RZ3ADO,RZ3AHS, RZ5UWG,UA1OAI,UA1OBQ, UA1ODP,UA1TBQ,UA1ZCL, UA3AIF,UA3AMR,UA3BC, UA3DER,UA3DFK,UA3DI V, UA3DLD,UA3IAT,UA3IDT, UA3IYL,UA3MCH,UA3MDX, UA3PBY,UA3PGN,UA3QEB, UA3TBQ,UA3TEW,UA3UCD, UA3VA,UA3VCP,UA3VDE, UA3XBY,UA3ZBZ,UA4CQB, UA4CQF,UA4HFF,UA4HFQ, UA4NAA,UA4NAD,UA4UBM, UA4YAZ,UA6AKB,UA6AKO, UA6ALE,UA6ANS,UA6AUZ, UA6LXZ,UA6YR,UA9ACU, UA9CEM,UA9CIH,UA9CLQ, UA9FCP,UA9MY,UA9NW, UA9OEK,UA9TS,UA9WDM, UA9WDR,UA9ACJ,UA9BBR, UA9NH,UA9SBQ,UB5EF, UB5FAB,UB5MJU,UB5PS, UB5QCP,UB5RAF,UB5TH, UB5UCF,UB5UGF,UB5VAW, UB5WDD,UB5ZBG,UC2ACK, UC2OAJ,UK2BBF,UK2IAK, UK3XAM,UK4CBL,UK5EAQ, UK5FAB,UK6AAF,UK6AAJ, UK6FAB,UK9HCJ,UK9SBH, UL7LAW,UL7TAK,UO6ODN, UQ2GBR,UQ2GDQ,UR2QI, UV3DN,UV3FL,UV3MM,UW3TR, UW3ZU,UW4NI,UW9SG,VE3CEA, W3BOU,Y21CF,Y21DC,Y31DH, Y31HB,Y21HI/A,Y22TD,Y22ZL, Y23BF,Y23KD,Y23MF/A,Y23RO, Y23ZF,Y24XJ,Y25HJ,Y26MH, Y26XM,Y27KO,Y31PA,Y33TA, Y34YF,Y39XO,Y39ZC,Y41ZM, Y43XL,Y44WA,Y44ZK,Y47VM, Y47YM,Y53YF,Y575M,Y59ZA, Y75YL,Y85YL,YO4BII,YV3ANG, YV5HLY,ZL1AGO,OK2-18747, YO3-12261/CS,YO8CEZ

Disqualifications(excess duplicates):

I6NOA,UA6LBC,K9FW(4K9s TUS UWA VFE,KB9OT,N9NO,W9FC)

Public Service

Conducted By Robert J. Halprin,* K1XA

Hams Help in Hot Spots

Monday, November 24, 1980 marked the beginning of nine days of wildland fires in the Southern California area. The loss in acres of watershed was staggering. Six lives were lost and over 350 homes were destroyed with dozens more damaged. Damage figures combined with costs of firefighting efforts exceeds 75 million dollars.

At one time during this period fires raged uncontrolled in San Diego, Riverside, San Bernadino, Orange, Los Angeles, Ventura and Santa Barbara counties. Untold numbers of dedicated Amateur Radio operators provided communications support for police, fire, local government and Red Cross efforts on almost every fire front.

Orange County experienced the longest fire siege and was the scene of the most destructive of the fires in terms of total acreage destroyed. A fire that began in adjacent Riverside County close to last winter's flood-ravaged Lake Elsinore area was quickly whipped by Santa Ana wind conditions exceeding 75 miles per hour into the rugged canyons of southeast Orange County. Much of this area hadn't burned in decades and in a high-wind, low-humidity environment the fire quickly spread into Indian, Holy Jim, Trabuco and Silverado Canyons. A number of structures on ranch land in the mountainous area were destroyed. A juvenile detention camp located in the foothills halfway up Santiago Peak was threatened, and a full evacuation was required within 24 hours of the fire's onset. The exclusive community of Cota de Caza was nearly overrun by the fire, and only the last-ditch valiant efforts of weary firefighters prevented the destruction of numerous million-dollar homes. Cota de Caza, like the Joplin Boys Ranch, required evacuation as did several hundred residents of nearby Modjeska and Silverado Canyons.

As the Orange County Sheriff and Fire Departments began the evacuation of threatened residents, a relocation center was established at El Toro High School, some 10 miles from the fire front. The local chapter of the American Red Cross was mobilized from the nearby city of Santa Ana to assist the evacuees. Based upon practiced procedures and prior disaster experience from throughout Orange County, the Red Cross quickly called on amateur operators from throughout the county to coordinate communications between Red Cross headquarters at El Toro High School and the fire base camp at O'Neil Park. Members of the Amateur Radio Emergency Service from both North and South County responded under the leadership of ECs WA6TLE and WB6JBI. Reliable communications in support of the Red Cross effort were quickly established. Early in the nine-day fight against this raging inferno the Orange County Fire Department, which had relied on Amateur Radio assistance in major past fires, joined in a request for communications for fire-fighting logistical support. The efforts of county hams quickly became a 24-hour-per-day proposition for the duration of the disaster.

It should be noted that EC WA6TLE had, based upon last year's fires and flooding, installed an ARES-dedicated 2-meter repeater (WR6AUM) on Santiago Peak directly above this year's fire filled canyons. When commercial power was disrupted as fire destroyed power lines leading to the mountaintop sight, the repeater remained functional on battery and auxiliary generator power.

The South Orange County Amateur Radio Association repeater W6TIO is situated ideally to serve not only the immediate fire area, but the evacuation center and Red Cross headquarters as well. Just two days before the onset of the fire, the repeater had malfunctioned, requiring its removal from service for repairs. Through the efforts of trustee W6TIO, WA6QCA and Huntington RACES Officer WD6AWP, a makeshift machine was put on the air using two 10-watt transceivers. Less than 48 hours later, their decision to expend the extra effort paid off when the fire broke out. For nine days, the makeshift repeater functioned flawlessly even though it was pressed into almost continuous service.

In addition to handling priority, fire-related traffic, Orange County hams utilized existing traffic nets to enable firefighters from eight different states to send messages home during brief breaks from their duties. In view of the fact that fire fighting continued over the Thanksgiving weekend, this traffic-handling capability was greatly appreciated.

This major fire represents one of the most prolonged, efficient and praised instances of Amateur Radio disaster assistance in the history of Southern California. Credit for this success must be given to the dozens of hams who gave of their time, expertise and equipment. To those hams — men and women, young and old — thousands of firefighters, dozens of public officials and citizens say a sincere thank you. Perhaps the most meaningful expression of thanks came from one Cota de Caza resident whose home was saved owing to the valiant efforts described in this article. That homeowner, like many of his fellow residents, posted a hand-painted sign along the road leading from the fire base camp. It read: "Thank God for the best firemen in the whole world, and the ham operators, too!" — *Jerry Boyd, WA6CUP, Laguna Hills, California*

NATIONAL WEATHER ASSOCIATION RECOGNIZES AMATEUR PUBLIC SERVICE

Ed "Doc" Dougherty, W3WN, of Frederick, Maryland, has been selected by the National Weather Association to receive its 1980 award for the greatest contribution to meteorological operations by an individual who is not a part of the professional meteorological community. The Awards Committee was virtually overwhelmed by the multiple nominations and supporting documentation from the National Weather Service and other public service agency officials citing Doc's half-century record of outstanding leadership and continuous dedicated support to the general forecast and emergency weather operations of the National Weather Service. Doc's efforts were recognized at the NWA's annual meeting in St. Louis in December, as he received the association's Award Plaque. Honorable mention citations go to Art Erickson, AGØB, of Fort Collins, Colorado, and Ted Hummel, W7LFL, of Cheyenne, Wyoming, for their weather observations and emergency communications support during several severe weather outbreaks during 1979 and 1980.

The NWA awards program annually recognizes outstanding services provided to the public by both individuals and organizations through support to operational weather services. This year's recipients join a fast-growing list of Amateur Radio operators and clubs/nets that have been recognized over the past four years for their efforts. The 1981 NWA awards program will be announced in this column in a future issue. — *Bruce Eggers, WA9NEW, Chelmsford, Massachusetts*

PUBLIC SERVICE DIARY

☐ Eureka, California — November 8, 1980. When an earthquake measuring 6.9 on the Richter scale struck the area, hams used WCARS on 7255 kHz and 2 meters to relay damage reports and other information for Red Cross personnel. (WB6IZF, SEC Santa Clara Valley)

☐ Las Vegas, Nevada — November 21, 1980. After a fire broke out at the MGM Grand Hotel (one of the largest hotels in the world), hams used 2 meters to handle health-and-welfare traffic. To this date, 84 people perished in the fire, with hundreds more injured and hospitalized. (K6HIT)

☐ Oklahoma City, Oklahoma — November 26, 1980. When the town's ambulance service (AMCARE) was left without radio communications owing to disrupted telephone service, amateurs were called in to help. Using 2 meters, hams supplied the only means of communication for several hours, until telephone service was restored. (WA5FSN, SCM Oklahoma)

☐ In addition to the groups mentioned previously, amateurs in the following areas assisted their local police departments by conducting a Halloween "Goblin Patrol": Chelsea (Michigan), Hillsboro (Oregon), South Haven (Michigan).

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Mariana Islands — November 22-23, 1980. When Typhoon Dinah was predicted to strike Guam with 100- to 125-mile-per-hour winds, hams relayed weather reports, continually updating storm speed and location. The storm finally veered to the north, hitting Saipan. (KH6ITL, EC Guam)

☐ Big Basin State Park, California — November 17-19, 1980. As a large forest fire threatened to ravage part of the park (which contains some of California's giant redwoods), ARES members volunteered their services. Using 2 meters, hams handled fire-related traffic between district fire headquarters and the disaster sight, while updating weather reports and dispatching vehicles. By 6 A.M. on the 19th, the fire was 75 percent contained. (W6ASH, EC Los Altos)

CONNECTICUT ARES IN MASS-CASUALTY DRILL

The Connecticut Amateur Radio Emergency Service, under the direction of SEC W1SY, was asked to furnish radio communications for the North Central Connecticut Emergency Medical Services (EMS) Council, Inc., for a "mass-casualty exercise" held in Wethersfield, Connecticut, November 13, 1980. The purpose of amateur involvement was to simulate the

*Assistant Communications Manager

EMS uhf communications system that the council will have installed at medical control, area hospitals and ambulances. The "med-radios" will have ten-channel capability in the 450 MHz band. For the purposes of this exercise, only one amateur frequency repeater pair was used.

The Pioneer Valley Repeater Association machine K1FXD, 04/64, with the permission of the PVRA directors, was the assigned primary frequency for this test. In the event of a real emergency, this repeater frequency will be used for primary amateur communications. It is recognized that in the event of an actual emergency, or perhaps in future tests, more than one frequency would be used to effect more efficient use of communications links. The main purpose of the use of one frequency was to provide non-amateurs with one frequency that they could monitor on commercial scanners or receivers, and follow the exercise and the communications from each of the operational points.

Backup communications were provided for on the 220 MHz band, with base station set up at the medical control and portable units at the command post, triage and test coordinator. The WA1RYZ repeater on 224.94/223.34 was used. The 220 MHz band was chosen for (1) technical reasons — to have two transceivers next to each other free of cross interference, and (2) to have communications with main control points for priority and command functions without interfering with the primary net on 2 meters. The 220 MHz band can't be received with commercial scanners or receivers; therefore only command functions (not general listeners) have access to such transmissions.

At the request of the EMS Council communications chief, the initial message from the "scene" to medical control was transmitted on 220 at 1028 local time: "REMCC, this is Wethersfield Fire at the scene of a bleacher collapse in Mitchell School on Prospect Street in Wethersfield. Estimated 15 to 20 injuries."

At 1000 local time, W1SY made the following transmission on 04/64: "This is W1SY . . . this is a test exercise conducted by the North Central Connecticut Emergency Medical Services Council. A standby alert is now issued on this repeater. This is W1SY, clear."

At 1019 local time, the following transmission was made on 04/64: "This is a test exercise. This is W1SY, section emergency coordinator. A directed net is now called. All communications will be carried out at the direction of net control station W1EFW. Only stations with real emergency or real priority traffic should break the net. The purpose of this net is to conduct a test by the North Central Connecticut Emergency Medical Services Council. This is a test exercise. W1SY, clear."

Critique

Amateur operators should be assigned to permanent stations or tasks, with at least one backup operator for each, familiar with station location and equipment. This would speed up response to an actual emergency. It would also be advisable to arrange a meeting of this group to educate them as to the total, overall mission. This type of meeting would give each operator the function and communications associated with each point, with special emphasis on the field operators, i.e., communications officer and loading officer. The location of these two operators vary greatly during the time of the disaster, and they are not always in favorable locations for line-of-sight to the repeater, thereby affecting the transmitted signal. Also, it must be kept in mind that the physical position, particularly the operator with triage, is widely variable. Operators should keep in mind the battery capacity of their rigs; operating time extends much longer than normally experienced, so plan on extra battery packs with chargers/adapters to put into handheld transceivers. Another recommended accessory is a small hearing-aid-type earphone. The high ambient noise level that the operator is exposed to at the disaster site adds to the difficulty of hearing radio commands.

Radio operating locations from the hospital emergency-room areas are not ideal from the antenna aspect. All stations operated very well on a temporary basis; however, it should be noted that there was time to set up antennas in favorable locations because of the preplanning. In an actual emergency, this time would not be available, and there would be a great deal more activity, anxiety and confusion, which would preclude the operator from spending a lot of time setting up antennas.

One area of need for improvement was noted at some hospital locations: the amateur operators had to find the personnel to deliver messages, or find the personnel who knew what the exercise was really about, and familiar with the "emergency plan." It should be understood, though, that our purpose is to furnish communications only. This is what we are trained to do. And to do this most efficiently, the proper hospital staff should be at the communications point to receive messages and answer them if replies are required.

The administrator of the University of Connecticut Medical Center was enthusiastic and extremely helpful in executing the "emergency plan" at this facility. He was impressed with the service furnished by the amateurs and has started the task of ordering components for an outside antenna. The UCONN Health Center will be making a public-relations film on the "emergency plan" at this facility. Plans are being made for filming of the coming spring exercise, including Amateur Radio operations.

On Wednesday, November 19, an informal net was held on 04/64 to critique the exercise. This on-the-air meeting lasted for 50 minutes. Most of the amateurs who took part in the exercise attended this critique, and offered their comments and suggestions. The net was opened to other amateurs who did monitor but did not take part. We did have comments from non-participants and offers of help for the next exercise. The general expression of success was made by all, with comments and constructive criticisms noted in the main text of this report.

I would like to thank the EMS Council for the opportunity to participate in this exercise. It affords us, the Amateur Radio operators, a chance to practice and perfect our skills. — *Bob Warzocha, W1SY*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For November, 28 SEC reports were received, denoting a total ARES membership of 16,342. Sections reporting were Ala, Alta, Ariz, Ark, Colo, Conn, EBay, Ill, Ind, Kans, La, Me, Mich, Minn, Nev, Ohio, Okla, Org, SV, SDgo, SJV, SCV, SFla, Va, Wa, WVa, WMass, Wis.

COMMUNICATIONS SERVICE OF THE MONTH

Although Hurricane Allen is gone, the storm and its resultant path of destruction will long be remembered by many southern Texas residents. Even before the storm headed inland, Amateur Radio operators were preparing for the blow that Mother Nature had in store for their areas.

As the storm's westerly path crossed 24°N and 84°W on August 8, the Louisiana Emergency Net on 7240 kHz was placed on *watch* status by SEC WB5TPG. When a hurricane watch and gale wind warnings were issued for the Louisiana coastline, the net was put into full operation.

In Texas, the state Emergency Operations Center (EOC) in Austin was activated at midnight on the 8th, and was operated continuously until early morning on the 11th. As the storm approached the Texas shore, hams monitored the National Hurricane Net on 14,325 kHz, listening for updated reports.

When Allen finally hit the Texas shore on August 10, normal communications channels were overloaded or nonexistent — the National Weather Service office at Brownsville's airport was left without its landline link with the National Hurricane Center in Miami. WD5CLL and his crew set up a station at the NWS office, and used 14,325 kHz to update information on the storm.

WR5AOZ in Los Fresnos was kept very busy during the emergency, and performed almost flawlessly. WA5YXS, WD5CZI, W5UDR and N5CEY set up stations at the evacuation shelters and maintained communications on 2 meters.

In Weslaco, WD5JLA passed weather bulletins to the news media, while W5DYB and W5SBN used hf and vhf to handle traffic throughout the Rio Grande Valley. WB5FRO was operational on the Navy MARS circuit, relaying bulletin updates as they came out.

WB5URK proved to be a valuable addition to ARES, providing communications for civil defense authorities in the previously shut-in town of Lytord. WA0YNC at the Raymondville hospital took occasional time-outs from her nursing chores to maintain contact on 2 meters.

Across the border in Mexico, XE2AS and XE2ARV in the town of Matamoros maintained contact with WD5CLD in Brownsville on 2 meters and relayed information to the rest of Mexico on 40. XE2NE kept the Mexican population informed, passing bulletins and other weather-related information to the media.

Many amateurs were involved in the operation following the storm, and all deserve credit. To all who put in the extra effort that makes the amateur fraternity what it is, thanks for a job very well done. (W5KR, N5IB and WA5AAO)

REPEATER LOG

According to reports received between November 21 and December 21, the following repeaters and simplex frequencies were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Fire	Public Safety Events	Drills/Alerts	Power Failures	Total
K1FXD							1			1
K1HF							1			1
N1ADE						1				1
WA1RYZ							1			1
WR1ADN					1					1
WR1AGL							1			1
W2VL					11	1	1	1		14
WR2ABM							1			1
WR2ADJ					2		2			4
W3UER			1		2	1	1			5
WA3ZXG	2							2		4
WB3CAJ						2				2
WR3ABM	1									1
W4VGA			1							1
WB4BXM					3					3
WB4TON					1		2	4		7
WR4ALJ							1			1
WR4AMJ				1	2					3
WR4AVE							1			1
WR4AZD					2					2
K5DI					1		2	1		4
K5XY								3		3
WB5RDD					3					3
WR5AFS							1			1
WR5AKZ					3					3
N6BAE						1				1
W6ASH								1		1
W6IYY					4		1	5	1	11
W6PVR				1	1	1	1			4
WB6FUB						1				1
WB6HUK						1				1
WD6CTX						1				1
WR6ACW					1		1			2
WR6AEC		3	1							4
W7IXF								1		1
WA8HOW						1	1			2
WB8UIN						1				1
WR8ADB							1			1
WR8AES							3	1		4
WR8AIL							1			1
W9FUL							1	3		4
WRØACM					5				2	7
Simplex	1			5		1	8	1		16
Total	4	5	8	39	11	3	34	23	3	102

NATIONAL TRAFFIC SYSTEM

Welcome aboard to W1TN, new manager of 1RN/c2, and KB7BI, new manager of PAN/c2, replacing WA1VFI and WBØMTA respectively. RN7/c2 is growing in numbers of check-ins, and traffic is being handled as expeditiously as possible, reports WB7WOW. KH6HIJ and KH6IC received RN6/c4 certificates. Eastern Canada (ECN) has established an outstanding record of representation consistency on CAN/c4. VE3AWE sent in a reminder that Canadian postal codes, which tend to get garbled in NTS, are composed of two groups of three characters, with both letters and numerals. The first group contains two letters and one number, while the second contains two numbers and one letter, e.g., A5B 3D2.

November Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	1053	35.1	.816	94.4	
CAN	30	818	27.3	.454	100.0	
PAN	59	915	15.5	.432	91.1	
Region Nets						
1RN	54	255	4.7	.153	70.0	93.3
2RN	50	332	6.6	.410	64.0	100.0
3RN	30	176	5.9	.304	91.0	96.7
4RN	60	844	14.1	.504	79.3	100.0
RN5	30	351	11.7	.367	91.2	100.0
RN6	87	633	7.3	.293	75.0	93.3
RN7	60	758	12.6	.983	100.0	93.3
8RN	60	256	4.3	.380	68.3	76.7
9RN	58	354	6.1	.276	80.4	100.0
TEN	30	155	5.2	160	69.0	100.0
ECN						100.0
TWN	58	324	5.6	.340	67.0	86.7
TCC						
TCC Eastern	110[1]	750				
TCC Central	83[1]	439				
TCC Pacific	105[1]	396				
Cycle Four						
Area Nets						
EAN	30	2281	76.0	1.841	95.6	
CAN	30	1191	39.7	1.006	100.0	
PAN	30	1308	43.6	1.229	98.9	
Region Nets						
1RN	60	766	12.7	.531	97.0	100.0

2RN	90	892	9.9	.652	98.9	93.3
3RN						93.3
4RN	56	934	16.7	.577	87.1	93.3
RN5	60	753	12.6	.518	94.2	100.0
RN6	60	740	12.3	.465	94.0	98.3
RN7	60	790	13.2	.985	100.0	100.0
8RN	53	504	9.5	.472	81.0	93.3
9RN	60	725	12.1	.559	97.0	100.0
TEN	60	480	8.0	.440	90.0	100.0
ECN	60	295	4.9	.477	87.0	100.0
TWN	60	596	9.9	.390	97.3	98.3
TCC						
TCC Eastern	112[1]	542				
TCC Central	73[1]	459				
TCC Pacific	112[1]	875				
Sections[2]	6846	31,130	4.5			
Summary	8311	54,160	6.5			
Record	7450	50,766	18.4			

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (222): APSN (AB), AENJ, AENJ, AENK, AENM, AENS (AL), APN, ARN, OZK, SCARC (AR), ATEN, HARC, SWN (AZ), NCN, NCTN (CA), CWN, HNN (CO/WY), CN, CPN, NVHFTN, RASON (CT), DEPN, DTN (DE), FAST, FMSN, FMTN, FPON, FPTN, MEN, PEN, QFN, QFNS, SPARC, SWFTN, TPTN (FL), GSN, GSSBN, GTFCN, GTN (GA), I75MN, ICN, TLCN (IA), CD, FARM, IMN (ID/MT), ILN IPL (IL), ICN, IPN, IPON, ITN, IWM, QIN (IN), KPN, KSBN, QKS (KS), 5DARES, 6DARES, BARES, CARTN, KNTN, KPON, KRN, KSN, KTN, KYN, PAWTN (KY), LAN, LRN, LSN, LTN (LA), EM2MN, EMRI, EMRIPN, EMRISS, HHTN, NEEPN, WMARES, WMBC2MN, WMN, WMNN, WMPN, WMTN (MA/RI), MEPN, MMN, MTN (MB), MEPN (MDC), AEN, MPSN, MSN, OXRACES, PTN, SGN (ME), MACS, MITN, MNN, QMN, SEMTN, UPN (MI), MNAMWXN, MSN, MSPN, MSSN (MN), ACE, CMOEN, MON, MOSSBN, NEMOE (MO), APN, NPN (MR/NFLD), CAEN, GSEN, MN, MSBN, MSN, MTN (MS), CMN, CN, CNCTN, CNN, JFK, M2MEN, NCSSBN, PCTN, THEN (NC), DATA (ND), NEMPN, NP2MN, WNEN (NE), GSFM, NHN (NH), JSARS, NJN, NJPN, NJSN, NJVN, OBTTN, UCETN (NJ), NMRRTN, SWN (NM), NSN (NV), CDN, CNYTN, EPN, HVN, NYPON, NYS, OCTEN, SCRN, SDN, STAR, WDN (NY), BARF, BN, BNR, BRTN, COARES, LCNWOARES, O6MN, ONN, OSN, OSSBN, TSRAC, VWCEN (OH), OAN, OFON, OLZ, ONON, OPEN, OTWN, STN (OK), 16/76TN, BSN, JCARES, LBLARES, MPCARES, OREARES, OSN, PDXAARES, PTTN, SOFM (OR), 3DARES, EPA, EPAEPTN, NWPATMTN PFN, PTTN, WPA, WPAPTN, WPATMTN (PA), WQV/UHFARESN (PQ), BR2MN, SCNTN, SCSSBN (SC), RARA, SATN, SPM (SK), TNTSN, TPN, TVHFN (TN), DFW, TSN, TEX (TX), BUN, UCN (UT), VLN, VN, VNTN, VSBN, VSN (VA), EWTN, IETN, NWSSBN, PSTS, WARTS (WA), WINC, WINS (WE/IN), BEN, BWN, NWTN, SBN, WIN, WNN (WI), WVFN, WVN, WVNN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

TCC operations are going well, per the restructured NTS schedule. All operators in TCC are to be congratulated for their fine spirit of teamwork. TCC-Eastern/c4 certificates to W4UQ (19th annual), W2GKZ (13th annual), W8PMJ (10th annual), W3PQ (3rd annual).

1	2	3	4	5
Cycle Two				
TCC Eastern	122	90.2	1532	750
TCC Central	90	92.2	660	439
TCC Pacific	120	87.5	792	396
Summary	332	89.9	2984	1585
Cycle Four				
TCC Eastern	123	91.1	1689	542
TCC Central	90	81.1	865	459
TCC Pacific	120	93.3	1760	875
Summary	333	88.5	4314	1876

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (November) *Cycle Two* — Eastern Area (N2YL, Director) — W1s QYY XX, K1XA, WA1UGJ, K2PL, N2YL, W2s CQB RQ ZOJ, WA2MFV, K3JSZ, N3SJ, WB3GZU, N4AZI, W4JK, WA4CCK, WB4PNY, AF8V, WB8YDZ, VE3s ATU CWA GOL. Central Area (W9JUJ, Director) — W4OGG, WD4HIF, W5KLV, WA5s BHF INJ, WB5s NKC OXE YDD, K5s KJN PE, KA5BSN, W9s JUJ NXG, WB9WGD, WD9IUX. Pacific Area (WØHXB, Acting Director) — W5JOV, KA5DDW, WB6s EIG PVH, K6OE, KM6I, W7s AK DZX VSE, WØs EJD HXB RE, WAØOYI, WBØs FFV LFR MTA, WDØAIT, KØDJ, NØs AGW BFH. *Cycle Four* — Eastern Area (W4SQQ, Director) — W1s KX NJM, K1s BA EIR GN SSH XA, WA1ZAZ, W2s CS FR GKZ MTA RQ, K2NY, WA2s ICB SPL, W3s FAF PQ, K3KW, WB3GZU, W4s JK MEE SQQ UQ, K4s BKX KNP, KB4N, WB4PNY, N4s KB NK, W8PMJ, WB8WTS, K8KMQ, KC8C, VE3s ATU CWA GOL SB. Central Area (W5GHP, Director) — N4MD, W4ZJY, W5s RB SBE, K5s GM RG TL, N5s BB BT RB TC, W9s CXY DND NXG, WB9UYU, WØs AM HI, KØs CW EZ EVH. Pacific Area (KØDJ, Director) — K5MAT, N5NG, W5KH, N6s GW PZ, W6s EOT JXK OA SX VZT, WB6PVH, K7s HLR KSA MC, W7s AK DZX EP GHT LYA VSE, WA7GYQ, KØs BN DJ TER, WØs HXB LQ, WDØAIT, VE7ZK.

Independent Nets (November 1980)

	2	3	4
Amateur Radio Telegraph Society	30	1036	308
Central Gulf Coast Hurricane	30	163	2629
Clearing House	30	231	304
Early Bird	30	964	408
Empire Slow Speed	27	98	395
Hit and Bounce	29	444	553
Hit and Bounce Slow	30	162	373
IMRA	45	628	1547
Mission Trail	30	401	1617
New England Novice	30	106	271
North American SSB Traffic	25	209	223
North Central Phone	25	81	209
Piconet All Day Watch	155	237	2786
West Coast Slow Speed	30	150	406
20-Meter ISSB	25	623	553
75-Meter ISSB	30	601	1057
7290 Traffic	42	825	2763

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll November 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.

794
KA9CPA
264
WB7WOW
172
WA2MVQ
166
WA4PFK
164
WD4COL
163
WB2MCO
161
WB3GZU
156
WD8LRT
149
W7VSE
146
WB2IQJ
145
WDØAIT
140
WD4AWN
139
K9PNG
131
W7LRB
130
W7LNE
W2ZQ
129
W9JUJ
WB4FVV
128
WA1TBY
122
K4SCL
KA8CPS
121
WØOYH
118
AF8V
W5JOV
WA5RVT
117
KB3DT
KB5TC
116
KA4LNA
115
WB7TQF
WB2EAG
114
KCØZ
WA4JDH
113
N2APB
KB2HM
112
AF2L
111
W2ZOJ
110
AA4FG
KA1FE
108
AK1E
K3JSZ
WA4CCK
W6NTN
AG2R
K2VX
WA2SPL
107
W2MTA
WB5TAY
WD8NYN
W2TCA
106
N4ET
WB3FEH
WB2HDU
105
KY4K
W5KLV
WA2MFV
WA3PXA
104
N4AZI
W1EOF
W4NWM
WB6PVH
WD9IUX
KB2KW
W2YJR
WB2ZCM
103
VE3GOL
W7GHT
W9YCV
WA4SRD
WA4STO
WD4HIF
WB2PJU
102
AJ3R
KZ4K
N6AWH
WA3NAZ
WD5JYI
101
N9AUG
WA3WIY
WB1HIH
100
K7GXZ
KA4ASZ
VE3ATU
W7FJZ
99
KB9IT
98
N5TC
VE3GT
WB3CAI
W5DTR
97
KA4GFU
WB1CPF
WD6CSL
W2UEZ
96
N2AET
VE3HTL
WB8JGW
95
K3JL
VE3DPO
VE5AE
W1TN
W4CKS
W4GPL
WA8HGH
WB4WYG
KA6A
94
K4DZM
N4PL
VE3FGU
WB8MTD
KA3T
N2BNB
N7AKX
93
AFØO
KB4OW
KE8X
KN6C
92
KA1CMR
WB8SYA
91
KA8DJZ
WD8RNQ
W2XD
90
KB4OZ
VE5HG
WA4EIC
WB5YDD
WD8KZX
W2BIW
89
K1JHC
WØFT
WØOTF
W4ANK
W6JXK
WA7LCN
WA7MEL
WB5NKC
AA2H
88
KØEZ
N2BXB
WB6QBZ
87
N4AXN
W7LR
W9NXG
WA2KOJ
WB5NKD
86
K4EV
K8OZ
KA1BTU
N5BT
VE1WF
W4JK
W5HMR
85
K1BSO
KA5AVQ
KB5EK
KB5NX
W9DM
WB5JZP
84
K5KV
WA1UGJ
WDØBQG
83
KC4MM
82
K4ZN
W8VPW
WA4QON
WA8DHB
WD4CNQ
81
KB8MX
WØHXB
W6RNL
80
KB3LF
WA4PIZ
WA6LVQ
WD5GKH
79
W5VMY
78
KA7AOB
N7AFZ
WA8PIM
77
KK5B
W5VMP
76
WA3EHD
WA4EYU
WD8KBW
75
AA5J
W5CTZ
WD4CNR
74
KG5L
W6HJJ
WA3DUM
WB5UVX
73
KA1DZV
72
KØJCF
K5TL
W1TM
W6ASH
W9IOH
71
WD8BHE
WA2EQW
70
KØDJ
W4FMN
W4LXB
W9JIJ
WAØTFC
WB5MMI
WB8YRY
69
KB6FC
N8CW
W8GGZ
WB2IDS
WD9BCM
68
AA3B
K7NTG
KCØT
N4BZH
N6RB
VE3KK
WD5EUE
WD9DMV
WD9JAA
WB2PKG
W2CC
67
N3AZT
WA1IOG
WA2ZJP
WA5QFD
WB4TZR
N2CR
66
K4VHT
KA4BBA
N3EE
W4HON
WB1HGQ
WDØCID
WD4JJK
WD5DQR
WD8KFN
WB6BZZ
WB2RMJ/T
65
AG9G
KA9IHR
KB6OT
KF4U
WB9WGD
WD8DYW
WD9DVA
64
K9BVE
N6GW
VE3BVG
WA3WQP
WA8GMT
WB7OEX
WDØCGM
KA1KP
KA4FDX
N6ANL
KF2T
63
VE3DUK
W8UE
WA2HSB
KA2GQQ
62
K8DTG
N5CEK
W4NQL
WB1DXR
WB2OWO
WB8ZNS
WB9JSR
WA2CUW
61
K4VHC
K5DY
WA4ZPZ
WA2MIF
60
K6INK
KB2GT
VE5WM
WØOUD
W9IEM
WD8QMP
N2BDW
55
KA1CGP/T
WD8PMW/T
53
KA7CSP/T
52
W1EGE/T
WA2WUL/T
50
WD4SIH/T
47
KA9GBE/T
WB1EZT/T
43
KA4IKH/N
WD4JTO/N
42
N5AVV/T

Brass Pounders League November 1980

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	670	1109	1492	66	3337
WØWYX	55	953	353	600	1961
KA9CPA	45	914	207	740	1906
NØBQP	0	1031	374	450	1855
WAØHJZ	30	737	18	425	1210
WB7WOW	166	252	534	158	1110
WA4JDH	4	521	494	3	1022
W9JUJ	1	476	473	3	952
W7DZX	24	417	404	3	848
WD4AWN	3	382	421	19	846
WB4PNY	2	416	413	8	839
WB3GZU	52	355	356	60	823
W5SHN	246	108	435	21	810
W7VSE	9	363	303	48	723
WA4PFK	126	264	261	71	722
W3VR	269	131	294	7	701
KØONK	4	559	112	17	692
W4SIZ	15	323	326	18	683
W5KLV	2	321	325	25	673
WA1TBY	38	308	283	32	661
WB7TQF	62	267	286	46	661
WØBMA	138	186	266	58	648
N4PL	45	246	292	35	618
WD4HIF	3	295	300	12	610
W4OWD	391	26	158	17	592
K4SCL	3	308	267	11	589
WAØAUX	56	235	295	0	586
WB4FVV	6	307	234	23	570
WA4CCK	1	297	261	5	564
K4TH	9	243	171	128	551
AA4FG	225	45	258	21	549
W6JXK	27	261	253	8	549
WB6PVH	5	257	267	20	549
VE3ATU	2	257	254	3	516
WB5YDD	7	248	223	36	516
K3JSZ	13	238	248	12	511
WB6EIG	24	240	233	7	504
KA9CPA (Oct.)	54	898	125	706	1783

BPL for 100 or more originations plus deliveries:

WD4IIO	230	K5OWK	116
WA2MVQ	148	WD4COL	109
AB4J	139	WA4CRI	108
WB3CAI	132	WB6QBZ	108
W7LRB	132	K7NTS	108
WB4EXA	130	KA8CPS	104
		KA4EQW	101

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

Accommodation, Acquiescence or Anarchy?

Wherein we examine the philosophy, held by some hams, that "this band is mine; God gave this band to me."

Of all the phrases that are irritating to hear, the chief candidate at this QTH is, "The frequency is in use, OM." After finally finding a clear channel (after having queried two or three times, "Is this frequency in use" and getting a reply, "Yes it is, OM, and thanks for asking"), it is really provoking to hear a voice, heavy with venom, come on, stating, "The *fre*quency *is* in use!"

Memory Lane No Help

Stifling the retort, "You're danged right it is; I'm using it," is not always easy. Surely, somewhere between total anarchy (strongest signal may win — but not always) and being pushed all over the spectrum, there must be some happy ground. I suppose I suffer the curse of remembering when 40 was a cw-only band, and there, or even on 75/80, when you called CQ, you were well advised to start cranking the bandspread. In those days most fellows were rockbound, and you might be working each other over separations of up to 150 kcs — oops, kHz — or more.

Spectrum space then was heavily populated only after nightfall, even during contests. We've come a long way, true, but there are surely many more of us now than in the post-World War II days and beforehand. Even with the higher selectivities, ssb vs. a-m, super filters and super stabilities, we are just going to have these ethereal fender-benders now and then. The presence of strong nonamateur emissions within our assigned bands effectively reduces our spectrum space, too.

What to Do?

What I propose to do with this little piece is not so much to separate the flyspecks from the pepper in the much seasoned signal environment, but rather to address the amateur fraternity with a refresher about ownership of the amateur frequencies — despite a comfortable residency by individuals, cliques and formal nets. When this information is read and digested, perhaps those who are so quick to proclaim proprietary rights may become somewhat more charitable.

And this is no ill-conceived or malicious attack on anyone. In fact, I will mention mythical examples, but anyone active in Amateur Radio probably can draw the appropriate parallels. Still, that is not the point — this is no match-'em-up quiz. It is a sincere attempt to influence the fraternity's thinking to the extent that accommodation, not anarchy or complete acquiescence, may prevail, so that all of us may enjoy our hobby. No one likes to get his blood pressure up when he only wanted to have a nice QSO.

In my desire to be fair, I hope I have included all the main categories, but failure to mention any category does not mean I am protecting it; it will have been a pure oversight and unfortunate omission.

To emphasize where it is I am going with this, I make this paragraph say it as succinctly as I know how: *No frequency on any ham band "belongs" to any amateur, individually or collectively, no matter whether he/they have been using it virtually exclusively for umpteen years. No frequencies are assigned. All frequencies are theoretically available to any properly licensed amateur.* Accepting this simple truth, will display the kind of admirable maturity that we need in today's ham operations.

I have, in fact, summarized my frustration, in just those words, on more than one occasion, when I have been particularly taken aback at the type of remark, together with the tone of voice in which it was delivered, telling me, in effect, that I am a lowly transgressor on *his* frequency. (All together now, to the tune of "Exodus": "This band is mine; God gave this spot to me.") To my delight, on at least one memorable occasion, a disembodied third voice came up with an "Amen, brother." A kindred, if unidentified, soul out there, who adds his support to the nonexclusivity principle.

But, W1AW? But . . .?

Now that we all have agreed (didn't we?) that all the frequencies belong to all the amateurs, only licensing privileges affording any distinctions, then we must begin to compromise. First, reality number one: No one can use the frequencies when the band is dead, except for such techniques as backscatter or ground wave.

Then, since radio waves are notoriously oblivious to borders of nations, we find atmospheric sounders, "woodpeckers," and a glut of megawatt propaganda broadcasts and other powerful radio services encroaching into parts of our bands. We cannot compete with these, for the desired (and usually weak) signal is stifled if it is on or near the offending signal. So here is reality number two: We cannot use that frequency, either.

Because it is probably universally agreed that the code practice transmissions and other informational offerings of W1AW are to the best interests of amateurs in general, we recognize that a clear frequency is desirable for W1AW during its scheduled broadcasts. So right away, we have conceded that, yes, W1AW's scheduled transmissions should have a priority use of the frequency. At the same time, though, this is a convention, a gentlemanly accommodation. In fact, W1AW has no special legal right to any frequency, no more than I do, or you.

This brings to mind several other necessary "gentlemen's agreements," such as repeater frequency coordination, DX windows and specialized communications frequencies, all of which are recognized as contributing to the harmonious co-existence of conflicting modes/operating conditions. These all serve to actually reduce the usable spectrum space for general usage.

The Nets, Oh the Nets

Now we come to a telephone-book-sized list of nets. Without meaning actually to name any of them, typical names might be The Grandpappy Net, The Panther's Ear Net, The Ancient Mariner Net, and the various emergency nets. Then there are the less formal aggregations of old retired western onion growers' net, good ole noo yawk-to-flahridah transplant net, etc.

And there is not a darn thing wrong with any or all of these nets. The fact is, they need a place to meet, too, and within the limitations of their licenses, should be accommodated within the ham band they choose. The problems occur when a feeling of ownership of a frequency surfaces.

How do we resolve such a thing? Surely, if we establish a deservedness index, on a scale of 1 to 10, if W1AW is an 8 or so, then most of the types of nets mentioned above are probably a 4 or less. But whatever the actual rating, they should have none superior to the individual ham who is pursuing his hobby. Yet we hear, time and again, scoldings and snide remarks and downright exchanges of insults over the use of the frequency.

Is Anyone "More Equal"?

I suppose that, by now, I am getting to be an "old timer," one of the few dubious rewards of longevity. I do not consider my own long-time-ham status, or the fact of holding an Extra Class, any kind of lever. There should be no such levers — yet, I have also heard harangues based on, "We've had this frequency since 1776" or, "You punk, what is your class of license?" and similar irrelevant and irreverent remarks.

A notorious example of poor hamsmanship occurred a few years ago when a Florida ham was playing recordings of nonsense and other frivolous information. When called to task for it, he haughtily began his rebuttal with, "I am an Extra Class, I am breaking no laws, and I can do what I want and I will not stop."

Sounds a little like the "freedom of speech/shouting 'fire' in a crowded theater" argument, doesn't it? Well, I hope my own premise does not sound like anything but pure logic and fairness. I will not further beat on this horse, but will reiterate the purpose I mean to address. I address every clique, formal or informal net and pompous individual, to reiterate: *No one owns any particular frequency in the ham bands. No frequency is assigned by the FCC to any amateur or aggregation of amateurs.*

Having said this, I want all hams to know they have the right to operate on frequencies for which their license is valid; and that every ham should recognize it. With politeness and accommodation the rule of the day, we may better enjoy our wonderful hobby.

"Is the frequency in use?" — *A. W. Edwards, K5CN*

*Communications Manager, ARRL

SCM ELECTION NOTICE

To all ARRL members in the Alberta, Nevada, Rhode Island, Northern New Jersey, San Joaquin Valley, Utah, Maryland-D.C. and New Hampshire 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 St., 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, March 6, 1981.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on April 1, 1981, and returns counted May 19, 1981. SCMs elected as a result of the above procedures will take office July 1, 1981.

If only one valid petition is received for a section, that nominee shall be declared elected, without opposition, for a two-year term beginning July 1, 1981.

If no petitions are received for a section by the specified closing date, such section will be resolicited in July *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 Solicitations

Since no petitions were received for the Nebraska section as a result of notices in the July and August *QST*, nominating petitions for this section are herewith resolicited. See the above notice for details on how to nominate.

SCM Appointments

In the Colorado Section, Lawrence E. Steimel, WØACD, has been appointed to complete the term (until September 30, 1981) of Robert W. Poirier, kØDJ (resigned).

In the Virginia Section, Byron C. "Luck" Hurder, WA4STO, has been appointed to complete the term (until March 31, 1982) of Richard L. Genter, K4BKX (resigned).

SCM Election Results

The following were elected for a two-year term of office* beginning April 1, 1981:

Uncontested

Iowa	Robert McCaffrey, KØCY
Kentucky	David Vest, KZ4G
Mississippi	Paul Kemp, WB5SNB
Montana	L. C. "Les" Belyea, N7AIK
*North Dakota	Lois A. Jorgensen, WAØRWM
*West Indies	Julio Negroni, KP4CV

*18-month term because of resolicitation

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 90. A W1AW schedule also is available on request from ARRL headquarters. Please enclose an s.a.s.e. See the "Contest Corral" section of *QST* for times and dates of W1AW Code Proficiency Runs.

OSCAR Operating Schedule

Date (UTC)	OSCAR 7 Orbit No.	Time (UTC) Hr Mn	Eqx W. Long. (Degrees)	OSCAR 8 Orbit No.	Mode	Time UTC Hr Mn	Eqx W. Long. (Degrees)
1 Feb.	28,430	0049	88.6	14,834	J	0005	58.7
2 Feb.	28,443	0143	102.2	14,848	A	0010	59.9
3 Feb.	28,455	0043	87.0	14,862	A + J	0014	61.1
4 Feb.	28,468	0137	100.6	14,876	X	0019	62.3
5 Feb.	28,480	0036	85.5	14,890	A	0024	63.6
6 Feb.	28,493	0130	99.0	14,904	A + J	0029	64.8
7 Feb.	28,505	0030	83.9	14,918	J	0033	66.0
8 Feb.	28,518	0124	97.5	14,932	J	0038	67.2
9 Feb.	28,530	0023	82.3	14,946	A	0043	68.4
10 Feb.	28,543	0117	95.9	14,960	A + J	0048	69.6
11 Feb.	28,555	0017	80.8	14,974	X	0052	70.8
12 Feb.	28,568	0111	94.3	14,988	A	0057	72.0
13 Feb.	28,580	0010	79.2	15,002	A + J	0102	73.3
14 Feb.	28,593	0104	92.8	15,016	J	0107	74.5
15 Feb.	28,605	0004	77.6	15,030	J	0111	75.7
16 Feb.	28,618	0058	91.2	15,044	A	0116	76.9
17 Feb.	28,631	0152	104.8	15,058	A + J	0121	78.1
18 Feb.	28,643	0052	89.6	15,072	X	0125	79.3
19 Feb.	28,656	0146	103.2	15,086	A	0130	80.5
20 Feb.	28,668	0045	88.1	15,100	A + J	0135	81.7
21 Feb.	28,681	0139	101.7	15,114	J	0140	83.0
22 Feb.	28,693	0039	86.5	15,127	J	0001	58.4
23 Feb.	28,706	0133	100.1	15,141	A	0006	59.6
24 Feb.	28,718	0032	84.9	15,155	A + J	0011	60.8
25 Feb.	28,731	0126	98.5	15,169	X	0015	62.0
26 Feb.	28,743	0026	83.4	15,183	A	0020	63.2
27 Feb.	28,756	0120	97.0	15,197	A + J	0025	64.4
28 Feb.	28,768	0019	81.8	15,211	J	0030	65.6
1 Mar.	28,781	0114	95.4	15,225	J	0034	66.9
2 Mar.	28,793	0013	80.2	15,239	A	0039	68.1
3 Mar.	28,806	0107	93.8	15,253	A + J	0044	69.3
4 Mar.	28,818	0006	78.7	15,267	X	0049	70.5
5 Mar.	28,831	0101	92.3	15,281	A	0053	71.7
6 Mar.	28,844	0155	105.8	15,295	A + J	0058	72.9
7 Mar.	28,856	0054	90.7	15,309	J	0103	74.1

Orbit predictions by Project OSCAR, P. O. Box 1136, Los Altos, CA 94022. To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW, AMSAT bulletins transmitted around 29.490 MHz on Mode A, 145.960 MHz on Mode B, and 435.160 Mode J, during O 7 and O 8 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz lsb); international net at 1800 UTC Sundays on 14,280 kHz usb and 1900 UTC Sundays on 21,280 kHz).

O 7 progresses an average of 28.7373° W. per orbit in a period of 114.9416 minutes.
O 8 progresses an average of 25.8009° W. in a period of 103.1953 minutes

O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesday and Friday — Mode A + J. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D. Mode A + J is simultaneous operation of both transponders.

Spacecraft Frequencies

Spacecraft	Uplink	Downlink	Beacon
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz

Formulas for calculating approximate downlink frequencies. x = downlink frequency.

OSCAR 7

Mode A: x = uplink frequency − 116.450 MHz ± Doppler shift
Mode B: x = uplink frequency − 578.100 MHz ± Doppler shift

OSCAR 8

Mode A: x = uplink frequency − 116.458 MHz ± Doppler shift
Mode J: x = uplink frequency − 581.106 MHz ± Doppler shift

Note: A minus sign in front of the downlink frequency indicates that the passband of the satellite is inverted in that mode. This means that signals transmitted up to the satellite at the low end of the uplink passband will appear at the high end of the downlink passband.

Additionally, upper-sideband signals transmitted on the uplink will appear as lower-sideband signals on the downlink.

Mode J Club

Become a member of the Mode J Club. Complete eight Mode-J contacts. QSL cards are not required. Just list the call sign of each station worked, date, orbit number and station equipment used. Send this information along with $3 in U.S. funds, a one-time charge to cover the certificate and newsletter costs, to Mode J Club, c/o Larry Roberts, W9MXC, 3300 Fernwood, Alton, IL 62002.

OSCAR 8 QSL

To receive an OSCAR 8 QSL card, send a copy of the telemetry from the 29.402- or 435.095-MHz beacons. Please send your report, along with an s.a.s.e., to ARRL hq.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1KI

FEBRUARY

Jan. 31-Feb. 8

ARRL Novice Roundup, Jan. *QST*, page 80.

4

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z Feb. 5 (9 P.M. PST Feb. 4). Frequencies are approximately 3590/7090. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large, self-addressed envelope will help expedite your award/endorsement. The complete W1AW schedule appears on page 90 of Oct. *QST*, or is available for an s.a.s.e. to ARRL.

7-8

CWSP International DX Competition, Jan. *QST*, page 90.

7 MHz Contest, Jan. *QST*, page 90.

North American Sprint, Jan. *QST*, page 90.

Two-Land QSO Party, Jan. *QST*, page 90.

New Hampshire QSO Party, Jan. *QST*, page 90.

Vermont QSO Party, Jan. *QST*, page 90.

10

W1AW Qualifying Run, 10-35 wpm at 0300Z Feb. 11 (10 P.M. EST Feb. 10). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. See Feb. 4 listing for more details.

14

ARRL Frequency Measuring Test, Jan. *QST*, page 90.

14-15

YU DX WW Contest, sponsored by Savez Radio-Amatera Jugoslavije, from 2100Z Feb. 14 until 2100Z Feb. 15, cw only, 3.5 and 7 MHz only. Single and multioperator categories. Suggested frequencies 3520 to 3590 and 7010 to 7040 kHz. Exchange signal report and serial number. Count 5 points per YU QSO (10 points on 3.5 MHz), 2 points for other DX QSOs (5 points on 3.5 MHz), and 1 point for QSOs on your own continent (2 points on 3.5 MHz). Multiplier is the number of DXCC countries plus YU prefixes worked per band. Single-operator stations can only change bands every 30 minutes, multioperator stations every 10 minutes (except for a new multiplier, which can be worked anytime). Mail entry by March 15, 1981 to Savez Radio-Amatera Jugoslavije, YUDXC, Box 48, 11001 Beograd, Yugoslavia.

PACC Contest, sponsored by VERON, from 1400Z Feb. 14 until 1700Z Feb. 15, cw and phone, 160 through 10 meters. Work PA-PE-PI stations. Single- and multioperator categories. Exchange signal report and serial number. Dutch stations will send signal report and province (GR FR DR GD UT OV YP NH ZH ZL NB LB). Work stations once per band, regardless of mode. Count one point per QSO, multiply by sum of provinces worked per band for final score. Mail entry by March 30 to PACC-Contest, F. T. Oosthoek, PAØINA, Box 521, 4330 AM Middelburg, The Netherlands.

YL-OM Contest, sponsored by YL Radio League, from 1800Z Feb. 14 until 1800Z Feb. 15, phone only (cw on Feb. 28 - Mar. 1). YLs work OMs only and vice versa. No net or repeater QSOs, work stations once only. Exchange signal report, serial number and ARRL section (or country). Count one point per QSO. Multiply QSO points by total number of ARRL sections plus DXCC countries worked. Multiply by 1.25 if input power is less than 150 W dc or 300 W PEP. Mail entry by March 16 (must be received by April 6) to YLRL VP Key Hyman, WAØWOF, RR 2, Garnett, KS 66032.

21-22

ARRL International DX Contest, cw, Dec. *QST*, page 92.

*Assistant Communications Manager, ARRL

25

W1AW Qualifying Run, 10-35 wpm at 2100Z (4 P.M. EST). See Feb. 10 listing for more details.

MARCH

Feb. 28-Mar. 1

CQ 160 Meter Contest, phone, Jan. *QST*, page 90.

French Contest, phone, Jan. *QST*, page 90.

7 MHz Contest, cw, Jan. *QST*, page 90.

YL-OM Contest, cw, see Feb. 14-15 listing.

Nebraska QSO Party, from 0000Z to 2400Z March 1. Exchange signal report and QTH. Count one point per QSO. Separate phone and cw categories (or enter both). Entries should be sent to Reynolds Davis, KØGND, 3437 Anaheim Dr., Lincoln, NE 68506.

3

West Coast Qualifying Run, 0500Z March 4 (9 P.M. PST March 3). See Feb. 4 listing for more details.

7-8

ARRL International DX Contest, phone, Dec. *QST*, page 92.

11

W1AW Qualifying Run, 10-35 wpm at 0300Z March 12. See Feb. 10 listing for more details.

14-15

South Carolina QSO Party, sponsored by the Colleton County Contesters, from 1700Z March 14 until 0500Z March 15 and 1500Z to 2400 March 15. Exchange signal report and county (SC only) or state/province/country. SC stations count 2 points per QSO (SC Novice/Techs count 5 points per QSO). Others count 2 points per SC QSO, except 5 for SC Novice/Tech QSOs. SC stations multiply QSO points by sum of SC counties, states, provinces, countries worked; others multiply QSO points by SC counties for final score. Suggested frequencies: cw — 1810 and 50 kHz from low end; phone — 3900 7260 14,300 21,360 28,600 50,110 144.2 simplex; Novice — 3710 7110 21,120 28,110. Send a large s.a.s.e. for results. Mail entry by April 18 to Colleton County Contesters, c/o Elliott Farrell, WA4YUU, Box 994, Walterboro, SC 29488.

Virginia QSO Party, sponsored by the Sterling Park ARC, from 1800Z March 14 until 0200Z March 15, 160 to 10 meters. Exchange signal report, serial number and county (VA only). Count 1 point per QSO. VA stations multiply by total of VA counties, states, provinces and countries worked. Others multiply by number of VA counties worked. Suggested frequencies: cw — 60 kHz from low end and Novice bands; phone — 3930 7230 21,375 28,575. Send s.a.s.e. for results. Logs must be received by April 15. Send to Virginia QSO Party, Box 599, Sterling, VA 22170.

21-22

Bermuda QSO Party
BARTG RTTY Contest
Tennessee QSO Party

26

W1AW Qualifying Run

28-29

CQ WPX Contest, phone
Spring VHF QSO Party
YL ISSB QSO Party, cw

APRIL

4-5
ARRL Open CD Party, phone
SP DX Contest, cw
VS6 Activity Days
Wisconsin QSO Party

8-9
DX-YL to NA-YL QSO Party, cw

11-12
ARRL Open CD Party, cw
ARRL EME Contest, Part I
Gagarin Cup Contest (USSR)

15-16
DX-YL to NA-YL QSO Party, phone

18-19
SP DX Contest, phone
QRP ARC QSO Party

25-26
Helvetia (HB9) Contest
Trophy H. M. King of Spain Contest

MAY

9-10
ARRL EME Contest, Part II

JUNE

13-14
ARRL VHF Contest

27-28
ARRL Field Day

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received, for each QSO claimed for the contest credit.

2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.

3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.

4) Your log should be checked carefully for duplicate QSOs and, if more than 200 QSOs are made, dupe sheets should be included with your entry.

5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.

6) Avoid standard net frequencies.

7) International contests generally offer awards to top scorers from each U.S. call area and each country; state QSO parties to each state/province.

8) Your summary sheet should include the following statement: "I have observed all competition rules as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

NOVEMBER MIDNIGHT SPECIAL

About 125 logs were received from the more than 250 participants in the two-hour Midnight Special contest held November 23, 1980. Enthusiasm for the short contest format during non-prime hours continues to grow. Watch for the next one in "Contest Corral" sometime in the spring. — *Tom Frenaye, K1KI*

ARRL November Midnight Special High Scores

Call	*Points*	*Call*	*Points*
VE3DAP	266	WA5YTX	259
WAØTKJ	269	W4MOY	259
K9KM	304	K3LR	328
W8FN	297	N2IC	313
K5MM/7	291	W1ECH	269
K6WI	245		

Section Activities

A-1 OPR ★ EC ★ DXCC ★ RCC ★ WAS ★ STM ★ OES ★ OTS ★ NM ★ SCM ★ ARES ★ OVS ★ SEC ★ OBS ★ TCC ★ OO ★ NTS ★ WAC ★ CP ★

CANADIAN DIVISION

ALBERTA: SCM, E. Roy Ellis, VE6XC — SEC: VE6XC. Asst. SCM: VE6AMM. STM: VE6ABC. NMs: (APSN) VE6AFO (ATN) VE6ABC. Silent Key: VE6OH. He will be deeply missed due to his energetic efforts in many fields of ham radio. VE6HO busy on 40-meter net with health and welfare ttc re Calif fire. VE6HO reports that VE6AM came across accident on road and called road emergency on 2-meters and was answered by VE6DT who contacted police and the ambulance who responded immediately. Traffic: VE6CHK 203, VE6HO 86, VE6ABC 32, VE6QN 10, VE6CE 8, VE6AMM 6, VE6XC 6, VE6BAZ 5, VE6YW 1.

BRITISH COLUMBIA: SCM, H. Ernie Savage, VE7FB — British Columbia Emergency Net annual checkin showed VE7OM with 304, Second, VE7CSI 283 a total of ten SNC issued for over 100 checkins for 1980. BCPSC totals are not completed but by records they had a big year. Dogwood Chapter's Christmas dinner was a great success. VE7CIL who has months in hospital looks like he will be home for Christmas. VE7CPC had an operation and is doing fairly well. VE7CX lost his beam in the wind and heard someone lost his tower in the Albernies. Traffic: VE7ZK 246, VE7FB 107, VE7COA 51, VE7CCJ 24, VE7BLO 13, VE7BZT 11.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst SCM: VE4JP. SEC: VE4TR. STM: VE4RO. MNs: VE4s VJ NM TE AEJ. Checkins on all the nets is increasing, and winter is probably the cause. The prefix VE4OST is now being used by two ORS and there has been a demand for DXing. QSL cards for this prefix will be made available in 1981. NEPN QNI 1210, QTC 46, sess 30; MMN QNI 381, QTC 26, sess 30; MTN QNI 257, QTC 76, sess 30; WRIN QNI 116, QTC nil, sess 5. Traffic: VE4EAJ 58, VE4PG 39, VE4TE 25, VE4RO 21, VE4AED 17, VE4JA 17, VE4AAD 13, VE4CR 12, VE4AJE 8, VE4FK 8, VE4ID 8, VE4NM 8, VE4JP 7, VE4LB 7, VE4ADS 6, VE4AFO 3, VE4AFZ 3, VE4AP 3, VE4ALF 1, VE4OE 1.

MARITIME — NFLD: SCM, D. R. Welling, VE1WF — A/SCM: VO1FG. NM: VO1JN & VE1WF. SEC: VE1EI. STM: Open. New appointment VE1BZC as OES. Congrats. Exec. HARC: VE1BNK, pres.; VE1BSM VE1BNL, vice pres., VE1AVP, secy.; VE1BMF, treas. Congrats. Hospital: VE1AER & VE1BOO. Silent Key: VE1HM. Have been assigned VE1QST for Official Bulletin Station, anyone interested in this appointment? 80 and 40 meters becoming good DX bands in late evenings. Welcome back to APN: VE1CH & VE1ARB. VE1ASJ worked England crossband 6/4 meters. VE1AI planning DXpedition to Sable Island first week December. Nfld Net, 30 sess, QNI 1197, QTC 1, Time 851. APN 30 sess, QNI 142, QTC 73, Time 391. Traffic (Nov.) VE1WF 197, VE1LGR/RO 78, VE1CH 44, VE1BXA 16, VE1AUL 14, VE1XF 14, VE1KR 6, VE1OC 5. (Oct.) VE1AUL 6.

ONTARIO: SCM, Larry Thwierge, VE3GT — A/SCM: VE3GOL. SEC: VE3GV. STM: VE3ATU. At the emergency preparedness for the '80's conference, Amateur Radio, the League and its ARPSC were highly visible and audible. Participation consisted as a panel member of the Communications Workshop as well as a display demo at the International Centre which included a duplication of our activity during Mississauga '79. There were approximately 150 delegates attending the workshop from Canada, USA and as far away as Europe. At the display demo, about 1,000 delegates saw Amateur Radio at work as VE3RCO was active for 3-1/2 hours on 80 and 2 metres. The operation was a huge success. Special thanks to the many that assisted including VE3s IXB HGC LIY CWA ISW KK GOL ATU IYY TY LEM FSX GFN CBA IAC HOI IYQ MLP DRN MLF. VE3EFX had 83 contacts on OSCAR 7 mode B during the AMSAT UK sponsored OSCAR activity week contest. Middlesex County Repeater Assn. operating VE3MCR in Lucan on 60/.00 MHz has extended their coverage area with a new 40 watt solid state repeater. Welland Co. ARC recently held a successful emergency exercise involving police and fire departments as well as a CB group. Laurentian Net certificates have been issued to VE5 EUI FFG KOD. VE3s KAD and KTO have their Advanced. VE3CEA suggests club program chairmen consider Ont. Hydro who has an excellent slide presentation covering all aspects of nuclear energy including the 3 Mile Island disaster. An engineer from Hamilton supplies the commentary and is available to go to any place in Ontario. New calls on the air are VE3s MOD MOE LQN. VE3KLP has compiled an excellent club directory for the Ottawa ARC. At the annual KWARC banquet VE3DWH was chosen amateur of the year, while VE3KK was awarded the FD trophy for his undaunted effort in operating 20 cw nonstop for 24 hours. Traffic: VE3ATU 516, VE3GOL 321, VE3CWA 312, VE3KK 276, VE3DPO 181, VE3GT 142, VE3HTL 136, VE3RCO 84, VE3FGU 62, VE3JLL 62, VE3DVE 57, VE3AYZ 56, VE3GNW 56, VE3GFN 53, VE3WM 50, VE3DUK 47, VE3BVG 45, VE3EUI 41, VE3IXB 40, VE3HGJ 39, VE3JRO 32, VE3LDU 28, VE3EWD 25, VE3AWE 18, VE3KXB 18, VE3IFP 18, VE3WG 18, VE3LSJ 16, VE3FPI 11, VE3EFX 8, VE3BZB 6, VE3MKJ 6, VE3ANJ 4.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2FFE. VE7BIR, ex VE2BB, visiting friends in Montreal, was heard on the Happy Gang Net via VE2FJ phone patch. On the 8th of November, 1980, over 150 amateurs from La Mauricie and other locations were present at the VE2EC night at Trois-Rivieres. Rev. Charles who was first licensed in July 1931 and a member of ARRL continuously since Feb. 1933, a long time OTS, was presented many gifts and a 40 years pin by your SCM on behalf of the League. Felicitations a VE2AXK VE2BZL et les autres stations qui ont pris part au reseau d'urgence lors du desastre en Italie. Traffic: VE2FKI 45, VE2BP 38, VE2EC 23, VE2EKC 13, VE2FSA 10.

SASKATCHEWAN: SCM, Norm Waitho, VE5AE — SEC: VE5WM. STM: VE5XC. NMs: VE5WM VE5HG VE5DC VE5SF. Congratulations go to VE5WM for being the winner of the past election for SCM. I hope the membership cooperates and helps Bill as they did for me. Seems like a busy winter this year, the repeaters are very active, and the traffic nets have been the most active I have seen for a long time. VE5BL & VE5GG have a computer bulletin board going on 147.33. Moose Jaw is doing their annual old folks round-up this year on the 13th of Dec. Net rpt. SPN 1479/96, SATN 445/31, RAHA 374, SKTN 2-m 232, PWXN 550. Traffic: VE5AE 38, VE5HG 34, VE5XC 19, VE5XS 18, VE5UX 15 VE5TT 12, VE5WM 12, VE5ACN 8, VE5MP 4, VE5NJ 2.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: W3PQ. STM: WA3WIY. PSHR: WA3WIY 101, K3JL 95, WA3DUM 74, W3DKX 54, KA3DPR 42. 1981 1st State ARC officers": N3AOX, pres.; WB3HFL, secy.; KA3CCZ, treas.; K3ONO, act.; K3DX, pub/trustee. New DE nets: — Diamond State Slow Net (DSSN) 3735 kHz Su 1800 Tue/Th 1930 EST. New Castle Co. 2-mtr. Emergency Net 1830 EST Su 146.13/73. Welcome to DE for N8NA a Surgical Resident at Wilm. Med. Cntr. WA3QLS announces his engagement. Congrats! New appointment — WB3FOC OTS. DTN ONI 333, QTC 70; DEPN QNI 69, QTC 14. Traffic: (Nov.) W3PQ 172, N3AKC 97, W3QQ 97, K3JL 86, WA3WIY 72, N8NA 40, W3DKX 39, WB3DUG 36, KA3DPR 27, WA3DUM 18, WA3ZBI 17, WA3YTB 11, AC3T 10, K3ZXP 7, W3FEG 3, W3WD 3, WA3RTX 2. (Oct.) N8NA 6, WA3PWT 1.

EASTERN PENNSYLVANIA: SCM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: WB3JYZ.

Net	Freq.	Time	QNI	QTC	Sess.	Mgr.
EPA	3610	7/10 P.M. Dy	566	299	60	AA3B
EPAEPTN	3610	6 P.M. Dy	514	163	30	AJ3R
PFN	3956	5 P.M. M-S	295	421	25	WA3WOP
PTTN	3610	6:30 Dy	284	88	30	AG3R

Local and vhf nets reporting: D3ARESN ATN MTG CTY ARESN and WB3JOE/R with a total of QNI 254, QTC 121 in 28 sess. OBS reports: WB3FVJ K3EBZ and W3TI. OO reports: W3FAF W3GVR K3RDT and W3KEK. OVS reports: KA3DZD W3GOA. BPL to K3JSZ and WB3CAI. PSHR reports: N3AZT WB3CAI KB3LF KA3DZD W3GOA AA3B WA3WOP AJ3R WA3EHD WB3FEH and K3JSZ. New appointment, WA3VIL to NM. New gear: W3EEK a IC-2A HT; AF3Z a Century 21; KB3CH a TS630S; K3TXG is QRL erecting a new tri-band quad. Nice to hear W3CBH back on PTTN again. W3HK is QRL with Coast Guard Auxiliary. PFN welcomes WB2EAG KA2GSI, WB3GUK and K8NCV/2. New officers Carbon ARC: WB3JYZ, pres.; WB3LPT, vice pres.; KA3DGR, secy.; WB3JYY, treas. New officers for West Branch ARC: KA3CXB, pres.; KA3CPA, vice pres.; KB3LA, cor. secy.; WB3HOI, rec. secy.; K3QDA, treas. KA3DZD reports Skywarn Net activated during snowstorm on Nov. 17/18. W3GVR finds OO work very interesting. KB3LF active on cw and fone nets from home QTH. N3BHF planning on ONI cw nets more often. WB3CAI makes BPL for first time and trying to find time to complete 5BWAS. 5 Williamsport area amateurs participated in the making of a documentary film and slides based on the Lycoming County Flash Flood program. The film and slides will be used to show other counties the effectiveness of having an organized flash flood program. The new District 3 ARES Net is now active on the 147.78/18 W3EEK rpt every Mon at 8 P.M. local time. WA3VIL is NM. This makes 3 districts active now. Anyone interested in a DEC appointment contact WA3PZO or W3VA. We have 7 districts open at the present time. WB3GUR reports WB3JOE/R VHF Tfc Net temporarily extended to M-F-W on 147.66/06 at 9:30 P.M. local time. W3BUR reports RF Hill ARC Hamfest very successful. Warminster ARC participation in SET impressed township officials with amateur know how in case of emergencies. PTTN and EPAEPTN welcomes WB3LGY. WA3TQJ upgraded to big E and KA3FQT to General, congrats. KA3CAT reports ATN activated for snowstorm on Nov 17-18. K3ARR has lots of local QRM — a baby girl. Congrats to Frankfort RC for their excellent achievements in recent DX contests. Watch this column for info on section dinner meeting to be held in the spring. WA3CKA doing more hunting than hamming this time of year. K3WAC, EC Chester County, reports ARES activities on increase during fall season. Traffic: K3JSZ 511, W3AVJ 482, WB3CAI 397, AJ3R 314, WA3WQP/3 313, W3FAF 231, WB3FEH 172, KB3LF 158, W3DP 153, N3CD 147, AA3B 138, W3IPX 133, W3BI 125, W3VA 89, WB3GUR 86, WA3EHD 57, WB3CUF 53, N3BFL 37, W3ID 31, WA3VIL 27, WA3OFD 25, K3ARR 23, N3AZT 23, K3EIP 23, W3ADE 18, K3QXC 14, W3CL 12, WB3FVJ 10, K3EBZ 9, WB3HTW 8, WA3CKA 6, KA3EAQ 5, N3BHF 2, KA3DZD 2, AF3Z 2, WB3AZE 1, W3HK 1, K3KW 1.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — Our Section Emergency Coordinator is WA3TAI. Do you know your EC? It's cw forever with W3CVE. W3CDO is on the air almost every day. KA3DXZ meets the MEPN daily and the RACES Net Tuesdays. W3ECN has those dipoles back up. WB3LTA helped the Nat. WX Service Skywarn alert along with the Mont. County ARES/RACES stations. WA3AWS WA3BBM WB3DAJ KA3DXZ WB3FAP W3HVS W3IWC WB3LHT W3QBC and K3WPG. Good show. WA3FYZ is very pleased with his "Bug Catcher Mobile Antenna." W3ZNW keeps South County ARES/RACES alive. WB3JRW finds the holidays add to his work load! KB3LV says reporting is a habit of long standing with him. KB3AP had twice the receiver voltage needed with consequent bad results. N3IC N3AUC WB3DJU KA3W and KA3G have the BARC 222.64/.24 machine operating full time. BARC honors N3ARL WB3BPC WB3DJU N3EB KA3G KB3HF WA3HQX W3HYY K3HZU N3IC WB3JBR N3JC WA3LAD K3RA K3RMX W3RUN K3SP K3VC KA3W WA3YYR and WA3ZKV for service. Congrats to you all. KA3DUC opines she copies faster than she writes. N3AFM keeps exploring 6-meter propagation. W3AKO is a great grandad. WB3BFK quietly climbs the traffic ladder. W3DFW and W3OYY still holding off the snow! W3LDD says it is a new country a day with the new beam and tower. N3AGM beat winter and got his tower and beam up and working. W3FZV had a little time for Sweepstakes. AK3X is glad to be home from Europe. W3DQI has it organized at his place. WB3CES does not like lightning! Who does! WB3GZU is getting to eyeball everyone in the state. KA3T has mobile in New England. FAR's Auto-Call has an interim editor. Montgomery County RACES/ARES have a nice new bulletin. With the nets: Net/manager sessions/traffic/QNI average. WR PON/W3DFW 21/24/21.3. MDC PON/W3OYY 4/7/24.3. MEPN/WB3GZU 28/170/29.9. 100 percent N3AGM KA3ARH W3LDD and K3ONU. Traffic: WB3GZU 823, W3FA 186, KA3T 113, W3DQI 48, WB3BFK 44, W3LDD 34, W3ECN 24, AK3X 24, W3FZV 20, WB3CES 10, WB3JRW 4, WB3LTA 4, KA3DXZ 2, W3ZNW 2.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — STM: KF2U. SEC: W2HOB. The expected rush of holiday traffic is here. I've heard of several clubs and groups doing their thing at local shopping malls to help promote Amateur Radio in general, local Novice classes and to just plain offer a valuable public service. Those that I know of now are the Camden County ARES group, led by EC WA2ONW, taking traffic at the Echelon Mall in Voorhees on all Saturdays in December. Then there is the yearly event sponsored by the Delaware Valley Radio Assn. and led by WB2IQJ and K3CPF. They have an attractive exhibit at the Quaker Bridge Mall. Last but not least is a first year effort by the Riverfront Wireless Assn. They set up at the Willingboro Plaza under the direction of WA2GTJ and WB2DGJ on the second Saturday of December. I must mention the superb job that WB2IQJ and K3CPF have been doing coordinating Italian traffic from the facilities of IQJ's station and that of W2ZQ. Throughout recorded history the DVRA club station has stood ready to help and has indeed handled thousands of messages through many emergencies. The boys from the Trenton area deserve a lot of credit for keeping ZQ on the air and manned. Many thanks! Traffic: WB2IQJ 490, W2ZQ 292, KC2A 125, WB2PKG 82, AA2H 73, WB2LCC 50, WA2CUW 43, K2YBN 34, K2UL 25, N2AEP 24, WA2HEB 23, WA2ONW 19, KB2OE 18, KF2U 17, WA2WUL 15.

WESTERN NEW YORK: SCM, William Thompson, W2MTA — SEC: W2BCH. STM: N2APB. ASCM: W2GLH. NM: N2APB WB2AZW W2FR K2KIR K2KQC WA2MFV WA2PUU WA2ZJP W2ZOJ. EC: N2ALI K2s CWD DUR OIU KA2AYZ W2s BYO EWO FEY GLH WA2s DHB GJI HSB LWH NAC OVT PEA VAM VCM PHH WB2s JWD NAO QZL. Net reports:

Net	Freq.	Time	Sess.	QNI	QSP	Mgr.
NYPON*	3913	5 P.M. Dy	30	561	282	K2KQC
OCTEN*	34/94	6:15 P.M. Dy	30	411	116	WA2MFV
NYSPTEN	3925	6 P.M. Dy	31	(Oct) 173		WB2OTC
ESS	3590	6 P.M. Dy	30	425	67	W2WSS
STAR*	325/925	6:30 P.M. Dy	30	131	31	WB2AZW
ONET	31/91	6:30 P.M. Dy	30	450	10	
BSN	93/33	7 P.M. Dy				WA2WXG
NYS/E*	3677	7 P.M. Dy	30	591	282	W2ZOJ
SLVARES	31/91	7:30 P.M. Su	4	31	2	WB2NAO
YCARES	3942	7:30 P.M. W				N2ALI
JCARN	10/70	8 P.M. Dy	30	568	15	WA2WAX
OARCN	25/85	8:15 P.M. W	4			K2VTT
CNYTN*	90/30	9:15 P.M. Dy	30	468	124	WA2PUU
NARAN	22/82	9:30 A.M. Su				WA2JPM
WDN*	04/64	9 P.M. Dy	30	777	153	N2APB
NYS/L*	3677	10 P.M. Dy	30	353	274	W2ZOJ
NYSCN	3677	10 A.M. Su	5	55	5	W2MTA

*Part of National Traffic System — upward liaison. No BPL. PSHR: N2APB 113, W2ZOJ 111, W2MTA 107, WA2MFV 105, W2AET 96, N2BXB 88, WA2KOJ 87, KA2CTU 80, WB2IDS 69, WA2ZJP 67, WB2MVC 64, WA2HSB 63, WB2AZW 62, WB2OWO 62, KB2GT 60. Appointments: (ORS) WB2s ABD AIO AZW GTB MBM YQH WA2s AOG ECA ICB LGC NPO N2BXB KI2D AF2K K2s IGW KIR. (OBS) W2GLH. (OO) WB2ABD WA2AOG KI2D WB2AIO K2KIR. (OES/OVS) W2AET. Nice Goin'. WA2ANU article in new ARRL Handbook "Emergency Battery Power;" WA2PEA tnx seven FB years as EC Onondaga County; N2BXB and W2BCH TV news re Italian earthquake; KA2CLT Assistant Mgr. NYPON; New officers NYSPTEN; AA2Y K2VTT K2UCO KD2V; MARS outlets including KI2D WB2s AZW MVC WA2FJJ N2SY; N2APB and WDN Simplex night last Sunday of month (ROCH 147.45, BFLO 147.42, other WDN 147.48, Crosslinks 147.51 147.54) and WDN ttc Handlers Info Net Tues. 8 P.M. 04/64. Changes: WDN moves to 9 P.M. Jan. 81; HF Traffic Handlers Net Mon. 8:30 P.M. on 3913. Notes: WNYEC Net on third Sundays 8 P.M. 3955. ECs keep up monthly reports to W2BCH. N2APB talk on "Computers and Ham Radio" Batavia Gram Club. ARRL affiliated clubs, let's hear from you ALL. RAWNY HAM-O-RAMA officers; WA2ZSJ K2IGW KA2HBO K2GUG; RAWNY Net on 3900 daily 9:30 A.M. Fulton ARC "Toroid" FB; W2YRL says "Crow-Bars" save rigs in storms. Traffic: WA2HSB 469, W2MTA 336, WA2ELD 332, W2ZOJ 317, N2APB 235, N2BXB 218, WA2MFV 191, KA2CTU 146, W2AET 140, WB2OWO 115, KA2CLT 114, WB2IDS 109, WA2ZJP 70, W2FR 61, WB2MVC 59, AF2K 57, AE2T 55, WB2AZW 52, KB2GT 48, WA2KOJ 35, WA2ANU 26, WA2MFU 25, WB2OIX 24, WA2AIV 22, W2PPS 20, AF2A 15, WB2OTC 14, KG2D 13, K2VR 4, WB2NAO 2, KA2DBD 1.

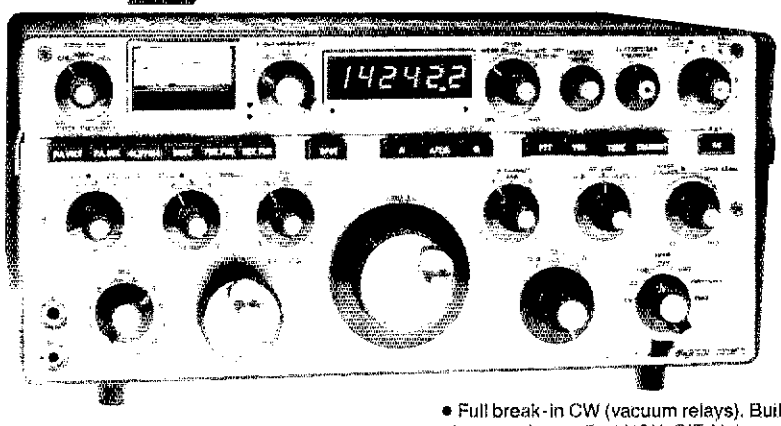
WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM: N3FM. SEC: WA3JBQ. DEC: WB3JDI. STM: N3EE. NMs: W3NEM W3MML & WA3PXA.

Net	Sess.	QNI	QTC	kHz	Time/Day
WP A CW	30	408	193	3585	7:00 P/D
WPAPTN	30	540	201	3983	6:30 P/D
WPA2MTN	30	562	100	146.28/88	8:00 P/D
NWPA2MTN	30	325	13	146.04/64	9:00 P/D

PTTN 3610 kHz 6:30 P/D, WPA RACES 3990.5 9:00 A/S. I am sorry to report two Silent Keys, W3RWQ and W3HCU, our sympathies are extended to their families. N3BKV is now an OBS. New Novice is KA3LGD. Upgrades are WB3IAS & N3BMU/ex KA3AXO to Tech.; KA3CNO WB3ERD & WB3ERE to General; WB3JZN and W3DMB to Advanced. W3YO & XYL, WB8PAV, are back in Sharon after a job training stay in N.J. New officers for the BVAFMA are: KA3EPF, pres.; K3NPW, vice pres.; WB2FVI, secy.; WB3HWB, treas.; KB3L, chief eng. Steel City officers are: W3IOH, pres.; WB3FWC, vice pres., WA3FWA, treas.; KA3AJN, rec. secy.; W3UUH, cor. secy. Irwin Area ARS: K3JZD, pres.; WB3CUW, vice pres.; K3CHD, secy.; WB3BRD, treas.; WB3EVZ, com. dir. Two Rivers ARC new officers: AG3H, pres.; WA3UFI, vice pres.; KA3BLJ, secy.; W3GUL, treas.; WA3IZH W3TZX W3UST trustees. K3WT has accepted a job in Min-

TWO MORE FAMOUS LINES PRICED RIGHT at HAM RADIO OUTLET

CX-11A signal/one



- Dual VFO's: Independent control, transmit/receive on either.
- 150 W output from solid-state, no-tune final amplifier.
- Synthesized! All amateur bands, 1.8-30MHz plus 4 new future WARC bands.
- Unequalled selectivity. 3, cascaded crystal filters... IF shift...active audio BP filters ...tunable peak notch filters.
- Active double balanced mixers provide +20dbm, 3rd order intercept point.
- Full break-in CW (vacuum relays). Built-in electronic keyer. Fast VOX. RIT. Noise blanker, RF speech processor. RF envelope clipper plus 8 pole filters (2) in SSB.
- LED freq. readout. 6 digit, 100Hz resol.
- Built-in power supply. Heavy duty HyperSil* tape wound transformer for high regulation, power w/compact size, low weight. Full overload protection.
- Modular construction. Easy circuit board accessibility.
- Self contained. 16¼"W, 7¼"H, 14"D. 40 lbs.

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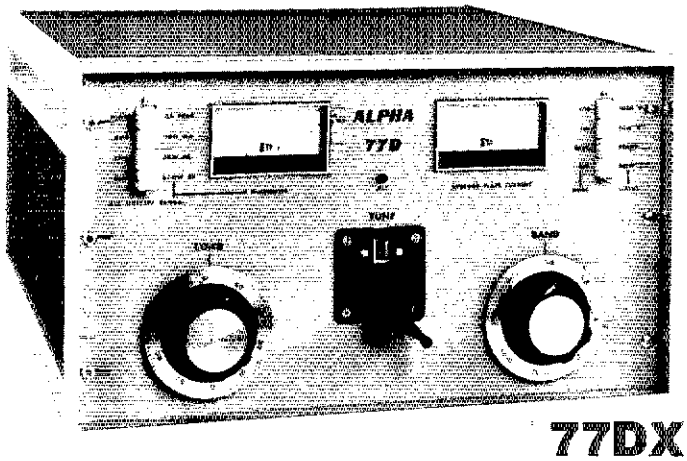


77DX

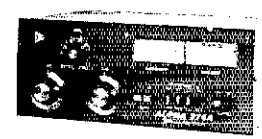
ALPHA 77DX, without question, the ultimate amplifier for HF communications. Conservative ratings, careful crafting, finest components.

- Rated 2KW p.e.p. or continuous carrier. No time limit.
- Uses Eimac 8877 ceramic/metal triode. 1500W plate dissipation.
- Ducted air cooling. Quiet.
- 4.4KW Hypersil* transformer is easily removed/replaced.
- 25 mfd oil-filled filter cap.
- Two vacuum relays for full CW break-in.
- Drive for 2KW input is 100W.
- Manually tunable 1.8-2MHz, 3-24MHz**.
- 11"H, 19.5"W, 22"D. 103 lbs.

76A

Full pwr w/desk-top convenience, rated up to 2.5KW p.e.p. SSB, 1 KW average, CCS. Tunable 1.8-2MHz, 3-24MHz**. Nom. drive, 100W p.e.p., 60W carrier. Uses 2-Eimac 8874 ceramic/metal triodes in G/G. Full cabinet ducted air cooling. Size 7.5"H, 17"W, 14.75"D. 65 pounds.

Full legal pwr plus factory-preset BP circuits for instant change 80-15 meter amateur bands (also tunable for general coverage). Rated to 2.5KW p.e.p.SSB, 1KW av. No time limit! Nom. drive:100W p.e.p., 60W carrier. Uses 2-Eimac 8874 ceramic/metal triodes in G/G. Full cabinet ducted air cooling system. 7.5"H, 17"W, 14"D. 75lbs.



374A

**Export-only overseas units include 24-30MHz (10 meter band). FCC type-accepted versions required for U.S. delivery, can be legally and easily restored to full 10 meter capability by qualified, licensed amateurs without affecting the warranty.

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Store addresses and phone numbers are given on opposite page.

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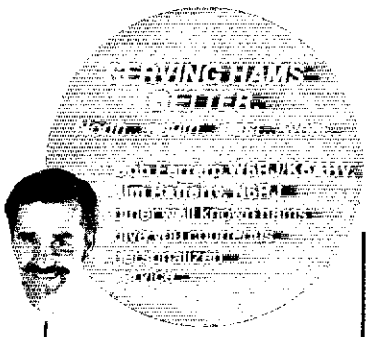

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1 mile east Knotts Berry Farm.

BURLINGAME, CA 94010
999 Howard Ave., (415) 342-5757
5 miles south on 101 from S.F. Airport.

OAKLAND, CA 94609
2811 Telegraph Ave., (415) 451-5757
Hwy 24 Downtown. Left 27th off-ramp.

SAN DIEGO, CA 92123
5375 Kearny Villa Road (714) 560-4900
Hwy 163 & Clairemont Mesa Blvd.

VAN NUYS, CA 91401
6265 Sepulveda Blvd., (213) 988-2212
San Diego Fwy at Victory Blvd

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R.L. DRAKE COMBO

TR7/DR7 all band transc'vr.

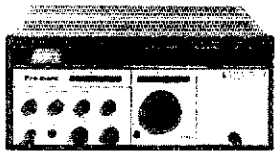
R7 full-coverage rec'vr.

Ask for details, prices.

FREE SHIPMENT (UPS Brown)

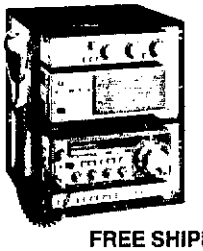
COLLINS KWM-380

BEAT THE PRICE INCREASE while they last



Ask for details, prices.

FREE SHIPMENT (UPS Brown)



YAESU RACK FOR FT-7 STATION

Ask for details, prices.

FREE SHIPMENT (UPS Brown)

CUBIC/SWAN ASTRO 103

Ask for details, prices.

New commercial grade transc'vr provides full 9 band coverage.

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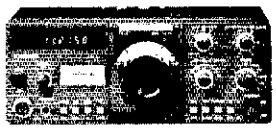
KENWOOD

TS-130-S



CALL FOR YOUR SPECIAL PRICES ON ALL OF THESE OUTSTANDING ITEMS

(and other well known Kenwood ham products)

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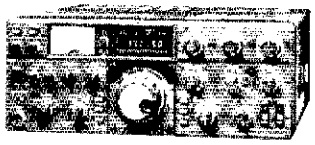
TS-520-SE

TS-830-S



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25W OUT FROM TR-2400 w/American Radio "324"

TR-2400 plugs directly into compact assembly. Linear amp features V-Mos pwr transistor, gives 25W RF across band w/1.5 watts drive. Built-in amp/spkr boosts audio more than 2W. Also current limited charger for TR-2400. 12VDC @ 4A. Socket for ext PTT mic.

$199.95 FREE SHIPMENT (UPS Brown)

MIRAGE B-1016 2M AMPLIFIER

160 W OUTPUT SSB, FM, CW.

REG. 279.95 $249.95

Freq. range: 144-148MHz • RF out: 160W nom. (10W in). • RF power in: 5-15W • DC operating pwr: 13.6VDC @ 20-25A • Intermittent duty cycle • Built-in receiver pre-amp. Automatic internal or external relay keying.

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ALLIANCE	CDE
U-100	HAM IV
$41.95	$169.95
HD-73	T2X
$109.95	$229.95

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VHF/FM DEVIATION METER

$99.95

FREE SHIPMENT (UPS Brown)

Direct meter readout of FM deviation (marked for nom. tone pad/voice deviation). Covers 144-148MHz w/freq. selected by xtl. 146.52 MHz xtl supplied. Operates from 11.9 to 16VDC.

Prices, specs subject to change without notice

Calif. residents please add sales tax.

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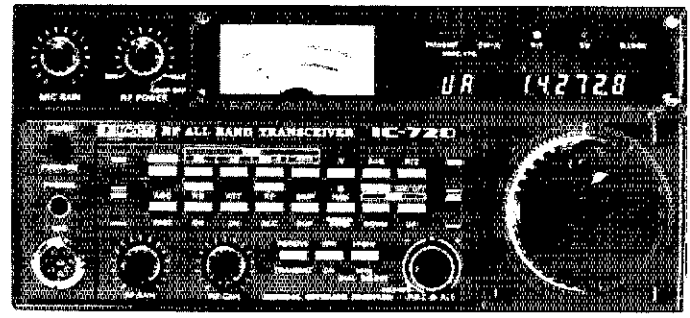
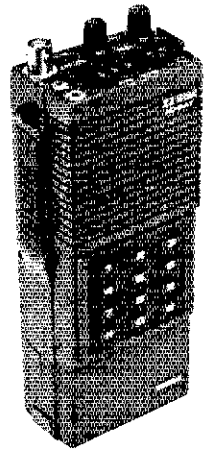
IC-720 HF, ALL-BAND TRANSCEIVER



- All 9 HF bands w/100kHz (min) each end.
- All solid state. Broadband tuned and LP filter.
- Digitally synthesized. Tuning resolution 10Hz.
- Passband tuning CW, SSB, RTTY modes.
- Two VFO's. Simplex and duplex and RIT.
- RF speech processor.
- CW filter plus narrow CW. Fast, semi-break in.
- Noise blanker, fast and slow AGC.
- 20db RF attenuator.
- Matched mic., metered ALC, excellent TX audio.
- Press-to-talk or VOX.
- WWV reception, 2.5, 5, 10, 15 and 20MHz.
- GENERAL COVERAGE RECEIVER! 0.1 to 30MHz. (No transmit in general coverage.)
- Power output: SSB-10, 100W p.e.p. AM-10, 40W. CW, RTTY-10, 100W.
- Receiver sensitivity: Less than 0.25μV.
- Operating voltage: 13.5VDC @ 20 amps.

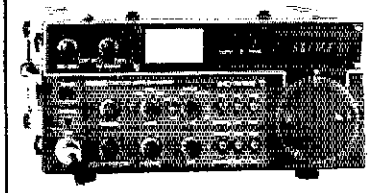


IC-2AT SYNTHESIZED, 2M HAND-HELD TRANSCEIVER

- TOUCH TONE® pad.
- 800 T/R Channels
- 1.5 watts output • Hi/Lo battery saving switch • Separate built-in speaker and microphone • Quality receiver (0.2μV/20db typical)
- Small! About size of a dollar bill!
- Slip-off bottom NiCd pak. 3 sizes available (250ma standard).

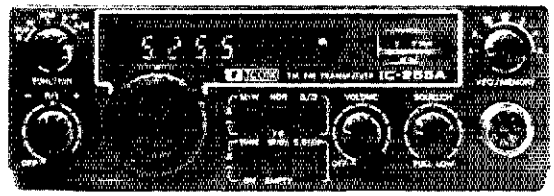
Complete w/BP3 Ni Cd pack, wall charger, flexible ant, belt clip.

IC-551 6 METER TRANSCEIVER



Only set w/capability for scanning on SSB! Invaluable for checking on 6M band openings. • Cont. tunable, 50-53.999MHz. Dual VFO's. • SSB w/ USB,LSB, CW, AM, FM*. • 3 chan. memory w/scan stop all modes. • CW monitor. Speech comp. • Band scan (any portion) all modes. • Digital, freq / mode readout. • AC/DC supply. Options: *FM, pass band tuning, VOX. • Rec: SSB, CW,AM: 0.5μV for 10db S+N/N. FM: 0.6db for 20db quieting.

IC-255A 2 METER FM TRANSCEIVER.



- 25 watts power output. Current drain only 5.5A.
- 5 channel memory w/*memory scan.*
- Full coverage plus overlaps, 143.8 to 148.2MHz.
- Dual, built-in VFO's. Tuning in 5 or 15kHz steps.
- An outstanding receiver.
- Standard ±600kHz splits but can be programmed for any split between 143.8 and 148.2MHz.

FREE SHIPMENT, ALL OF THE ABOVE ITEMS, UPS (Brown)

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. . . Most radio amateurs know what that phrase means. But that phrase can also be applied in a literary sense. In both cases, the message comes across clear — uncluttered, readability 5, dead full quieting. Solid copy describes *The New ARRL Operating Manual.*

If you belong to an active affiliated club, you probably have had a chance to look at the *Operating Manual* at a club meeting. We think this is the finest book on Amateur Radio operating ever written. It should be. Each chapter was written by an expert with extensive on-the-air experience in his or her field. For those who have not had a chance to see for yourselves, here is a chapter by chapter glimpse:

Strange Magic: The editor of the *Operating Manual* sets the tone of the book — the Amateur Radio experience is fun and rewarding!

Basic Amateur Radio: Getting your license, setting up your station, making your first contact, QSLing, the HANDI-HAMS and information on radio clubs.

Rules and Regs — An Introduction: A brief description of the FCC, applying for your license, modifying your license, U.S. call signs, third-party communications, operating in another country, proper identification, guest operating, logging, RFI, and the *new* bands.

Traffic Handling: Originating a message in the proper form, checking into nets, how the National Traffic System works.

Emergency Communications: The Amateur Radio Emergency Service and its operation in a communications emergency. *Must* reading for every amateur.

DX and DXing: Find the right band, the right time and the right frequency to work foreign Amateur Radio stations. Propagation on each band is described as well as using propagation forecasts. A section on low power DXing is included, as is information on use of the QSL bureau systems.

Contests: This chapter makes you want to "jump in and join the fun." Contains all sorts of tips on preparing for a contest, competitive operating, accurate logging, and checking for duplicate contacts.

Awards Chasing: How to collect "wallpaper" for your shack to show off your achievements in Amateur Radio.

FM and Repeaters: How repeaters work, antenna requirements, the autopatch — "mobile communications for a mobile society."

VHF/UHF Operating: There's more to VHF/UHF operating than FM and Repeaters. Even low-power stations find 1000-mile DX isn't uncommon. Besides commercial equipment there are still frontiers to explore by building your own gear, and there are plenty of records to be set!

Satellites: Nothing can match the excitement the first time you hear your own signal coming back from space — unless it is your first QSO via satellite. K1JX tells how it is done.

Visual Communications: Tired of pounding brass or just talking? This chapter provides some new excitement showing how to make your first Teletype or television QSO. Even FAX is explained.

Microcomputers: Within the next several years, the small computer will become as common an item in the ham shack as a transmitter and receiver are today. This chapter tells what computers can do in the ham shack and provides basic (no pun intended) information as to how computers work.

SWLing: The radio world extends far beyong the ham bands. SWLing is not just for the beginner; many experienced radio amateurs find this an interesting pastime.

References: 5BDXCC country check-off list, ARRL Numbered Radiograms, Table of Allocations of International Call Signs, Spanish Phonetics, Q Signals, CW Abbreviations, ARRL Station Appointments, RST System, ARRL Field Organization, DX Operating Code.

The **ARRL Operating Manual** is available for $5.00 in the U.S. or $5.50 elsewhere (in U.S. funds) from ARRL Headquarters or your local dealer. Order you copy *today!*

THE AMERICAN RADIO RELAY LEAGUE, INC
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neapolis. W3YX, Erie, has a weekly schedule with LU1TAB/W3KHQ. Beaver Valley has a new club — The Society to Advance Am. Rad. Research. The Breezeshooters ground wave contest on ten meters was huge success by the number of calls heard on the air over the tri-state area. Traffic: (Nov.) WA3PXA 273, W3EGJ 248, KB3DT 219, AC3N 122, N3FM 120, N3WS 115, N3EE 105, K3CR 99, W3AS 92, W3KUN 79, WB3JGD 75, W3KMZ 44, W3MML 43, W3UNX 43, K3SMB 41, KA3ETC 38, WB3JDI 36, W3NGO 36, N3BKV 35, KA3BGC 30, K3HCT 29, WB3GUK 28, W3RUL 26, W3EXC 25, K3VQV 24, WB3IAB 16, N3KB 15, W3TTN 12, AB3X 8, WB3JCW 7, AF3B 4, KA3BRO 3, W3SN 3, W3FSB 1, W3LOD 1, N2NT/3 1, K3UA 1. (Oct.) AF3B 6

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst. SCM: W9RYU. SEC: W9QBH. NMs: WA9KFK and WB9JSR. STM: WB9JSR. Cook County EC: W9HPG.

Net	Freq.	Times/Days	Tfc.	Sess.
ILN	3690	0030/0400 Dy	332	60
ILL Phone	3915	2130 Dy	213	30
NCPN	3915	1200/1700 M-S		
IEN	3940	1400 Su		
W9VEY				
Mem Stn	2 Mtrs.		10	4

The newly elected officers of the Six-Meter Club of Chicago are K9ZWU WA9FIH K9ENZ K9ZWV WD9GDA WA9MJJ WA9ASD and WA9TWW. WB9RFC WD9GGT WD9GGS WD9AQL and W9RZC are the new officers of the Sangamon Valley Radio Club, Inc. The CAND report for Nov was 818 messages during 30 sessions. IL represented 100 percent with WD9UCE W9HOT WD9FDB W9JIJ W9NXG and WB9WGD. KB9BB has a new K260A ssb rig. KA9JNP KA9JDZ and KA9JLD are new Novices in the Lincoln area. 11 local Streator amateurs provided communications for the 18 mile Superwalk along the route. KA9EGW has upgraded to Advanced Class. WD9DMV has a new dipole on 40 meters. W9YB was recognized by the Kishwaukee Amateur Radio Club for being continuously licensed with the same call at the same address for 50 years. WD9DVJ N9BQV N9GB and KA9FMX were elected officers of the Western Illinois Amateur Radio Club for the coming season. The 9RND traffic had 58 sessions, 354 QTC. Illinois participation 100 percent with W9NXG W9JIJ W9HOT WB9WGD WD9FDB and W9TLU. KA9GOA N9BTF and K9BQL have upgraded. KA9FHV has joined the ranks of Silent Keys. Our sympathy to his family and many friends. The 1981 ARCH convention will be held at Stouffer's River Front Inn on March 21 and 22. KB9OW WB9OGD W9MOS AK9N KAØDNQ WB9MMM WA9NTT and KA9BOD are the newly elected officers of Rockford Amateur Radio Association, Inc. The Antique Radio Club of Illinois was incorporated in March. Contact Barry Janov of 1304 Carlann Lane, Glenview, Illinois 60025 for further details. W9WU, practicing attorney, spoke at the November 5th meeting of Hamfesters and discussed local ordinances and zoning regulations as they relate to amateur antenna structures. Their officers for 1981 recently elected are: WD9DYR WA9EKA N9BIA KA9HDB KB9KZ N9BCO W9HPG WB9UHA WD9BBL KA9BVS N9AQB and AF9C. WB9UHQ was appointed manager of Central Cable System of Clinton and WA9RTI was appointed to the Board of the Sanitary District of Decatur. Both are members of the Macon County ARC. Traffic: (Nov.) W9NXG 424, K9PNG 296, W9JIJ 266, WD9DMV 223, WB9WGD 204, W9TLU 108, W9OK 103, W9HOT 99, KA9ALR 86, WB9JSR 74, WA9KFK 64, W9LNQ 62, K9BVE 50, KN9BAM 46, KA9EGW 32, W9QBH 26, W9PRN 24, WA9AON 19, W9KR 14, W9HPG 13, W4IZI 10, K9SW 6, WD9EBQ 4, AA9R 4, K9HVS 3, WD9HZF 3. (Oct.) WB9WGD 155.

INDIANA: SCM, Bruce Woodward, W9UMH — SEC: W9UMH. STM: W9JUJ. NMs: (TN W9QYY. QIN WD9GXW. IGN N9AEI. VHF W9PMT. IWN K9DCX. IPN W9DLF. IPON K9RGF. November net reports:

Net	Freq.	Time/UTC/Daily	QNI	QTC	Sess.
ITN	3910	1300/2300	2841	372	60
QIN	3656	1430/0100/0400	841	451	89
IGN	3708	0014	102	17	27
IPN	3910	2130	1234	174	30
IWN	3910	1315	841	0	30
IPON	3910	1300 Su	110	6	4

Hoosier VHF nets report: QNI 3597, QTC 167, Bulletins 41, Time 5098 for 19 nets. D9RN 100 percent: W9JUJ W9QLW K9CGS W9DLF W9FZX. 9RN 100 percent: W9JIJ N9AEI W9EI W9QLW W9XD WA9QCF N9HZ K9WWJ WB9UYU WD9GXW. CAND report D9RN 100 percent: W9JIJ W9QLW K9CGS Appts: OVS WA9PKL. OBS KB9NR W9QYY. EC AE9U Elkhart County, K9BRF Hancock County, N9BLK Jasper County, KC9C Tippecanoe County. Endorsements: OTS N9PS EC WD9HCE Brown County, WD9JES Johnson County. Silent Keys: W9CVU W9RAR WB9OBN W9KZN. EC reports: WB9WWB N9AST K9FVN WB9LCN WA9OHX WD9DVA WB9VIW K9UJK WA9UGP W9QWI K9POP WD9BHR KC9C KB9JK WD9JLT W9MJI N9BI.K K9EQT. I am sorry that Someone Else is dead, but Else really has not been active in Indiana for sometime. KA9BTV is a good example of this. Taking over the Wet Net reporting for W9UEM who is in Florida for the winter. The Indianapolis Radio Club at its annual banquet gave its Outstanding Amateur of the Year award to WB9KTM for his expert antenna work over the years. W9BR and W9AI were presented Honorary Life Memberships and awards from the Scientech Foundation for their long service to IRC by Bob Annis 9CUD. KA9ASH and WB9TZL were presented the Club Presidents award by the Whitewater Valley ARC. Hoosierland Amateur Mobile Systems, Inc. is working closely with the Indiana State Police INCERT program. The Clark County ARC reports KA9ILH is on 40 cw QRP tnx to WA9TJS WN9DDV and N9AOJ. The Fort Wayne Hamfest was a great success and I appreciated the Sewer Net display and hospitality thanks to WA9LHP. There sure were a lot of blue and gold jackets around that booth. FWARC you are fantastic. Congrats to the Warrick ARC for its new ARRL affiliation. I enjoyed speaking to the Bloomington ARC. It fun will keep you alive, those hams should live forever. Traffic: (Nov.) W9JIJ 952, W9FC 283, W9EI 175, WB9UYU 153, N9PS 136, K9FZX 118, W9QLW 95, WA9QCF 88, W9PMT 66, WD9DVA 60, N9AEI 56, W9WKM 54, K9DCX 45, W9IOH 41, WB9LCN 41, K9WWJ 37, WD9JAA 32, W9UEM 30, W9XD 28, W9ZW 27, W9URQ 26, WA9OKK 23, W9ZGC 23, WB9AWI 22, W9RTH 22, K9KTB 20, WB9EAP 18, WA9JNC 18, W9DLF 15, WD9EPU 15, W8LKU 14, W9WEI 14, WA9GJZ 10, WA9OHX 10, K9DIY 9, WA9YAY 9, W9OZJ 9, K9FVN 8, N9AST 7, WD9JAB 7, W9UPI 7, WD9ART 6, KA9BLN 6, K9CGS 6, N9BLK 5, KA9EJT 4, WD9WHU 4, WB9AJY 3, W9EHY 3, KC9C 2, WD9CIV 2, W9BDP 1, W9KMY 1, WB9KQT 1, K9OUP 1. (Oct.) WD9DVA 116, K9DIY 17, WD9CIV 16, WA9JNC 8.

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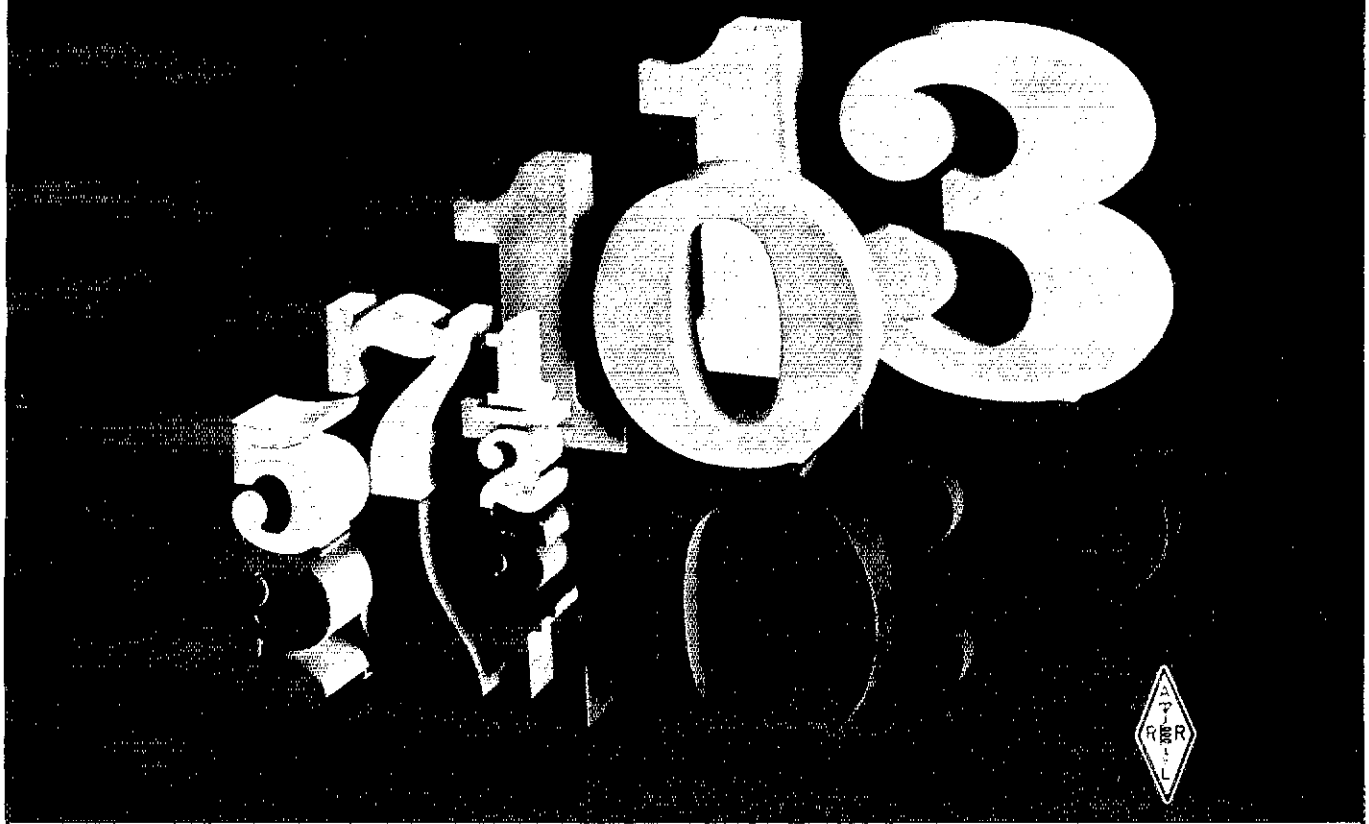

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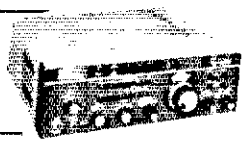

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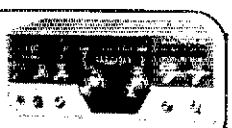

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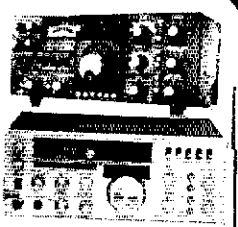

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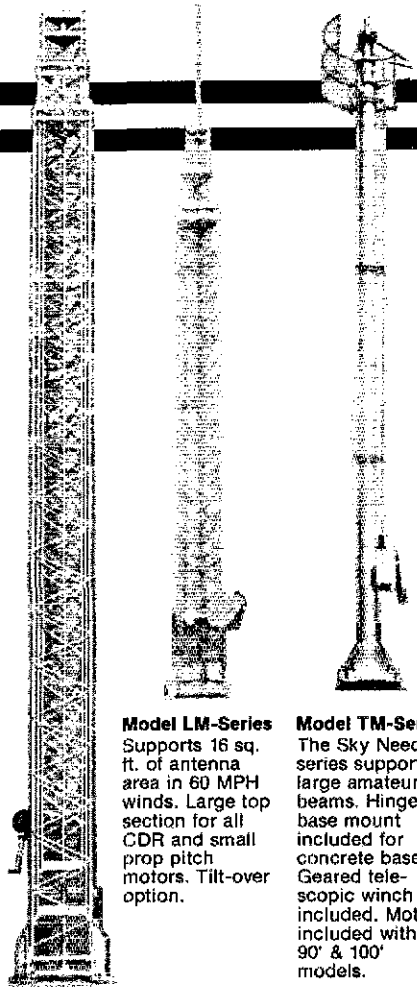

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WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN WB9YPY QNI 904, QTC 1017; BEN WB9ESM QNI 650, QTC 216; WSBN WB9ICH QNI 1009, QTC 302; WNN N9AUG QNI 238, QTC 42; WIN-E W9DM QNI 375, QTC 120; WIN-L K9LGU QNI 276, QTC 140; XPO WA9NIX QNI 438, QTC 53. KA9GZQ has General. WA9AWO has Extra. ARES conference held November 9 at Portage, was very successful, watch for details, date and place for next year and please write it down on your calendar. KA9CPA made BPL. New manager of the WSBN effective December 1 is WD9ESZ. Thanks to WB9ICH for his past services as NM of WSBN, good luck to you in your new venture, hope we can hear you on the bands mobile. Regret to report WA9EKO's wife passed away, our sympathy. N9BAF has WAS. Congrats to K9EN on being reelected Vice Director Central Division. KA9FKF now KB9RR. NWTN had 469 checkins and cleared 46 messages. Green Bay 2 meter Net had 14 QNI and no QTC. I'm very glad to see so many stations reporting their PSHR. I need more input from you people for this column. Traffic: (Nov.) KA9CPA 1906, WD9IUX 433, W9YCV 210, W9CXY 216, WD9ESZ 207, K9AKG 179, WB9YPY 172, K9FHI 137, N9AUG 130, WB7OJV 120, N9AZI 118, W9DND 115, W9IEM 112, W9DM 102, WD9BCM 95, W9UCL 70, WB9NRK 67, WB9RGO 63, WB9ICH 61, WB9ESM 58, N9BCX 45, WA9WYS 44, K9GDF 41, K9JPS 41, N9CP 40, AG9G 37, WB9JSW 37, W9UW 37, WD9DHF 36, W9LDO 36, K9LGU 35, W9IHW 34, W9FDY 30, K9AQ 29, KB9NG 29, WB9YPZ 29, WB9ABF 26, W9AYK 24, KB9FM 23, WA9GGH 23, K9HDF 23, WB9BRE 22, KA9EMF 22, WB9WHQ 22, K9UU 21, WD9AJA 20, K9UTQ 13, W9CJE 11, KA9GBE 8, WB9PAW 8. (Oct.) WB7OJV 66, W9BCC 9, KA9CBE 2.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — SEC: WAØOIT. STM: AFØO. Our congratulations to WDØCZN, who recently upgraded to General and is now NØCCS. Also, the section congratulates KØJCF, of St. Charles, who was elected president of the Rochester Amateur Radio Club. This club plans to host the 1981 Dakota Division Convention, so he has his work cut out for him. The sympathies of the entire section go out to the families of KØKRO of Rochester, WAØVUA of Byron, WDØFKX of Cook, and WØRAV of Blackduck, who all became Silent Keys late in October. The Arrowhead Radio Amateur Club, of Duluth, has great plans coming up for some public service in the coverage of two races in the near future. The first is a car race "on ice" in the Duluth Harbor in January and the second will be the "John Beargrease Sled Dog Marathon" in February, which at 166 miles in length, is the longest sled dog race in the continental United States. Both uhf and vhf coverage is planned. The car race committee is headed up by WBØZAH and the sled dog committee by AFØO. Still looking for more public service minded stations for better coverage of various areas of the state via the National Traffic System. Traffic: WAØTFC 364, AFØO 160, WBØTHZ 128, WDØCGM 112, KØJCF 107, WØDFX 96, KCØT 78, KCØZ 78, WBØNZB 57, WØGRW 53, KØPIZ 52, KBØMB 37, WAØAIN 34, KØCSF 34, NØBRC 16, WDØCEX 15, WAØYVT 15, WBØSCN 14, AFØQ 8, WBØWXU 8, KØTS 6.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØRWM — SEC: WBØTEE. OBS: WØDM. NM: WAØCRH. OO: WDØCLD. Congrats to those that upgraded to Gen: WBØZMW KAØBAB KAØDPL; Gen to Adv: KAØBAW; Adv to Ex: WAØCRH, KAØFXI got 2nd Class Commercial. WDØHBU now KBØOY. To Gen: KAØBAV; Gen to Adv: WBØYIB WAØCYW. KCØW has got WAS on 6 meters after 19 yrs of hard work. Forx Club has 10-meter net on Wed at 0100 UTC on 28.800, KAØGYR net control. Forx had their annual auction and hamfest with a good turnout and Bark Club had amateur display at Gateway Mall. Williston Club is already working out their plans for Field Day. WDØGMD is back on from Epping. WAØVGJ and WAØRWM visited WAØRWL in Ohio for Thanksgiving. Traffic: WAØRWM 192, KBØIP 149, WAØCRH 26, KA7AWS 17, NØAFP 10.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: K5TML. NMs: WA5LGN W5MYZ W5POH WA5ZWZ. Nets: ARN 3.995 0030/dy 1219 80 WA5LGN; OZK 3.760 0100/dy 191 35 W5MYZ; APN 3.937 1200/M-S 806 41 W5POH; M-Bird 3.928 2230/M-F 692 33 WA5ZWZ; SCARC 28.765 0230/M&T 60 24 WA5VSV. KA5HNB now General. KA5JCA now Tech. W5KL & W5UAU attended the National QCWA convention in Orlando, Fla Nov. 1 & 2. Renewed following appointments — EC: W5BBV WB5OAO. NM: W5MYZ. OTS: W5ASD W5BED WB5BLF W5UAU attended NWAARC annual banquet & meeting, Nov 15th. Cancel OTS appt of WD5CND. K5VR reported car tire to state police and WB5IAC reported car wreck via auto-patch 2-meter. OBs by K5DW 4, WA5LGN 4, WB5KUI 4, W5UAU 2. Traffic: W5QFU 48, W9YCE 47, N6AEN 44, W5UAU 43, KA5CFB 11, WB5GQH 8, W5KL 2.

LOUISIANA: SCM, Jim Giammanco, N5IB — New officers at GNOARC are WA5WJZ, vice pres., K5NL, member-at-large. GNOARC sponsors a 2 P.M. Saturday net on the 01/81 repeater. To reach the GNOARC club station, W5UK, just dial 523-HAMS. New officers of BRARC are: KB5AQ, pres., K5WMT, vice pres.; KB5YY, sec.; WB5RYC, treas.; WB5COO W5KYC and KA5CMX, directors. BRARC gave a set of ARRL publications to E. Baton Rouge Library, courtesy of WB5OAF. The NOVHF Club will soon have a repeater on the 450 MHz band. The club will be providing communications for the Mardis Gras Marathon in February. N5AVV and ARES provided communications during the YMBC air show in Lake Charles. CELARC enjoyed a covered dish supper to celebrate the Holiday Season. If you or someone you know performs a public service via ham radio, please let your SCM know about it. If we don't sound our own horn, no one else will. Don't forget the Lafayette Hamfest in

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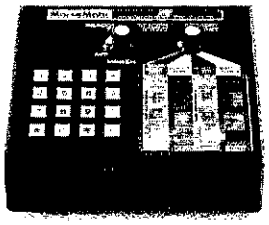
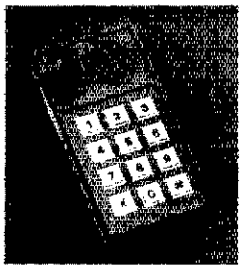


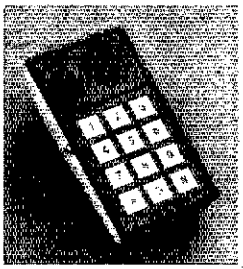
MorseMatic™

KT-1



Keyer Trainer

MT-1



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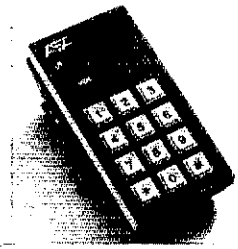
CK-1



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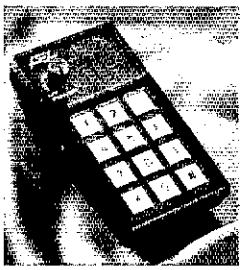
MK-1



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Memory Capacity (Total Characters)	500			500		400	100/400	400	
Message Partitioning	Soft			Soft		Hard	Hard	Hard	
Automatic Contest Serial Number	Yes			Yes		No	No	No	
Selectable Dot and Dash Memory	Yes	Yes		Yes	Yes	No	No	No	No
Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Calibrated Speed, 1 WPM Resolution	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Calibrated Beacon Mode	Yes			No		No	No	No	
Repeat Message Mode	Yes			No		Yes	Yes	Yes	
Front Panel Variable Monitor Frequency	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Message Resume After Paddle Interrupt	Yes			Yes		No	No	Yes	
Semi-Automatic (Bug) Mode	Yes	Yes		Yes	Yes	No	No	No	No
Real-Time Memory Loading Mode	Yes			Yes		Yes	Yes	No	
Automatic Word Space Memory Load	Yes			Yes		No	No	Yes	
Instant Start From Memory	Yes			Yes		No	No	Yes	
Message Editing	Yes			Yes		No	No	No	
Automatic Stepped Variable Speed	No	No	No	Yes	No	No	No	No	No
2 Presettable Speeds, Instant Recall	No	No	No	Yes	No	No	No	No	No
Automatic Trainer Speed Increase	Yes	Yes	Yes						No
Five Letter or Random Word Length	Yes	Yes	Yes						No
Test Mode With Answers	Yes	Yes	Yes						No
Random Practice Mode	Yes	Yes	Yes						Yes
Standard Letters, Numbers, Punctuation	Yes	Yes	Yes						Yes
All Morse Characters	Yes	Yes	Yes						No
Advertised Price	**$199.95**	**$129.95**	**$99.95**	**$129.95**	**$79.95**	**$139.95**	**$ 99.50/ $139.50**	**$229.00**	**$129.95**

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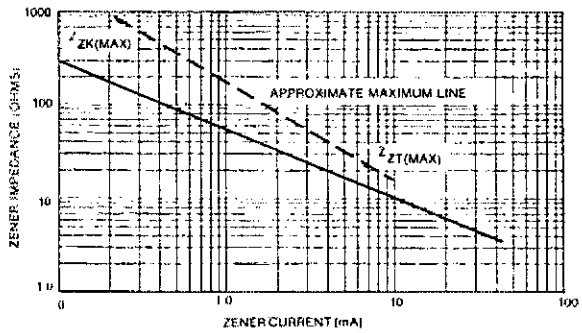
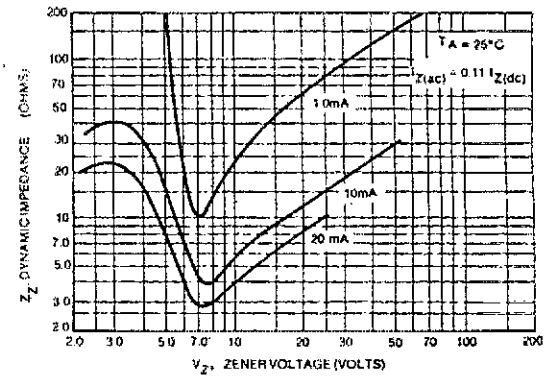
QST DATA FILE NO.5

CONCERNING ZENER-DIODE REGULATORS



CURVE NO.1



CURVE NO.2

A cursory look at the Zener diode suggests that it is a simple device with a standard p-n junction and a controlled breakdown-voltage characteristic. For most amateur applications we can accept this premise. But, in stringent applications we need to consider the diode impedance versus voltage and current, temperature coefficient, power derating, surge capability, thermal time response and frequency response (capacitance and switching effects).

Perhaps our greatest concern for the special diode characteristics is that of impedance. This becomes particularly significant when Zener diodes are used in ac and rf circuits. Specifically, the slope of the Zener voltage-Zener current (V_z/I_z) at Zener breakdown can be defined as the Zener impedance or resistance in ohms. The diode impedance always decreases as the current becomes greater, as shown by the curve at the top of the page. We can consider I_{zt} and I_{zk} as the two significant impedance terms for a Zener diode. I_{zt} is established near the quarter-power point of the diode, whereas I_{zk} is an arbitrary low power point in the knee region of the curve. If we plot the impedance between these two points on a log-log scale we will have an almost straight line. Since the current is a function of applied voltage, the curve will not be straight in an ac type of circuit. Rather, it may resemble curve no.2 at the top of the page.

What does this mean to the amateur? It suggests that we be aware of this characteristic when we use a Zener diode in a circuit where too low a parallel impedance could disrupt the circuit function. An example might be where a Zener diode is used as a protective clamp from collector to ground in an rf power amplifier. Another case would be where a Zener diode is used as a gate (series circuit) in a signal lead: During conduction the diode will present a series impedance in the signal path. Therefore, in a series type of circuit we should ensure that the current is such that the impedance is at a low value.

The diode capacitance with reverse voltage applied can be very high, and this will have a marked effect on many ac and rf circuits in which the diode is used as a shunt element. The lower the power rating of the diode, the lower the junction capacitance. Conversely, the lower the voltage rating of the diode, the greater the capacitance. This capacitance can range from less than 100 pF for a 1/4-watt, high-voltage diode (100-V) to more than 10,000 pF for a 50-watt, low-voltage (10-V) diode. Since the diode capacitance can introduce unwanted X_c in a circuit, its presence must be taken into account.

Our fundamental concerns when using Zener diodes in dc circuits are the voltage and power ratings. These are called out in the manufacturers' literature. The question remains as to selecting the correct power rating for a specific application. Detailed information on this can be found in the 1981 *Radio Amateur's Handbook*, chapter 4. Not only are Zener-diode equations and practical circuit examples provided, numerous types of diodes are discussed. These include PIN diodes, hot-carrier diodes, switching diodes, Gunn diodes, LEDs and solar-electric diodes. No amateur library is complete without this modern reference on solid-state devices. There is also a wealth of other technical and practical data in the vastly revised 1981 edition of the Handbook. — *Doug DeMaw, W1FB*

For more information about *The 1981 Radio Amateur's Handbook*, see page 133 of November 1980 *QST*. To order, see page 125 of this issue.

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Capital Area EN net manager, AD5O. Thanks to outgoing KA5AGD. Also congrats to WB5SNB now Extra and KA5EDW now General. With the Christmas holidays on us, we wish you all seasons greetings. The new year will bring new club officers, etc. Please send me such info so your officers can be listed. CAND (W5KLV) sess 30, QTC 818, with DRN5 rep. 100 percent by MS station N5AMK. DRN5 (WB5NKD) sess 30, QTC 351, with MS rep. 93 percent by N5AMK W5EDT WB5HAS W5UCY. GGCHN (KB5NX) sess 30, QNI 2629, QTC 163. MSBN (WD5EYM) sess 30, QNI 2001, QTC 47. MTN (K5OAF) sess 30, QNI 142, QTC 41. MN (WB5RMW) sess 28, QNI 472, QTC 5. MSN (KA5GGG) sess 12, QNI 29, QTC 11. RACES (N5AMK) sess 5, QNI 225, QTC 0. CAEN (KA5AGD) sess 5, QNI 113, QTC 3. GSEN (KB5W) sess 20, QNI 479, QTC 30. Traffic: N5AMK 414, KB5W 366, K5OAF 174, W5EDT 100, WB5SNB 50, W5XT 24, KA5AFT 20, WD5EYM 9, W5RIM 8, KA5GGG 4.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joseph E. Miller, K4DZM — STM: KZ4G. SEC: WB4ZML. Nets reporting (section net *)

Net	QNI	QTC	Net	QNI	QTC
B-ARES	63	6	*KNTN	474	164
5-ARES	43	3	*KSN	157	69
6-ARES	154		*KYN	312	259
CARN	159	18	*KRN	512	25
SEKEN	31	2	*MKPN	1146	105
TRI-ST	419	50	*KTN	1361	137
PAWTN	378	34	KPON	83	7
EWPN	239		9HN-D	334	354

Bullitt ARS turning out a new batch of Novices. Thanks to the DECs who are organizing their districts. We need stations to QNI 9HN-D. Traffic: K4JLX 169, KZ4G 155, K4HOE 132, K4DZM 114, KA4MZY 105, KB4OZ 94, WD4LXX 75, WA4EBN 73, WB4APC 69, KA4SAA 67, WD4ONV 62, KA4GFU 59, KS4V 55, W4RHZ 54, WA4AGH 53, KA4AZT 40, WD4COF 39, WA4JTE 39, WA4OMH 36, KA4MBF 32, WA4AVV 27, WD4JTO 23, K4AVX 20, KA4IKH 20, WB4ILF 20, WB4AUN 19, WA4SWF 18, W4PKX 16, WA4GAL 13, WA4YPO 12, W4CDA 11, N4AOF 10, KA4GVJ 10, WD4BSC 9, WA4NOG 9, WD4CJQ 7, KA4FJR 7, K4MHL 7, KU4A 4, WD4LTD 3, W4TPB 3.

MICHIGAN: SCM, James R. Seeley, WB8MTD — ASCM: WA8DHB. SEC: WA8EFK. STM: AF8V. DECs: WB8FLK K8RGT W8VWY. NMs: WD8BHE WA8DHB K8LNE K8KMQ WD8LRT WA8PIM W8SCW WA8RNB WD8RNQ WB8YDZ W8YIQ K8ZJU.

Net	Freq.	Time/Day	QNI	QTC	Sess.
QMN*	3663	1800/2200 Dy	1245	449	90
MITN*	3953	1900 Dy	646	336	30
GLETN	3932	2100 Dy	1150	231	30
MACS*	3953	1100 Dy	691	201	30
MNN*	3722	1730/2000 Dy	522	101	60
UPN*	3922	1700 Dy	755	83	35
SEMTN*	146.64	2045 Dy	128	43	29
BR	3930	1730 M/S	491	29	25
WSSBN	3935	1900 Dy	631	28	30
MEN	3930	0900 Su	215	1	5
VHF Activity 10 reports			661	28	59

*NTS nets. Times local. 3932 kHz is MI emergency frequency. Traffic workshop Sundays 3953 kHz at 1600. ARES net Sundays 3932 kHz at 1730. ARES (U.P.) Thursdays 3922 kHz at 1730. New OBS: W8MPD. OO reports: K8JH K8NKB W8QG W8RUQ KE8X OBS reports. K8NKB WA8RNB. Silent Keys, with deep regret: WA8IML W8WSA. WB8YRY has resigned as STM because of new business activities which leave him no time for leadership. Our new STM, AF8V, brings a lot of experience, plus interest and willingness, to the job. He is active at all levels, including TCC. Many thanks to WB8YRY for his fine work, and best wishes for AF8V. I enjoyed two fine club meetings in November: ARROW in Ann Arbor, and the Holland ARC. Superb hospitality and good rapport at both. Visiting clubs is one of the most enjoyable parts of the SCM job, and I hope to meet many more of you this way in the months to come. Kent County Repeater Assn. has merged into the Grand Rapids ARA, forming a single general interest club. Meetings first Friday, 8 P.M., at Red Cross Bldg. K8UNZ, pres.; K8JH, trustee. Upgrades to General: KA8ECB (now N8CDZ) KA8LDS/WD8LNW; to Advanced, WB8CUJ WB8SXO; to Extra, WA8QPN (now KI8V). N8AUL now KI8O. New officers for L'Anse Creuse ARC: KG8F, pres.; WB8ZJI, vice pres., K8OLM, secy.; WB8IOB, treas.; KA8EGT, act. mg. BPL: KA8CPS. Traffic: KA8CPS 394, AF8V 353, WD8LRT 317, WB8MTD 288, WD8KZX 269, WA8PIM 229, K8KMQ 182, K8DTG 173, WD8RNQ 170, WB8ITT 141, KE8X 134, W8UE 121, WA8DHB 105, W8VPW 104, KB8MX 86, N8KABA 81, W8SCW 75, WD8BHE 68, WD8MJB 65, WD8BSE 57, W8VIZ 56, W8IHX 55, WD8OSE 54, WB8SYA 50, K8GXV 49, WB8YRY 44, K8OCP 43, WA8DAF 43, W8YIQ 42, WB8HPZ 41, K8LNE 41, WD8IXZ 40, WA8TAQ 39, WD8ROK 38, WD8NKT 35, WB8ZIY 33, KI8O 30, W8MOF 29, WB8TTA 28, WB8VAI 28, W8LDS 27, WD8RWR 26, N8BJD 25, WD8EIB 25, W8HIN 25, K8UPE 22, W8JXJ 20, WD8JRT 19, W8PDP 18, K8ZJU 18, WB8ZNS 18, KG8Z 16, KB8GC 14, WD8JUP 14, WB8DJS 13, WD8RHU 13, KB8GT 12, W8TBP 12, K8BZ 11, KA8ECT 11, WD8IBY 10, W9NXD 10, KA8AID 8, WD8JFF 8, W8JUP 8, WD8LIP 8, WB8YWA 8, N8BNC 7, K8JED 7, W8SDB 7, W8EOI 6, WB8VVF 6, WB8AXI 5, KB8PW 4, WA8VBF 4, N8AFZ 3, W8BEZ 3, K8CIP 3, KB8FK 3, W8VWY 3, WD8BEN 2, K8DD 2, K8NKB 2, W8WVL 2, WB8WYO 2, W8LOU 1.

OHIO: SCM, Allan L. Severson, AB8P — Asst SCMs: W8MOK AF8O. SEC: K8AN. NMs: K8AAZ WD8KBW WB8KWD K8OZ WD8OMP WB8YGW. Net reports:

Net	QNI	QTC	Sess	Time (Local)	Fren.
BN	537	285	58	6:45/10 P.M.	3.577
BNR	94	2	22	6 P.M.	3.605
ONN	211	50	29	6:30 P.M.	3.708
OSN	232	130	30	6:10 P.M.	3.577
OSSBN	3011	948	90	10:30 A.M. 4:15 6:45 P.M.	3.9725
O6mN	328	37	30	9 P.M.	50.160

W8ADW (new president of Cleveland Chapter 1 of QCWA) reports that QCWA has picked Cleveland for the site of its 1981 National Convention. If you can help him organize this most important project, give him a call. K8JE advised that the Hamilton County ARPSC has scheduled an Ohio State Convention in the Cincinnati area for June 13 and 14. Your input here is also requested and more details will follow. Public Service activities continued throughout the month with cooperative weather. Now both hospitals and Amateur Radio groups are gearing up for "Operation Santa Claus" state-wide. An immensely satisfying but heart-breaking service in many ways; you'll never forget the sight of an afflicted child's face lighting up as Santa talks to her/him "from the North Pole." Try it. Upgrades:

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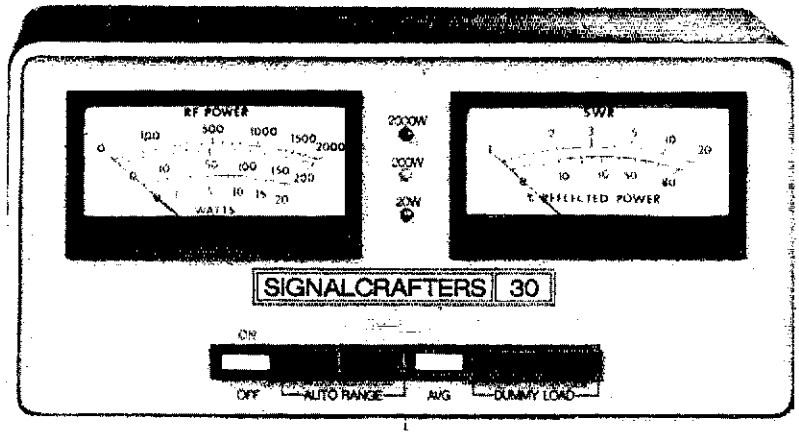

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Local Nets	QNI	QTC	Sess.
BARF	115	41	23
BRTN	343	172	30
COARES	117	5	3
LGNWOARES	308	73	25
MASER (Oct)	70	4	1
RARA	95		4
TSRAC	556	68	24
VWCEN	32	7	4

Cleveland Wireless: W8IMF, pres., W8SDV, vice pres.; W8LYD, secy/treas., NOARS: K8US, pres., KB8MU, vice pres., N8AHK, secy.; WD8ADE, treas. Westpark Radiops: N8AUH, pres.; AC8X, vice pres., AF8C, secy., WD8BJL, treas., LEARA: AB8P, pres.; WB8JGW W8HFE, vice pres.; WA8MAA secy.; W8GRG, treas. Traffic: (Nov.) K8OZ 234, WD8KFN 211, WB8JGW 203, WB8DMF 194, AB8P 159, K8AAZ 152, W8JMD 150, WR0EM 150, WA8HGH 144, WD8KBW 139, WA8GMT 131, W8OZK 98, WB6UBR 87, N8XX 86, WB8MEK 84, KA8DJZ 83, N8AKS 80, K8BYR 80, N8CW 71, WA8SSI 65, WB8IKU 57, WD8DYW 54, KF8J 54, K8AN 48, W8GGZ 47, WD8OYO 47, WD8PMW 47, WB8SIQ 47, W8TP 46, W8MOK 40, WB8MRL 37, WB8PIY 37, WD8QMP 36, N8CDO 35, WA8MAZ 35, WD8NEG 35, K3RC 32, WB8YGW 32, WB8WEG 30, WB8KQJ 29, W8UOY 28, WB8CJU 27, W8UPD 27, WB8TTQ 26, WB8QXN 24, WB8EMK 22, WB8YYS 21, WB8BHL 20, K8CKY 20, WD8INK 18, W8ELG 17, W8IM 16, WB8QHV 15, W8EK 14, W8RG 14, N8AUH 13, WD8DTG 12, WB8TRK 12, WD8DDE 10, WB8SRC 10, WA8VEC 10, W8HVA 9, WD8PUH 9, WB8QHU 9, K8DL 8, KA8IUK 8, WD8MIO 8, WD8LZW 7, WB8NHV 7, N8AHK 6, WA8BOV 6, WD8EKI 6, WB8KKI 6, W8OQL 6, K8BNL 4, WB8VLR 3, N8AJU 2, WB8NTR 2, WB8YUS 1, K8YUW 1. (Oct.) WD8DTG 22, WB8JJU 11, KA8HXX 8, K8NQW 6, WD8MIO 4. (Sept.) KF8J 78.

HUDSON DIVISION

NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MVQ — SEC: WB2VUF. STM: W2XD. NMs: N2CR KB2HM W2PSU KA2GQQ W2TCA W2UEZ & WB2IQJ.

Net	Freq.	Time/Days	Sess.	QNI	QSP
NJN/E	3695	7 P.M. Dy	30	1453	218
NJN/L	3695	10 P.M. Dy	30	303	156
NJSN	3735	6:30 P.M. Dy	30		
NJPN	3950	6 P.M. Dy	35	630	307
NJVN	49/49	10:30 P.M. Dy	30	292	214
OBTTN	72/12	8 P.M. Dy	30	515	102
UCTEN	085/685	7:30 P.M. Dy	30	213	73
NJRTTY	147.51	Autostart Dy	30	75	102

OO reports: WA2QZD W2TPJ and WA2MVQ. Note: The Northwest New Jersey VHF Net operates Wed at 8:30 P.M. on 147.90/30 with N2BNB as NM. Sussex and adjacent Counties check into this new net. N2BOP will assume NM of OBTTN 1 January 1981. The rest of the above NMs will continue for next year. Fair Lawn ARC reports they sport a new TH6DXX at their club station. TCRA reports the following upgrades: to General KA2JQA and KA2AMG to Advanced. WA2CBB has received #5 DXCC via satellite. What an accomplishment! BARA news: new officers — K2TM, pres.; KB2EI, vice pres., WA2ASC, treas.; WA2INW, secy. Upgrades: KA2CJI to Advanced, KA2ILD to General and KA2CXG to Tech. WA2UGT's German quad working FB! Metroplex reports a total of 569 members with 12 DX members including VE, G, GM, F, JA and 8P6s. N2BFL upgraded to Advanced. Sussex County ARC notes: WB2GUR upgraded to Extra and N2BNB passed his 20 wpm. N2BNB is organizing "Operation North Pole" to cheer up children in hospitals via ham radio. SWLs in the Sussex area interested in taking the Novice course, call WB2LHY, 383-5126, or N2WM on 948-6489 both 201 AC. Upgraded: KA2IXB to General. Old Bridge ARC: AF2L has been appointed to the Emergency Communication Advisory Committee for Second Region and is most anxious for suggestions in this area. WA2UDT was active during SS test with 43 states on 6 meters and worked 4U1UN on 6 for a new country. KB2IY and N2BQL from the Old Bridge DX group to earn DXCC. STM W2XD advises he was well received with a "Traffic NTS handling" presentation to TCRA. KA2GQQ has converted a Sears Roadtalker to 10. W2NKD advises KA2ERG is planning ham coverage of the International Boys Soccer Tournament in Westfield on Memorial Day in 1981 and is looking for volunteer help. New Extra from Holmdel ARC is KI2Q. W2PSU and WA2MVQ have been active on RTTY handling Italian earthquake health and welfare messages. NJVN was active during the Italian earthquake and on November 26 passed 65 pieces of traffic with the following active: AG2N WB2WEX AG2R N2BNB WA2MVQ W2PSU and WA2OPY. *Traffic:* WA2MVQ 469, KF2T 302, W2UEZ 301, AG2R 260, W2GWS 224, W2TCA 206, K2VX 185, AF2L 180, W2XD 138, N2BNB 137, N2BOP 118, KA2GQQ 93, N2CR 78, KB2HM 76, WB2RMJ 53, W2CC 49, KA2HNQ 45, KA2CYZ 34, N2XJ 30, WA2CLP 25, W5DTR 25, WA2MIF 25, WB2KLF 20, N2SU 20, WA7DPK 17, N2BQL 10, KA2FXA 6, W2NKD 6, KI2Q 5, N2BC 4, K2UM 1.

MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, K0CY — SEC: W0RPK. STM: KA0X. NM: WB0AVW W0YLS. Welcome to KA0X as the new STM. She is a very competent traffic handler at all levels and will do a fine job. Hope to meet all at the Davenport Hamfest Feb. 29th. Hope to have a section meeting at the Hamboree 5 in Sioux City March 21 & hope everyone will attend. New 2-m ssb net Sunday at 8 P.M. on 144.300 from Sioux City. KA0CLQ WB0URA WD0EIF K0PCG &KB0OE received DXCC. Congrats to WB0ZKG for ARRL VHF Contest Award with Division leader endorsements. Congrats to upgrades KA0FZN to Advanced. New call for WA0VKF, now KF0H. 1981 officers for North Iowa Amateur Radio Club; WB0UPF WA0ZLA & WB0FWB. Send in your nominations for "Iowa Amateur of the Year" by April 1. W0SH received Win Mager Award in Des Moines. Support the Iowa Code Net on 3713 at 0100 MWF. Good training net. Humboldt citizen of the year is K0GP; nice going. Good reports from K0HCO K0IIR W0FQ W0BW K0MST WD0HUJ & W0JAQ. WA0AUX with another BPL.

Net	UTC	Days	Freq.	QNI	QTC	Sess.
IOWA 75m	1830	M-S	3970	1181	127	25
IOWA 75m	2330	M-S	3970	1079	72	25
TLCN	0030-0400	Dy	3560	382	150	60
ICN	0100	T-Th S	3713	23	4	8

Traffic: WA0AUX 586, W0SS 171, W0YLS 129, AE0R 104, KA0X 100, K0GP 78, K0CY 71, WB0UPF 28, W0LFF 19, W0BW 14, W0RPK 7, WD0HND 6.

KANSAS: SCM, Robert M. Summers, K0BXF — SEC: W0KL. NMs: W0OYH W0FT. This must be the relaxing month, at least from the reporting standpoint of view.

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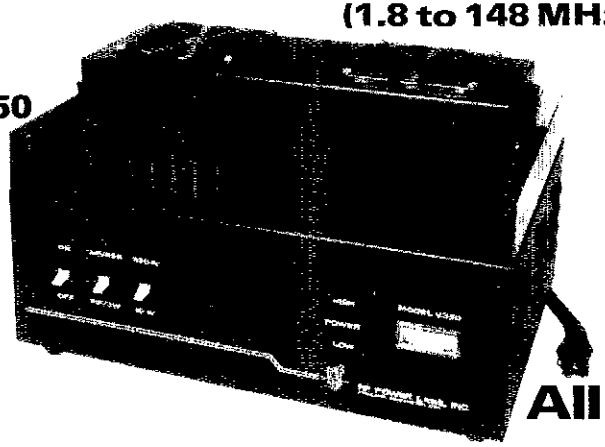
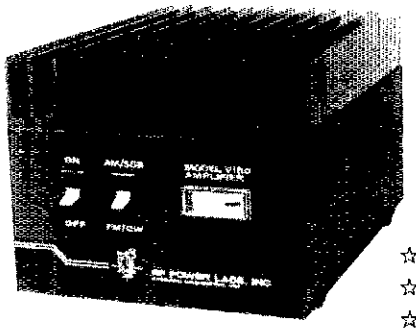
MODEL: V350





MODEL: V180

- ☆Built-in 115/230 VAC Supply
- ☆AM-FM-CW-SSB-RTTY
- ☆60dB Harmonics
- ☆60dB Spurious
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- ☆Illuminated Panel Meter
- ☆Automatic T/R Switching
- ☆VSWR Protected
- ☆ +13V/3A Accessory Socket
- ☆U.S. Manufactured

MODEL	FREQUENCY	INPUT	OUTPUT	SIZE WxDxH	WEIGHT	FAN KIT REQUIRED	PRICE
**C500X	2-22MHz	15-40W	500W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	$1395.00
A1000	160-15 Meter	50-100W	600W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	1395.00
**A1000X	160-10 Meter	15-40W	600W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	1395.00
V76	50-54MHz	8-15W	100-120W	216x330x178mm	11.7 kg (26 lbs)	No	399.00
V360	50-54MHz	5-10W	400-450W	432x330x203mm	23.4 kg (52 lbs)	Yes	1085.00
V70	144-148MHz	10-15W	75-90W	216x330x178mm	11.7 kg (26 lbs)	No	349.00
V71	144-148MHz	1-3W	75-90W	216x330x178mm	11.7 kg (26 lbs)	No	399.00
V180	144-148MHz	5-15W	170-200W	216x330x178mm	13.5 kg (30 lbs)	CW & FM	599.00
V350	144-148MHz	10-20W	350-400W	432x330x203mm	23.4 kg (52 lbs)	Yes	1085.00
F110	Fan Kit, 115VAC			135x135x50mm	1 kg (2.2 lbs)	—	$ 39.00
F220	Fan Kit, 230VAC			135x135x50mm	1 kg (2.2 lbs)	—	39.00
*F135	Fan Kit, 115VAC			381x140x89mm	3.2 kg (7 lbs)	—	75.00
*F235	Fan Kit, 230VAC			381x140x89mm	3.2 kg (7 lbs)	—	75.00
RM-1	19 Inch Rack Adaptor			483x3x178mm	1 kg (2.2 lbs)		29.00
*RM-2	19 Inch Rack Adaptor			197x32x28mm	.5 kg (1.1 lbs)	—	19.00

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VISA

Only 3 stations reporting PSHR totals. Only 16 reporting traffic activity. Just 1 report received. Let's WHOOP it up next month gang and have a 2 page report!! Have it on pretty good source that WØHI now has a voice rig and we just might hear his real voice instead of just dots and dashes. KS Wx Net reports QNI 894 and 501 QTC. We have all missed WAØLBB the past month while he has been in the hospital. Cw Net QKS: QNI 319 and QTC 118. KSBN: QNI 1164, QTC 141 for 26 reported sessions, figures out 1343 QNI and 162 QTC for a perfect 30 session report. WHO slipped up??? KBN Avg 378 QNI and 20 QTC. Still no one wanting to take up mgr of QKS-SS. WØKL is building up equipment to work OSCAR. The lil birdie passed the word that WØQQQ will soon be transmitting on a new linear — hope some transmit the rig on the KANSAS NETS frequencies. For any ham in Salina area on Wednesdays, drop by the Elmore Cafeteria, you just might catch up with a few more hams, especially at the noon hour. Have you been to a club meeting lately??? They need your support too!! But they are not doing anything you say. Remember you are one of those; THEY; people too. Someone has to stay aboard to keep things going. Don't be a drop out. Traffic: WØOYM 163, WØHI 111, WØFIR 89, KØEZ 88, KØBXF 82, WBØYLP 82, WDØACG 80, WØAM 72, WØFT 60, WØPB 38, WØCHJ 33, WØASY 25, KØYTA 23, WØFDJ 22, WØRBO 11, WØKL 7.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst SCM, Joe Flowers, WØOTF. SEC: WBØFKY. New officers of the Kansas City DX Club have been elected and are as follows: KBØU, pres.; KBØX, vice pres; AKØA, secy./treas. WØVWW is home from the hospital and doing real well. He is putting up a new 3-element yagi. WØCKK is recuperating at home from a lengthy stay in the hospital. The Ozark Amateur Radio Society is making the ARRL 10-Meter contest a club effort.

Net	QNI	QTC	Net	QNI	QTC
Cent. Mo. Em.	127	19	MOSSBN	788	64
NEMOE	114	2	MON	182	250
ACE	38	1	MON2	153	80
HBN	334	36			

Our deepest sympathy to the families and friends of WØJXJ WØEVI KØPKS and W9VUC/Ø who joined the ranks of the Silent Keys. Congratulations to the following upgrades: Tech — KAØISM and WDØFTQ; Gen — KAØGON KAØGOO KAØHUI and KAØIZJ; Extra — KØTBB WBØCJB W4SNB/Ø and KAØAQZ, a 15 year old. Traffic: KØONK 692, WØBMA 648, WDØBEV 356, WØOUD 281, KØSI 192, WØOTF 116, WØBV 101, KØPCK 90, KØBM 85, WDØGCZ 38, KAØP 28, KAØE 19, WAØKUH 5, KØRWL 3.

NEBRASKA: SCM, Shirley M. Rice, KAØBCB — SEC: WAØASM. New 40-Mtr Net off to a good start. Meets 1900Z Dy 7233. Congrats to WØFQB on receiving QCWA's Meritorious Service award. FB! 1981 officers are: WØPNV, pres.; WØAP, vice pres.; WØUOJ, secy.; WØWVE, treas.; WØBTM WØCSW WØEUT WØLJO WØWKP, dir. Congrats to KAØIOM and NØCBK upgraded to Gen & KAØIME to Tech. Traffic: WBØSXM 197, WDØBQG 195, WDØCID 166, KØBRS 132, WØHOP 49, WBØSXN 41, WØEUT 40, KAØBCB 26, WØZNI 23, WBØGMQ 15, WAØLOY 14, WØFQB 12, WAØPCC 12, WAØQEX 12, WAØDXY 11, WBØGWR 11, WØNIK 10, WØWKP 5, WØWZR 5, WAØWRI 3, KAØBWM 2, WBØULH 2.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, Stan Horzepa, WA1LOU — SEC: W1SY, STM: KA1KD, Asst SCM: WB1AIU.

Net-NM	Freq.	EST	Sess.	QTC	QNI
CN-K1EIR	3640	1900 + 2200	60	302	341
CPN-K1EIC	3965	1800/1000 Su	30	88	313
NENN-WB1CPF Nutmeg-	3720	1815	30	106	271
WA1ELA RASON-	28/88	2130	29	87	345
WB1CPF WESCON-	13/73	2100 MWF	12	9	70
WB2PJU	78/18	2030	30	113	437

Hi QNI CN: WB1ESJ K1GF WB2PJU. CPN: K1AQE WB1DGR KA1DZV KA1EJF WB2PJU. N1AEC and K1DP handled Italian earthquake traffic for Stamford area. Valley ARA provided communications for Derby Griffin Hospital when phone system failed. Waterbury EC, N1ADE, called on area members to provide communications for search and rescue operation for lost child. southeastern ARES members (43 strong) average 21 attending weekly drill. Bethel Middle School ARC has 47 signed up for Novice class; WB2PJU's Advanced and Extra class starts in January. Congratulations to 5 year old Greater Fairfield ARA. K1OQG pining for new skyhook. New appointee: WB3GPR OO, WB1CPF interim RASON NM. New calls: N1BFJ ex-WA1ZXU, N1BFS ex-KA1BFO, KA1ML ex-KA1BEJ. Upgrading: Advanced's N1API and KA2BNV, W1VS likes life on 160 meters. Dx net forming in Danbury area ... contact WB9LFD. K1FHP put CQ Radio Club's K1BCI on the air from Bethlehem during holiday season ... commemorative QSL card available. W1QV traveling westbound. May the new year bring new rewards aboard the ham radio bands! Traffic: (Nov.) W1EFW 338, WB1CPF 269, WB2PJU 204, K1GF 192, W1BDN 122, K1XA 107 WB1DGR 97, WB1ESJ 97, K1AQE 63, W1DFT 52, W1GV1 44, WB1CRH 43 WA1WOG 36, KA1DZV 25, KA1KP 24, W1KV 24, WA1LOU 24, K1BHT 21, K1CE 21, W1QV 16, K1EUW 15, KA1KD 8, W1CUH 5, K1OQG 2. (Oct.) W1DFT 75.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — STM: WA1TBY, SEC: WA1BLG, ASCM: WAØNEW.

Net	Mgr.	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	N1GO	3.658	1900/2200/Dy	389	353
EMRIPN	KA1BJY	3.898	1730/Dy	376	237
EM2MN	KA1CGP	90/30	2000/MWF	83	33
EM2MN	KA1CGP	145.8	2000/TTh		
NEEPN	K1BZD	3.945	0830/Su	70	19
HHTN	K1BSQ	04/64	2230/Dy	639	221
HHTN	WB1EZT	23/63	1815/Dy	---	---
EMRISS	WB1DHW	3.715	2030/Dy	176	98

Many thanks to the fellows that have been helping out taking traffic into and out of Italy after the earthquake. Some of those that I know about are K1BSO WA1TBY W1EGE and W1XA. Also W1YNE from the RI Section has been a major point of contact throughout the disaster. Everyone of these fellows are active in out traffic nets and it is no coincidence that when the chips are down these experienced traffic handlers are the leaders. My apologies if I did not mention any others, but these fellows were the ones that I heard about. On a personal note I have moved, or at least I should have by the time you read this. The bad news is that it is not out of the section, so you're still stuck with me as SCM. My new address is 6 Tracy Circle still in Billerica. I had a pretty good vhf location before, but this one is even better, be-

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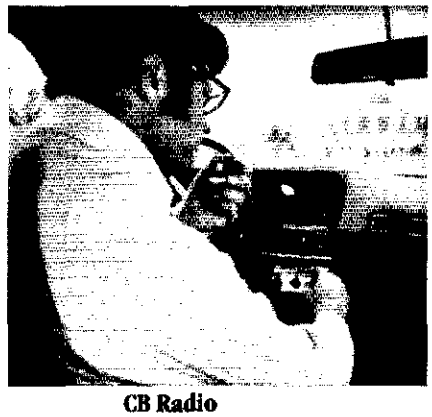

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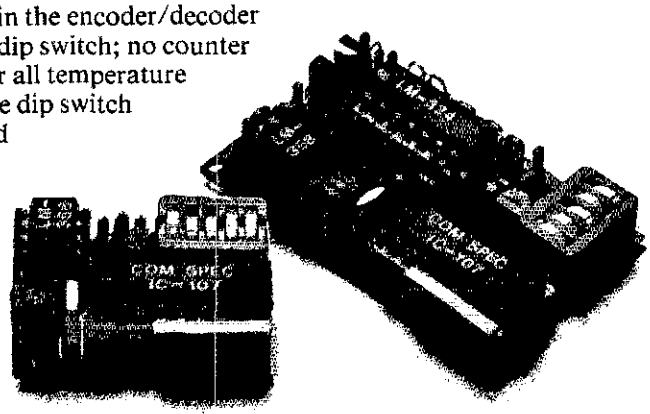

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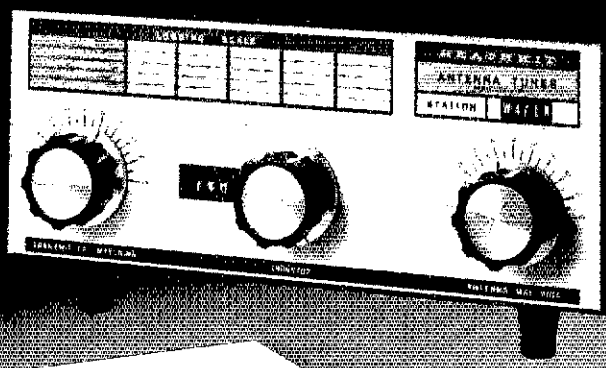

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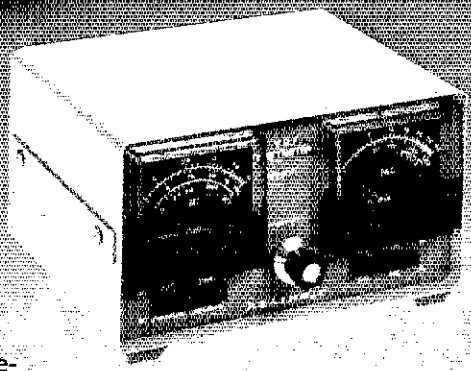

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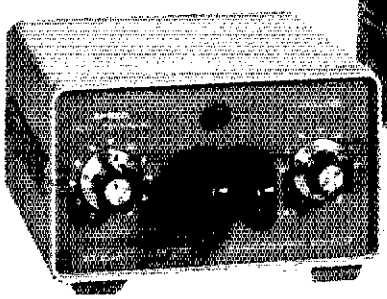

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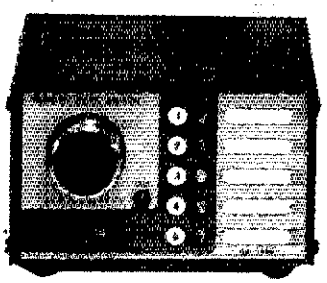

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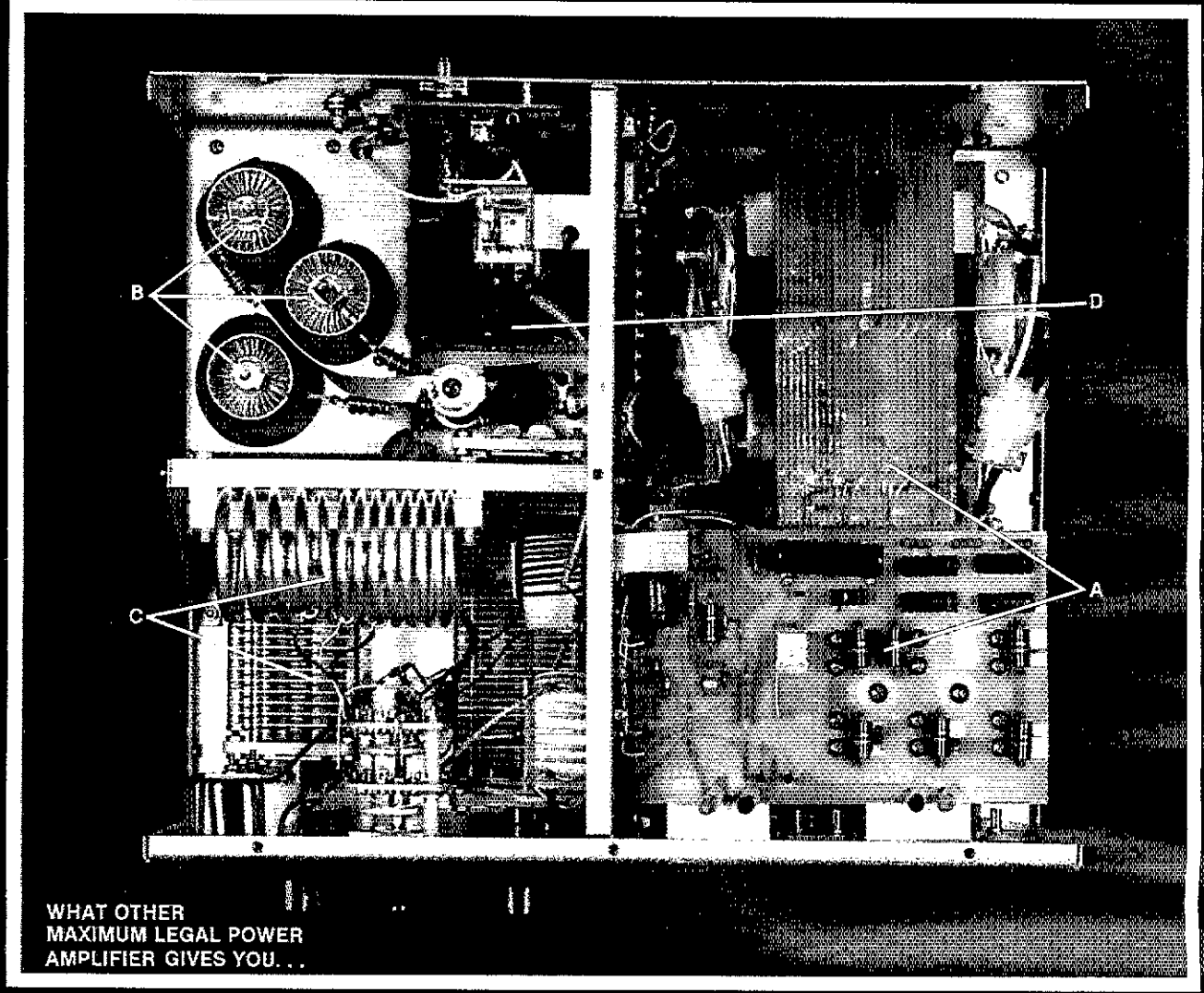

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ing right on top of a hill with a view of the Boston skyline. I'll be waiting until spring to get the tower and beam up, but in the meantime there will be some kind of a fash up you can be sure. You're all invited to inspect the new abode at your pleasure. Quannapowitt Club held a successful auction agn. Mitre Bedford member, W1JR, now at WANG. Chelmsford Club running Novice classes. Wellesley Club member, WB1FTD, upgraded to Advanced. Framingham member, W1JDO, home from the hospital after his heart attack. Middlesex Club has ten students in its Novice class. Transplanted Capeway Club member, W1AN, paid a visit recently on a trip back to New England. Massasoit Club member, AE1P, has started FD preparations already. Traffic: (Nov.) WA1TBY 661, WB1OHW 302, K1BSO 248, K1GN 160, W1ATX 158, K1BA 124, WA1GJ 100, KA1CMR 97, N8TM 81, K1BZD 80, WB1EZT 80, W1EGE 74, W1DMH 59, KA1EMO 53, WA9NEW 49, K1BT 45, KA1CGP 45, WB1DXT 35, WB1DXR 34, WA2ORV 27, AK1J 20, WA1FNM 14, AE1X 14, W1CE 11, W1PJ 10, KA1MI 9, WB7TPY 9, W1LE 7, W1XA 6, W1PEX 4, WB1ANT 2. (Oct.) WB1DXR 48, WA1IFE 28, KA1EMO 20.

MAINE: SCM, Cliff Laverty, W1RWG — STM, W1KX. SEC: KL7IJG. I made an official visit to the Sandy River Radio Club in Farmington at the invitation of the president, W1HTG. A five-wire group, they are upgrading a repeater 37/97 on Sugar Loaf Mtn. SEC KL7IJG, gave an outstanding presentation on emergency preparedness and demonstrated his 3-day pack: hf vhf power, food & shelter. PSHR: W1RWG 102, AK1W 93, AF1L 76. Sessions/QNS/Msgs: BN 25/830/5; SGN 25/1205/128; AEN 4/64/1; MSN 12/81/17; PTN 30/326/157; CMEN 12/152/23; RACES 5/68/7. Traffic: W1KX 141, W1RWG 139, WB1BYR 103, W1HDC 51, AF1L 51, N5YX/1 49, WA1JZP 43, W1JTH 40, W1YA 35, AK1W 27, W1AHM 22, K1TVT 16, W1GKJ 10, WA1YNZ 10, W1BMX 6, KA1FCU 3, WA1ZJL 3, WA1MUX 2.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH. STM: W1TN. NMs N1NH & AK1E. Congrats to W1JB, 57 years a ham. The QST front cover for Dec was K1NH not W1NH. Thanks for congrats, but they are for Bill in Newport. KA1BBI has WAS & 25 wpm CP. WB1HGQ now Extra; KA1GXB now General, WA1WRS's gal Sarah now KA1GEE; WB1FVL now KA1LZ. Looks like the girls are advancing faster than the guys. AK1E reports many new operators on GSFM Net. KA1KW now Extra. Flash: WB1HGQ is on cw! An excellent time was had by all at the Port City Club's annual meeting & Ladies Night. The entertainer must have been a cw operator, she could send very fast. Active OVS: AF1T, now teaching in Concord. Grafton County EC, WA1OUO, is resigning. Thanks for your efforts & support. Seen on hyways and byways: K1SNY W1GUH WA1UKA & W1MHD. The Concord Brasspounders held its annual Ladies Night at the Cat & Fiddle. WA1TLO now KA1O. The Great Bay Radio Assn is holding a drawing for a cord of wood this spring. Contact editor KA1BXA and help the club. K1BH reports the Portsmouth repeater will be ready soon. Don't forget the NH QSO Party in February. Keep shoveling. Traffic: AK1E 224, W1TN 207, N1NH 98, WB1HGQ 65, W1MHX 52, KA1BBI 43, W1GLJ 36, N1ALM 27, W1ALE 26, WA1PEL 17, WB1DSW 15, N1BAP 10, W1CUE 10, W1NH 8, W1UN 3.

RHODE ISLAND: SCM, J. Titterington, W1EOF — SEC: K1DT. STM: N1RI. RIEM 2-Mtr Tfc Net: sess 20, QNI 209, QTC 57. Rpt by WA1OSL, acting Net Mgr. W1ZPG is enjoying his retirement. Several clubs held Christmas parties and a good time was had by all. W1YNE busy with his earthquake tfc, but no report from him as to quantity. Seems RTTY is doing a good job to Italy. We go into 1981 and only a handful of people are doing all the work. Let's hope the New Year will bring forth more help from the rest. Within the limits of our economic scene, hope one and all of you do enjoy a prosperous New Year. Traffic: W1EOF 343, KA1FE 180, KA1BTU 169, N1RI 51.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. STM: WB1ABQ. WB1ABQ, Lyndenville, has been appointed Section Traffic Manager. The VTN, slo-speed cw tfc net, is operating on 3614 at 7 P.M. daily, with contacts in various VT nets and other nets. QNIs with or without tfc are very welcome. K1BQB is home from a rgh go in the hospital & still under strict orders from her doctor. Is coming along fine. Oct VSR 393/31/85; GMN 464/25/38; VSB 440/30/133; Carrier 413,25/43; VPN 69/5/9. WB1CZE, formerly of Pittsfield, MA, now in Williston since Oct. My call was hrd out of 7 MHz band oping cw — this stn not on air time date. Wud appreciate knowing if anyone hears the call other than net freqs. Any others, same boat? Traffic: WB1ABQ 84, N1ARI 66, WB1CZE 27, W1RNA 21.

WEST MASSACHUSETTS: SCM, Art Zavarella, W1KK — ASCMs: K1BE W1BVR. SEC: W1JP. STM: W1TM. NMs: W1UD W1UPH WA1MJE. A record month for ARES with 485 QNI and 39 QTC in 5 Sunday A.M. sess. of WMEN and concurrent liaisoned repeaters K1ZJH K1FFK W1GZ WR1ABO K1NBS WR1AEF. Welcome new OESs: W1YI K1JHC WB1DBN. Word from W1UD: the new Ultimate Design repeater Clinton Civ. Def. wiemer. power back-up, mobile Mt. Wachusett bound 144.750 in/145.350 out, only 2 cu. ft. The restart of Novice Tfc Net off to good start per summary from STM: 22 stations, 44 QNI, 28 QTC with KA1EBA and WB1FXJ leading new check-ins. Italy earthquake traffic kudos to K1EPI WB1CJH K1JHC. PSHR: WB1HIH 101, K1JHC 89, W1TM 72, KA1EBA 44. Traffic: WB1HIH 218, W1TM 213, W1UD 155, W1KK 99, K1SSH 94, KA1EBA 67, W1ZPB 59, K1JHC 56, WA1OPN 47, W1YI 33, W1BVR 29, W1EFC 27, K1IJV 26, WB1CWH 15, W1JP 13, W1UPH 8, WB1HKN 6, K1BE 2.

NORTHWESTERN DIVISION

ALASKA: SCM, Fred S. Wegner, KL7HFM — ASCM: AL7AC. KL7IBG KL7EWQ. SEC: AL7O. STM: KL7HPU. NM: Snipers KL7JFY Bush Net AI7R AK Code Net KL7JFT See Saw Net & EC Juneau AL7AW. EC: Anchorage KL7JDR Kenai KL7HIX Kodiak KL7IKX MARS. More appointees needed so if YOU would like to help, please feel free to contact any of the present officials and discuss it. A lot of AK hams are anxiously awaiting the 1049 mile Iditarod Dog Sled race this year. A big opportunity to get out to the bush communities, be a part of the action and help. Many lasting friendships are made each year. AL7G asked EARLY for McGrath — look out BOOM-BOOM. Send your traffic reports and news items to any of the ARRL appointees for relay to me. Traffic: KL7JFT 80, KL7IYX 78, AL7O 50, AL7N 40.

IDAHO: SCM, Lem Allen, W7JMH — The Payette Club is having a Xmas banquet Dec. 20. The Boise Club is having their banquet Dec. 16, and is planning to give a crash Novice course during Xmas vacation, headed by WB7PFQ. N7APC has new Macrotronics M800. We all mourn the passing of WB7DVZ who joined the ranks of the Silent Keys Nov. 7. He will be missed. Net reports:

Net	Freq.	Time	Sess.	QNI	QTC
Farm	3935	7 P.M. Dy	30	1347	39

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BUILT-IN DEMODULATOR

ADVANCED OPERATING FEATURES

The Robot 800.

BLUEPRINT FOR A SPECIALTY MODE STATION.

If you have been shopping around for RTTY equipment, you probably have asked yourself "How can I get high performance, multiple-mode capabilities without spending a fortune?" Robot Research has answered this question through the use of microprocessor technology. The Model 800 is the most complete specialty mode terminal ever offered for under $1,000, yet it has features and performance capabilities which put it in the class of systems costing twice this amount or more!

HOW DID WE DO IT?

Most advanced RTTY systems on the market are designed for multiple applications. As a result, these systems are burdened with exotic features which are seldom used on amateur radio. These "features" add to the cost, complicate operation, and in some cases, even compromise performance.

The 800 does not attempt to double as a hobby computer, or a timeshare terminal. It was designed expressly for use as a specialty mode communications terminal for amateur radio, and nothing else! By focusing our attention on this simple concept, we are able to provide a product which works better, costs less, and is easier to operate than those systems which try to do "everything" and end up doing nothing very well.

ONE EXAMPLE:

The single most important factor which affects RTTY receive performance is the quality of the demodulator. In the 800, we do not allow for a wide variety of shift frequencies through the use of tuneable filters. There are only two shifts which are used in amateur RTTY, and tuneable discriminator filters are both expensive and are poor in performance. The 800 uses separate mark and space discriminator filters for each of these two shifts which are precisely tuned at our factory. Even though the center frequency for the mark filter is the same for both wide and narrow shifts, the bandwidth is different and therefore requires separate filters. By giving careful attention to these details, we can equal or exceed the performance found only in expensive stand-alone terminal units.

WHAT ABOUT FEATURES?

The Model 800 has all of the advanced operating features such as split-screen, word and line editing, message memories, autostart, SELCOM, and many others. In addition, the 800 has a complete set of operating aids such as an on-screen status line, graphic tuning indicator, and a side-tone oscillator. To get a complete picture of all of the features which the 800 offers, we suggest that you contact us for a full-color brochure, or visit one of our dealers for a demonstration.

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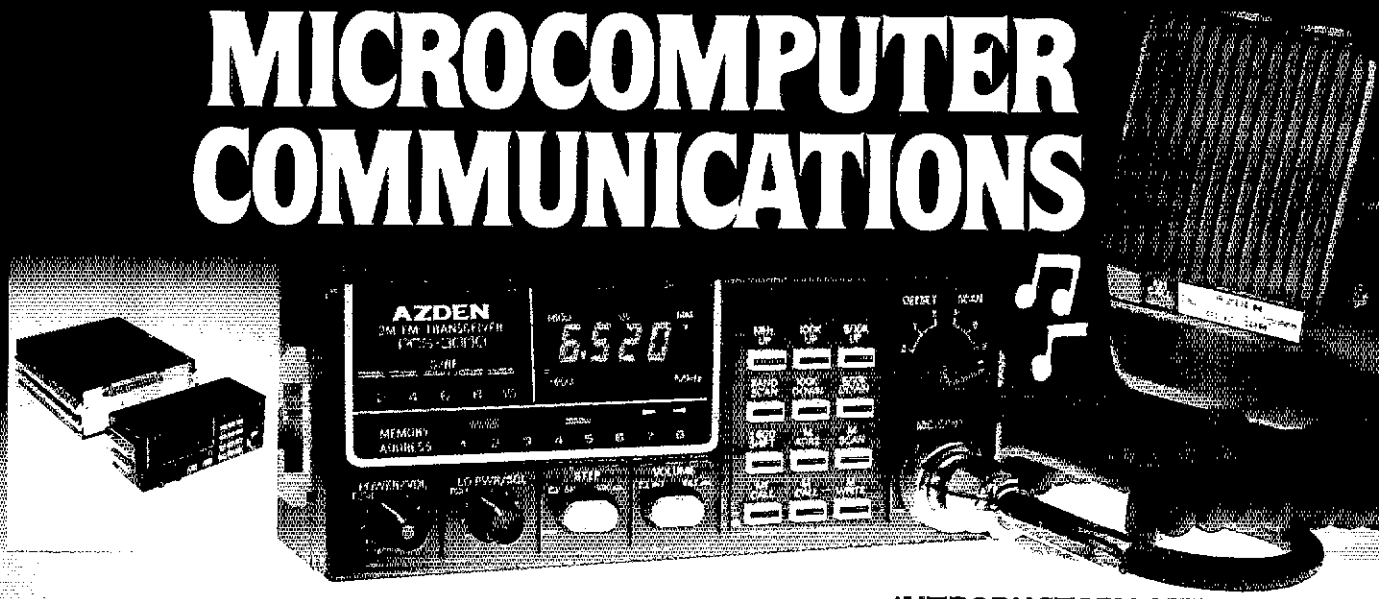

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INTRODUCTORY OFFER

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COMPARE THESE FEATURES WITH **ANY** UNIT AT **ANY** PRICE

- **8 MHZ FREQUENCY COVERAGE, INCLUDING CAP/MARS BUILT IN:** Receive and transmit 142.000 to 149.995 MHz in selectable steps of 5 or 10 kHz. **COMPARE!**
- **SIZE:** Unbelievable! Only 6¾" by 2⅜" by 9¾". **COMPARE!**
- **MICROCOMPUTER CONTROL:** All frequency control is carried out by a microcomputer.
- **MUSICAL TONE ACCOMPANIES KEYBOARD ENTRIES:** When a key is pressed, a brief musical tone indicates positive entry into the microcomputer. **COMPARE!**
- **PUSHBUTTON FREQUENCY CONTROL FROM MICROPHONE OR PANEL:** Frequency is selected by buttons on the front panel or microphone.
- **8 CHANNEL MEMORY:** Each memory channel is reprogrammable and stores the frequency and offset. Memory is backed up by a NICAD battery when power is removed.
- **INSTANT MEMORY 1 RECALL:** By pressing a button on the microphone or front panel, memory channel 1 may be accessed immediately.
- **MEMORY SCAN:** Memory channels may be continuously scanned for quick location of a busy or vacant frequency.
- **PROGRAMMABLE BAND SCAN:** Any section of the band may be scanned in steps of 5 or 10 kHz. Scan limits are easily reprogrammed.
- **DISCRIMINATOR SCAN CONTROL (AZDEN EXCLUSIVE PATENT):** The scanner stops by sensing the channel center, so the unit always lands on the correct frequency. **COMPARE** this with other units that claim to scan in 5-kHz steps!
- **THREE SCAN MODES WITH AUTO RESUME:** "Sampling" mode pauses at busy channels, then resumes. "Busy" mode stops at a busy channel, then resumes shortly after frequency clears. "Vacant" mode stops at a vacant channel and resumes when signal appears. If desired, auto resume may be prevented by pressing one button. **COMPARE!**
- **REMOTABLE HEAD:** The control head may be located as much as 15 feet away from the main unit using the optional connecting cable. **COMPARE!**
- **PL TONE OSCILLATOR BUILT IN:** Frequency is adjustable to access PL repeaters.
- **MICROPHONE VOLUME/SQUELCH CONTROL:** Both functions may be adjusted from either the microphone or front panel.
- **NON-STANDARD OFFSETS:** Three accessory offsets can be obtained for **CAP/MARS** or unusual repeater splits. **CAP** and Air Force **MARS** splits are **BUILT IN! COMPARE!**
- **25 WATTS OUTPUT:** Also 5 watts low power to conserve batteries in portable use.
- **GREEN FREQUENCY DISPLAY:** Frequency numerals are green LEDs for superior visibility.
- **RECEIVER OFFSET:** A channel lock switch allows monitoring of the repeater input frequency. **COMPARE!**
- **SUPERIOR RECEIVER:** Sensitivity is better than 0.28 uV for 20-dB quieting and 0.19 uV for 12-dB SINAD. The squelch sensitivity is superb, requiring less than 0.1 uV to open. The receiver audio circuits are designed for maximum intelligibility and fidelity. **COMPARE!**
- **ILLUMINATED KEYBOARD:** Keyboard backlighting allows it to be seen at night.
- **TRUE FM, NOT PHASE MODULATION:** Transmitted audio quality is optimized by the same high standard of design and construction as is found in the receiver. The microphone amplifier and compression circuits offer intelligibility second to none.
- **OTHER FEATURES:** Dynamic microphone, built-in speaker, mobile mounting bracket, external remote speaker jack (head and radio) and much, much more. All cords, plugs, fuses, microphone hanger etc. included. Weight: 6 lbs.
- **ACCESSORIES:** CS-ECK 15-foot remote cable... $35.00. CS-6R 6-amp ac power supply ... $49.95. CS-AS remote speaker ... $18.00. CS-TTK touch-tone® microphone kit...$39.95.

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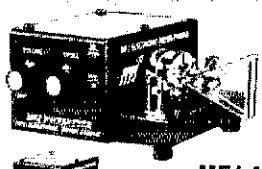
NEW MFJ/BENCHER Keyer-Paddle Combo — "The Pacesetter"



MFJ-422 Combo $99.95 (+$4)

MFJ-422X Keyer only $69.95 (+$4)

The best of all CW worlds — a deluxe MFJ keyer in a compact configuration that fits right on the BENCHER iambic paddle! And you can buy the combination or just the keyer to fit on your BENCHER.

New MFJ keyer — small in size, big in features. Curtis 8044 IC, *adjustable weight and tone*, front panel *volume and speed controls* (8-50 wpm), built-in *dot-dash memories*, speaker, sidetone, and push-button selection of semi-automatic/tune or automatic modes.

Ultra-reliable solid-state keying: grid-block, cathode and solid-state transmitters (−300 V, 10 mA max; +300 V, 100 mA max). *Fully shielded*. Uses 9 V battery or optional AC adapter ($7.95 +$2)

Beautiful functional engineering. The keyer mounts on the paddle base to form a small (4⅛Wx2⅝H x 5½"L) attractive combination that's a pleasure to look at and use.

The BENCHER paddle is a best seller. Fully adjustable; gold-plated silver contacts; lucite paddles; chrome plated brass; heavy steel base with non-skid feet.

NEW MFJ 4 & 8-Band Mobile Shortwave Converters

MFJ-304 $59.95 (+$4)

MFJ-308 $79.95 (+$4)

Another MFJ "first," these low cost mobile SWL converters provide new excitement and variety for your driving/listening pleasure.

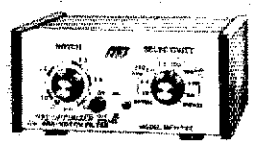
Two models to choose from. The 4-band "World Explorer I" (MFJ-304) offers complete *19, 25, 31 and 49 meter coverage* (the most popular HF bands due to their distance capabilities at various times of the day and year). Hear countries from Europe, Africa, Middle East, Asia, the Islands, North and South America. The 8-band "World Explorer II" (MFJ-308 adds *13, 16, 41, and 60 meter* bands) for even greater listening variety.

Compact and sensitive. The 4-band model measures just 5¼W x 1¼H x 4"D to *fit anywhere* in your vehicle (the 8-band version is just 1" wider and 1" deeper). Two dual-gate MOSFETS give these converters *excellent sensitivity and selectivity* when combined with your automotive receiver.

Easy to use, easy to install. Push a converter button to choose the band, tune in stations with your regular car radio. To install, just plug the car antenna into the converter and insert the converter cable into your car radio antenna jack; connect the power lead to 12 VDC.

Listen to the world on the road. Get the new MFJ mobile SWL converters — "World Explorers I & II."

NEW MFJ Active CW/SSB/Notch Filters



MFJ-722 $69.95 (+$4)

MFJ-723 $49.95 (+$4)

Two new super-selective filters. The new MFJ-722 "Optimizer" offers *razor sharp, no-ring CW filtering* with switch-selectable bandwidths (80, 110, 150, 180 Hz centered on 750 Hz), *steep-skirted SSB filtering*, and a *300-3000 Hz tunable 70 dB notch filter*.

The 8-pole (4-stage) active IC filter gives *CW performance no tunable filter can match*. (80 Hz bandwidth gives −60 dB response one octave from center and up to 15 dB noise reduction). *The 8-pole SSB audio bandwidth is optimized* for reduced sideband splatter and less QRM (375 Hz highpass cutoff plus selectable lowpass cutoffs at 2.5, 2.0, and 1.5 kHz, 36 dB/octave rolloff). Size: 5x2x6".

New model MFJ-723 is similar to the 722 but is for CW only, has a 60 dB notch tunable from 300-1200 Hz, and measures 2x4x6". Other models: **MFJ-721. $59.95,** like 722 but less notch; **MFJ-720, $39.95,** like 723 but less notch.

Versatile, all models plug into the phone jack, provide 2 watts for speaker or can be used with headphones. All require 9-18 VDC, 300 mA max (or 110 VAC with optional AC adapter at $7.95 +$2).

Enjoy pleasant listening and improved readability with one of these new MFJ filters.

NEW MFJ "Dry" 300W & 1KW Dummy Loads

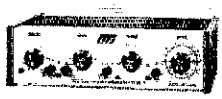
MFJ-262 $49.95 (+$4)

MFJ-260 $26.95 (+$4)

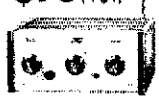
Air Cooled, *non-inductive 50-ohm resistors* in perforated metal housings with SO-239 connectors; both rated to full load for 30 seconds; de-rating curves to 5 minutes included. Just right for tests and fast tune up.

Low VSWR. 300W: 1.1:1 max to 30 MHz, 1.5:1 max. 30-160 MHz. **1 kW:** 1.5:1 max to 30 MHz. **MFJ-260** (300W) is just 2½x2½x7"; **MFJ-262** (1kW) is 3x3x13".

NEW MFJ Shortwave Accessories



MFJ-1020 $79.95 (+$4)



MFJ-1040 $99.95 (+$4)

MFJ-1040 Receiver Preselector

Boosts weak signals, rejects out of band signals, reduces images. *Covers 1.8-54 MHz* with up to 20 dB gain from low noise MOSFET circuitry. *Works with 2 antennas and 2 receivers* (even XCVRS to 350W input).

Built-in 20 dB attenuator prevents receiver overload. Also includes auto-bypass, delay control, PTT jack. Operates on 9 V battery, 9-18 VDC, or 110 VAC with optional AC adapter, $7.95 +$2.

Model MFJ-1045, $69.95, is the same less attenuator, bypass, delay, PTT, 1 antenna & 1 receiver.

MFJ-1020 Indoor Active Antenna

"World grabber," rivaling or exceeding reception of outside long wires.

Unique tuned circuitry with amplification *minimizes intermod distortion, improves selectivity, reduces noise* outside the tuned band, even functions as a *preselector* with an external antenna. *Covers 0.3-30 MHz in 5 bands*. Telescoping ant.; tune, band, gain, on-off-bypass; Uses 9 V battery, 9-18 VDC, or 110 VAC, with optional AC adapter at $7.95 +$2. 5x2x6".

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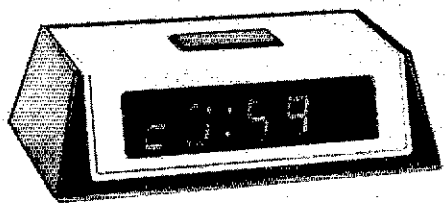
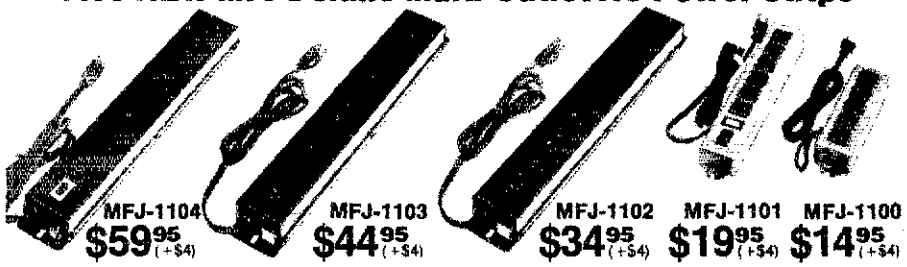


MFJ-102
$32.95 (+$4)

The latest in time keeping convenience. Now you can switch to either 24 hour GMT time or 12 hour format! Double usefulness—great for your operating position and great for other family members to use.
Switch to "seconds" readout. For the times when you need the utmost accuracy.
Switch to ID timer. Alerts every 9 minutes after you tap the button (also functions as a snooze alarm).
Switch to "observed" timing. Just start clock from zero and note end time of event; counts up to 24 hours and repeats. (requires resetting clock time after use).
Switch to regular alarm. For skeds reminder or wake-up use (has alarm-on indicator).
Synchronize with WWV. Now you can adjust the MFJ clock to WWV accuracy.
Fast/Slow set buttons for easy setting of time and alarm.
Big, bright, blue digits are 0.6" for easy-on-the-eyes, across-the-room viewing.
Lock function prevents missetting.
Solid-state circuitry for long life.
Operates on 110VAC, 60 Hz (50 Hz with simple modification). UL approved.
Handsome styling with rugged black plastic case with brushed aluminum top and front. Front has sloping surface for easy viewing. Cabinet measures 6x2x3".
Put this new improved MFJ digital clock to work in your shack.

Five NEW MFJ Deluxe Multi-Outlet AC Power Strips



MFJ-1104 **$59.95** (+$4)
MFJ-1103 **$44.95** (+$4)
MFJ-1102 **$34.95** (+$4)
MFJ-1101 **$19.95** (+$4)
MFJ-1100 **$14.95** (+$4)

Here's the most convenient, most protected way to power-up radio and computer gear.
MFJ-1104: Varistor protects against voltage spikes (worth the investment alone to guard your transceiver, computer, or SWL radios.
Individual double-pi RFI filters for each of 3 pairs of outlets to completely isolate radios, computers, and computer peripherals from interference.
8 sockets, 4 pairs, all 3-prong; the fourth pair is unisolated and unswitched.
Pop-Out fuse for easy changing (15A, 125VAC), heavy duty 3-wire 6' power cord.
Lighted switch shows circuits are "on."
Deluxe heavy-gauge .063 aluminum case, finished in black, has easy mounting slots. Measures 18"Lx2¾"Wx1⅞"H.
MFJ-1103, similar but 12 sockets (2 unswitched), one RFI filter for all.
MFJ-1102, similar to 1103 but no RFI filter.
MFJ-1101: 6 sockets, all 3-prong type. Fuse protected, 15A, 125VAC. On-off switch. Lighted "On" indicator. 3-wire 6' power cord. Steel case, finished in gray hammertone, has mounting slots, measures 13⅛"L x2⅜"Wx1½"H.
MFJ-1100, similar to 1101 but 5 sockets, less switch, light, and is 8⅝"L.

NEW MFJ Compact 3 KW Antenna Tuner Has Roller Inductor

MFJ-989
$279.95 (+$10)

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs — only 10¾Wx4½Hx14⅞"D
Matches coax, balanced lines, random wires 1.8-30 MHz.
3 KW PEP — the power rating you won't outgrow. (250 pf-6KV caps).
Roller inductor with a *3-digit turns counter* plus a *spinner knob* for precise inductance control to get that SWR down to minimum every time.
Built-in 300 watt, 50 ohm dummy load.
Built-in 4:1 ferrite balun.
Built-in lighted 2% meter reads *SWR plus forward and reflected power in 2 ranges* (200 & 2000 w).
6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 coax conn., ceramic feed-throughs, binding post ground.
Deluxe aluminum low-profile cabinet with sub chassis for RFI protection, black finish, black panel with raised letters; tilt bail; requires 12 VDC for meter light.

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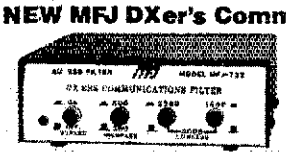
NEW MFJ VHF SWR/ Wattmeter/Field Strength Meters

MFJ-812 **$29.95** (+$4) MFJ-810 **$24.95** (+$4)

New low cost VHF operating aids.
MFJ-812: Reads SWR from 14-170 MHz to keep you informed about antenna/feedlines. SO-239 coax conn.
Reads forward & reflected power at 2 Meters (144-148 MHz) 2 scales (30 & 300W).
Reads field strength levels from 1-170 MHz. Binding posts provided for antenna.
Easy push-button switch operation.
MFJ-810, similar less field strength function.

NEW MFJ DXer's Communications Filter



MFJ-732
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MFJ-732 Puts more presence in SSB/ AM/FM voice communications, brings more signals out of the "mud."
Easy to use, just push up to 4 buttons.
10-pole (5-stage) circuit with *Chebyshev superfast roll-off* (up to 58 dB/octave). First button: On/Off-Bypass, response 300-3000 Hz; second: 500 Hz lower cutoff; third: 2200 Hz upper cutoff; fourth: 1500 Hz upper cutoff. *Built-in speaker,* 2 watt amplifier, LED, 9-18 VDC or 110VAC with optional AC adapter ($7.95+$2), 5x6x1⅝".

TO ORDER PRODUCTS, CALL TOLL FREE
master charge **800-647-1800** VISA

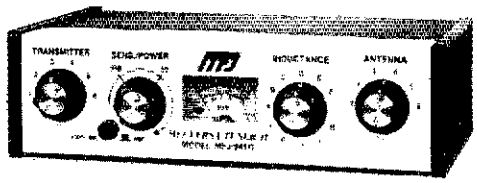
For tech. info., order or repair status, or calls outside continental U.S. and inside Miss., call 601-323-5869.

- **All MFJ products unconditionally guaranteed for one year** (except as noted)
- **Products ordered from MFJ are returnable within 30 days for full refund** (less shipping)
- **Add shipping & handling charges in amounts shown in parentheses**

Write for FREE catalog, over 60 products

MFJ ENTERPRISES INCORPORATED
Box 494; Mississippi State, MS 39762

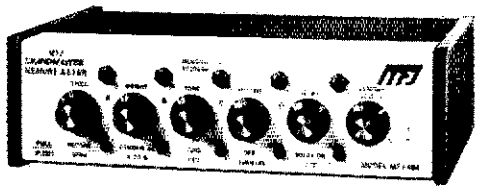
MFJ 941C Versa Tuner II



MFJ-941C
$89.95 (+$4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.
SWR + dual range wattmeter (300 & 30 watts full scale, forward and reflected power). *Sensitive meter* measures SWR down to 5 watts output.
More flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.
12 position efficient airwound inductor for lower losses, more watts out.
Built-in 4:1 balun for balanced lines. 1000v capacitor spacing.
Matches everything from 160-10 meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.
Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.
MFJ-945, $79.95, like model 941C but less ant. switch. Optional mobile bracket for either model is $3.

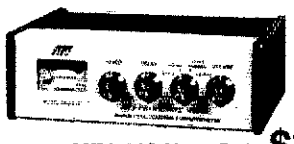
MFJ 484 "Grandmaster" Memory Keyer



MFJ-484
$139.95 (+$4)

Up to twelve 25 character messages plus 100, 75, 50 or 25 ch. messages (4096 bits).
Repeat any message continuously or with pauses of up to 2 min. LEDs show use.
Record, playback, or change messages instantly at touch of a button. Memories are resettable with button or touch of the paddle.
Built-in memory saver — 9 V battery takes over when power is lost.
Iambic operation with squeeze key. Dot-dash insertion. Optional BENCHER paddle $42.95 +$4.
Dot-Dash memories, self-completing, jam-proof spacing, instant start.
Panel controls: Speed (8-50wpm)/Record; Weight/Memories Combined; Tone/Tune; Delay (0-2 min.)/Repeat; rotary Vol/On-Off; Memory Select; Message Buttons select desired 25 ch. messages; Memory Reset button.
Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 mA max; +300 V, 100 mA max). Operates 12-15 VDC or 110 VAC with optional adapter, $7.95 +$2. Size 8x2x6". **MFJ-482, $99.95,** four 25 or 50+two 25 ch. messages; **MFJ-481, $89.95,** two 50 ch. messages. **Get the best seller keyers**-MFJ "Grandmasters."

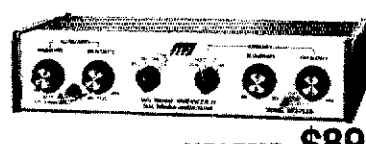
MFJ 410 "Professor Morse" Code Generator/Keyer



NEW LOW PRICE Save $20
MFJ-410 Now Only **$129.95** (+$4)

Use it to learn, use it to operate. It sends *unlimited random code* in random groups for practice; *never repeats* sequences. And when you're on the air, it's a *full feature keyer*.
Vary speed from 5-50 wpm; meter readout.
Vary spacing; give fast sound to low speed.
Alpha or alphanumeric with punctuation.
Built-in speaker and phone jack; tone and vol. Ideal for classroom or private use.
Full feature keyer includes vol., speed, tone and weight controls, tune switch, dot-dash memories, keys grid block, cathode, solid-state rigs. Optional BENCHER paddle $42.95 + $4. Operates on 9-18 VDC, two 9 V batteries or 110 VAC with optional adapter $7.95 +$2. Size 7x2x6". **Get "Professor Morse"** — you'll never outgrow it.

MFJ Dual Tunable SSB/CW Filter "Signal Enhancer"



MFJ-752B **$89.95** (+$4)

Dual filters give unmatched performance.
The primary filter lets you *peak, notch, low pass or high pass* with extra steep skirts.
Auxiliary filter; *70 dB notch, 40 Hz peak.*
Both filters tune from 300 to 3000 Hz with variable *bandwidth from 40 Hz to nearly flat.*
Constant output as bandwidth is varied; linear frequency control.
Switchable noise limiter for impulse noise.
Simulated stereo sound for CW lets ears and mind reject QRM.
Inputs for 2 rigs, switch selectable. Plugs into phone jack. Two watts for speaker. OFF bypasses filter. 9-18 VDC, 300 mA or 110 VAC with optional adapter $7.95 +$2. 10x2x6". **MFJ 751, $69.95,** similar, primary filter only, less high pass & noise limiter.

MFJ BEST SELLERS

favorite products from the world's leading manufacturer of amateur radio accessories

GMT Clock/ID Timer

MFJ-102
$32.95 (+$4)

NEW 12/24 Hour Digital Clock/ID Timer Switch from 12 hr. to GMT, to "seconds" readout, ID timer or elapsed timer. WWV sync, solid-state, blue 0.6" digits, reg. alarm + indicators. 110 VAC, 60 Hz, 6x2x3".

KW Dummy Load With Oil

MFJ-250
$29.95 (+$4)

Rated at 1 kW CW or 2 kW PEP for 10 min., half that for 20 min., cont. at 200 W CW, 400 W PEP, non-inductive 50 ohm resistor, quality transformer oil (no PCB), VSWR under 1.2:1 to 30 MHz, 1.5:1, 30-300 MHz, 2:1, 300-400 MHz. Coax conn., vent cap., 7½"h x 6⅝" diam.

300 Watt Antenna Tuner

MFJ-949B
$139.95 (+$4)

Does it all! Built-in dummy load, SWR, forward and reflected power meter, antenna switch, balun, matches everything from 1.8-30 MHz (coax, random wires, balanced lines), coax conn., binding post, 10x3x7".

TO ORDER PRODUCTS, CALL TOLL FREE
master charge **800-647-1800** VISA

For tech. info., order or repair status, or calls outside continental U.S. and inside Miss., call 601-323-5869.

- **All MFJ products unconditionally guaranteed for one year** (except as noted)
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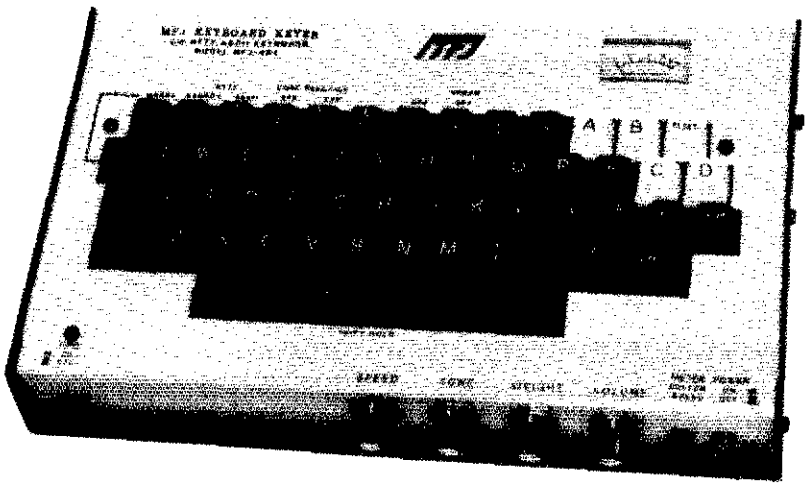

MFJ Super Keyboard

For $279.95 you get: CW, Baudot, ASCII, buffer, programmable and automatic messages. Morse code practice, full featured keyer, human engineering.

Sending CW has always been a task, especially when you get a little tired. Electronic keyers help, but it's still too much work.

Now MFJ has a Super Keyboard that makes sending perfect CW effortless. It also sends Baudot RTTY and ASCII.

"Big deal" you say. "What's so special about that. There are lots of keyboards." Yes, but this one is different.

HUMAN ENGINEERED

A lot of thought has gone into human engineering the MFJ-494 Super Keyboard.

For example, you press only a one or two key sequence to execute any command.

All controls and keys are positioned logically and labeled clearly for instant recognition.

Pots are used for speed, volume, tone, and weight because they are more human oriented than keystroke sequences and they remember your settings.

A meter gives continuous readout of buffer memory and speed. Two characters before full, the meter lights up red and the sidetone changes pitch.

PROGRAMMABLE, AUTOMATIC MESSAGES

Four automatic messages and two programmable message memories (A and B) are provided. Messages A and B can be a total of 30 characters. B starts where A ends.

When recalled, each message takes only one character of the buffer. They may be chained and/or repeated via the buffer.

"Well," you say, "that sure is not much memory." But it's more than it seems because of the built-in automatic messages.

For example, type your call into message A. Then by pressing the CQ button you send CQ CQ DE (message A). Press twice to send twice, etc.

The other automatic messages work the same way: CQ TEST DE (message A), DE (message A), QRZ (message A).

Special keys for KN, SK, BT, AS, AA, and AR.

TEXT BUFFER

The 50 character text buffer sends smooth perfect code even if you "hunt and peck."

Since each automatic or programmable message takes only one buffer character, this gives a far larger effective buffer.

You can preload a message into the buffer. Then when you are ready to transmit press the control key.

You can hold the buffer by pressing the shift key and space bar.

With the buffer in hold, you can send a comment with an external paddle as a keyer. To resume sending buffer, press the control key.

Simply backspace to delete errors.

RTTY: BAUDOT, ASCII

5 level Baudot is transmitted at 60 WPM. RTTY and CW ID are provided via message A.

Carriage return, line feed, and "LTRS" are sent automatically on the first space after 63 characters on a line. After 70 characters the function is initiated without a space. This gives unbroken words at the receiving end and frees you from sending the carriage return.

All up and down shift is done automatically. A downshift occurs on every space to quickly clear any garbles in reception.

The buffer, programmable and automatic messages, backspace delete and PTT control (keys your rig) are included.

The ASCII mode includes all the features of baudot. Transmission speed is 110 baud. Both upper and lower case are generated.

MORSE CODE PRACTICE

There are two Morse code practice modes. Mode 1: random length groups of random characters. Mode 2: pseudo random 5 character groups in 8 separate repeatable list. With answer list.

Insert space between characters and groups to form high speed characters at slower speed for easy character recognition.

Select alphabetic only or alphanumeric plus punctuation. Pause function lets you stop and then resume.

IT'S A KEYER, TOO

Plug in a paddle to use it as a deluxe full feature keyer with automatic and programmable memories, iambic operation, dot-dash memories, and all the features of the CW mode.

MORE FEATURES

Tune switch with LED keys transmitter for tuning. Tune key provides continuous dots to save finals. Built-in sidetone and speaker.

PTT (push-to-talk) output keys transmitter for Baudot and ASCII modes.

Reliable solid state keying for CW: grid block, cathode, solid state transmitters (-300 V, 10 ma. Max, + 300 V, 100 ma. Max). TTL and open collector outputs for RTTY and ASCII.

Fully shielded. RF proof. All aluminum cabinet. Black bottom, eggshell white top. 12"D x 7"W x 1¼"H (front) x 3½"H (back).

9-12 VDC or 110 VAC with optional adapter.

OPTIONS

MFJ-53 AFSK PLUG-IN MODULE. 170 and 850 Hz shift. Output plugs into mic or phone patch jack for FSK with SSB rigs and AFSK with FM or AM rigs. $39.95 (+ $3).

MFJ-54 LOOP KEYING PLUG-IN MODULE. 300 V, 60 ma. loop keying circuit drives your RTTY printer. Opto-isolated. TTL input for your computer to drive your printer. $29.95 (+ $3).

BENCHER IAMBIC PADDLE. $42.95 (+ $4).

110 VAC ADAPTER. $7.95 (+ $3).

A PERSONAL TEST

Give the MFJ-494 Super Keyboard a personal test right in your own ham shack.

Order one from MFJ and try it — no obligation. See how easy it is to operate and how much more enjoyable CW and RTTY can be. If not delighted, return it within 30 days for refund (less shipping). One year unconditional guarantee.

To order, call toll free 800-647-1800. Charge VISA, MC or mail check or money order for **$279.95** for MFJ-494 Super Keyboard, **$39.95** for MFJ-53 AFSK module, **$29.95** for the MFJ-54 loop keying module, **$42.95** for Bencher Paddle, and **$7.95** for the 110 VAC adapter. Include $5.00 shipping and handling per order or as indicated in parentheses if items are ordered separately.

Why not really enjoy CW and RTTY? Order your MFJ Super Keyboard at no obligation today.

TO ORDER OR FOR YOUR NEAREST DEALER
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Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi.

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CD	3990	8:10 A.M. M-F	20	557	17
IMN	3635	8 P.M. M-F	20	183	101

Traffic: W7GHT 259, AC7P 113, W7JMH 31, W7KDB 28.

MONTANA: SCM, Robert Leo, W7LR — IMN: QNI 183, QTC 101. N7AIK & WB7NFK candidates for SCM for Montana. N7AIK new SEC for Montana until new SCM appoints new SEC starting early 1981. KB7Q reports MT QSO Party results: MT winner W7JYW, 323,595; W1AQE out of state winner 1,428 points. County winners: W7LR Gallatin 210,330; W7TYN Deer Lodge 111,930; KB7BI Park 80,340; N7BMR Richland 49,725; K7ABV Cascade 42,525; W7BMI Yellowstone 8,649; N7BLD Missoula 7,161. W7GHT mobile 46,534 — FB. Special certs designed by N7BJS & WB7FBW. Silent Keys: W7KGJ and W7TPE. MT now has RTTY net begun by N7AGP. Meets 7 days a week 3618, 0200 GMT. Day RTTY f = 7090 kHz. WB7DZX makes PSHR again. Congrats to K87BI on being mgr for PAN. We would like more checkins for MT Section Net, 9:30 A.M. 7240 every Sun morning. KB7Q reports lots of 6-mtr DX QSOs, many JA KX6 KL7 KG6 etc. Also JA 6-mtr QSOs by KA7DLC W7KNT W7AVD. New 6-mtr ops: KA7AYN WB7WFY. 6-mtr net Tue 8:30 P.M. 50.115 MHz. WB7UTJ 7240 Net QNI 187, QTC 7. Traffic (Nov.) WB7DZX 138, W7NEG 10, W7LBK 8, WB7UTJ 7, W7LR 5, W7DB 5. (Oct.) W7IXD 71.

OREGON: SCM, Dale T. Justice, K7WWR — SEC: K7OLN. STM: W7VSE. Section nets:

Net	Time/Days	Freq.	QNI	QTC	Mgr.
BSN	0145Z Dy	3908 kHz.	822	53	K7WPC
OSN	0230Z Dy	3587	377	356	KB7JW
	0600Z Dy				
OARES	0115Z Dy	3993.5	381	116	W7HLF
	0230Z Dy				
WCN	0300Z Dy	3702	406	150	K7ZIG
PTTN	0300Z Dy	146.76	618	130	W7LRB
LBLARES	0330Z Dy	146.79	723	7	WB7QQH
PdxAARES	0330Z Dy	147.32	616	42	K7WWR
UCARES	0315Z Th-Sa	147.06	140	22	W7VSE
MPARES	0300Z M	146.85	115	0	WA7ZAF
	0300Z Th	147.02			
SOFM	0230Z M	146.64	121	8	W7FDU

My term as SCM has been exciting. The net activity has picked up to 10 reports per mo. Many thanks to the dedicated traffic handlers and net managers who have helped so much. Welcome to W7QMU as new SCM. N7DB reports all continents worked on six meters except Europe for himself and WA7GCS. An excellent month was had by all six-meter ops. Newly affiliated club is the Silverton RC. The Tualatin Valley Club had a slow-scan demo and show by W7QQF. KA7N arranged for a showing of the FCC monitoring van in Salem. TERAC reported on all known Mt. St. Helens participants, some 40 amateurs, who received PSA's for their estimated 5000 man-hours of work. 1981 officers for TERAC include W7MRH, pres.; W7VOK, vice pres.; W7FVF, secy.; W7JXU, treas. Traffic: (Nov.) W7VSE 723, W7LRB 328, K7NTS 328, KB7JW 165, WB7OEX 147, W7LNE 140, K7WWR 42, K7QPW 30, W7FDU 25, W7LT 16. (Oct.) KA7AOB 234.

WASHINGTON: SCM, Bob Klepper, W7IEU —

Net	Time(Z)	Freq.	QNI	QTC	Mgr.
NTN	1930	3970	1245	97	K7AJT
WARTS	0200	3970	3285	191	W7EQY
NWSSBN	0230	2945	738	45	W7ZPK
WSN	0245/0545	3590	700	247	W7GB
EWTN	0130/0530	146.64	84	60	WA7CBN
IETN	0130/0300	147.30	144	75	KA7CSP
PSTS	0130/0530	145.33	179	132	W7IEU

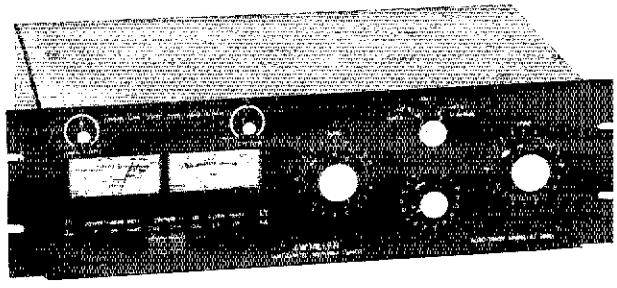
SEC: WA7RWK. STM: W7DZX. NMs: W7GB W7IEU WA7CBN KA7CSP. The ARES/NWS Net is progressing and SEC WA7RWK is looking for more outlying stations for reports, contact him if you want to take part and you don't have to belong to ARES to participate. ARES/NWS meets daily on 3910 kHz at 10 A.M., also using repeaters so everyone can help. Lower Columbia ARA received plaque from Cowlitz County Chapter of American Red Cross for outstanding assistance during Mt. St. Helens eruption. 1981 officers for North Seattle ARC are: W7GR, pres., K7KPC, vice pres.; W7GPS, treas.; KA7APK, secy. N7CT put up new antennas for 40/80 and getting started in photography. RASC members participated in Operation Ready, a simulated search exercise held by Skagit Cty S&R Council. K7MF added 1C-551 to station. GTE of the Northwest sponsoring an Amateur Radio club in Snohomish Cty and will center their operation around the 145.39 K7FR/R. Spokane Amateur Radio Council reforming to coordinate activities in Spokane area. WB7TQF is setting up station at Spokane Shrine Hospital. WA7YCM's code practice is on 3715 kHz at 9 P.M. Tues and Thurs. 1981 officers of BEARS are: WB7AZW, pres.; WA7EXJ, vice pres.; W7LUR, secy.; WA7BTZ, treas. Clark Cty ARC's "Rocking Chair Copy" warns users of repeaters to watch their language, especially the choice of words. Remember there are many people now, other than the FCC, that may be listening on their cheap scanners. Spokane Dial Twisters going to quarterly newsletter to reduce expenses. RASC members may take a survey of repeater sites near the cross state passes. Classes conducted by W7JWJ and W7QGP turned out 21 new amateurs. Chairman K7QMI and Mike and Kev members preparing for their very popular Santa talks program from Seattle area hospitals at Christmas. Thanks to Whidbey Island Repeater Group (WIRG 147.22) for the kind words about those who handle message traffic. Traffic: (Nov.) WB7WOW 1110, W7DZX 848, WB7TQF 661, K7GXZ 217, N7AFZ 190, K7CTP 141, W7IEU 135, AD7G 116, W7GB 90, N7AFY 62, WA7BDD 56, W7BUN 33, WA7RCR 20, W7LG 18, W7ERH 11, W7APS 8, W7AIB 3, KA7CSP 2, K7RBT 2. (Oct.) N7CT 8, K7MF 6.

PACIFIC DIVISION

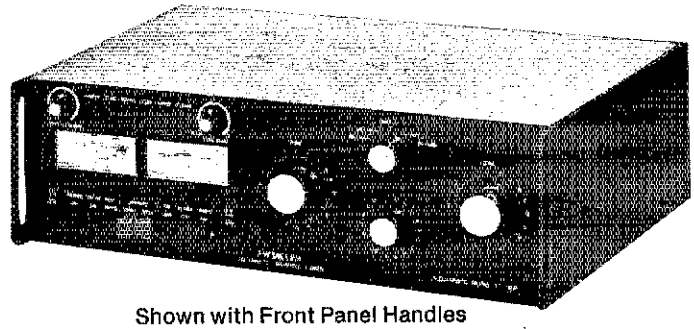
EAST BAY: SCM, Bob Vallin, W6RGG — Asst SCMs: W6ZF VE2AQV/W6. SEC: WB6KOU. W6JXK has stopped referring to his beam in a disparaging manner after making BPL 3 months in a row! FB job. W6OA now lists Tfc and computering as his major activities. W6ZF back from an 8000 mile auto trip through NV, WY, UT, NE, IA, MO, IN, TN, NC & VA during which he maintained daily skeds on cw with CA. Welcome back. Lake County ARS planning Xmas Pot Luck party. Congrats to recent upgrades KS6Q (WB6ZWW) & KS8H (WB6GPT). EBARC members WA6ZFV WD6ETU & WD6DLR conducting Novice code class. MDARC meeting featured WA6IRZ speaking on "The Lure of Pitcairn." WD6GDC new editor of their award-winning publication "The Carrier." SBARA upgrades: N6DOB (KA6IMM) N6DNC (KA6LOO) KA6NBW KA6NBX & KA6BUD. Alameda County RACES, with a little help from their friends, provided safety & administrative communications for the Oakland Marathon. Their mobile CP was in the RV of K6JNW. Traffic:

New Automatic Antenna Tuner Auto-Track Model AT 2500

Options Available at Extra Cost



Shown with Rack Mount



Shown with Front Panel Handles

Check these state-of-the-art specifications

- Power Capability: 2500 W PEP.
- Frequency Range: Continuous 3.0 to 30 MHz (Including WARC Bands).
- Impedance Matching: 10 ohms to 300 ohms to 50 ohms resistive.
- Direct Reading SWR Meter: 1:1 to infinity.
- Direct Reading Power Meter: Two meter scales from 0 W to 250 W and 0 W to 2500 W; front panel switch selects FWD or Reflected Power *(Illuminated panel meters)*.
- Power meter displays RMS with continuous carrier and automatically displays PEAK when driven with SSB signal.
- Average "Automatic" tune-up time: 15 seconds or less.
- Tune-up time not affected by power level, can be as low as 1 W (5-10 W preferred).
- A unique "Linear Disable" circuit automatically switches companion linear amplifier to standby within milliseconds whenever SWR exceeds the threshold preset on front panel, thus protecting the linear from excessive SWR.
- Toroidal bridge coupler provided in separate enclosure, permitting it to be installed directly at the output of the transmitter for meaningful SWR measurements.
- Power requirements are 115/230 VAC 50-60 Hz, 10 W operating/5 W standby; or 13.5 VDC, 1 A operating/.5 A standby.
- Antenna tuner packaged in cabinet 17"W x 5¼"H x 14"D (Front panel handles or rack mount optional).

Specifications subject to change without notice

See us in Dayton in April and enter drawing for free AT 2500.

Write for literature.

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COMPTON, CALIFORNIA 90224

DRAKE 7-Line Family

A pacesetter since 1943, Drake led in 1963 with 9 MHz i-f transceiving, and now with 48 MHz i-f "Up Conversion" . . . Drake brings you tomorrow's state of the art today.

R7

Synthesized General Coverage Receiver

Model 1240

Full general coverage reception, 0-30 MHz, with no gaps or range crystals required.

Continuous tuning all the way from vlf thru hf. Superb state-of-the-art performance on a-m, ssb, RTTY, and cw—and it transceives with Drake TR7.

- **100% solid state broadband design,** fully synthesized with a permeability tuned oscillator (PTO) for smooth, continous tuning.
- **Covers the complete range 0 to 30 MHz** with no gaps in frequency coverage. Both digital and analog frequency readout.
- **Special front-end circuitry** employing the high level double balanced mixer and 48 MHz "up-converted" 1st i-f for superior general coverage, image rejection and strong signal handling performance.
- **Complete front-end bandpass filters** are included that operate from hf thru vlf. External vlf preselectors are not required.
- **10 dB pushbutton-controlled broadband preamp** can be activated on all ranges above 1.5 MHz. Low noise design.
- **Various optional selectivity filters** for cw, RTTY and a-m are switch-selected from the front panel. Ssb filter standard.
- **Special new low distortion "synchro-phase" a-m detector** provides superior international shortwave broadcast reception. This new technique permits 3 kHz a-m sideband response with the use of a 4 kHz filter for better interference rejection.
- **Tunable i-f notch filter** effectively reduces heterodyne interference from nearby stations.
- **The famous Drake full electronic passband tuning system** is employed, permitting the passband position to be adjusted for any selectivity filter. This is a great aid in interference rejection.
- **Three agc time constants** plus "Off" are switch-selected from the front panel.
- **Complete transceive/separate functions** when used with the Drake TR7 transceiver are included, along with separate R7 R.I.T. control.
- **Special multi-function antenna selector/50 ohm splitter** is switch-selected from the front panel, and provides simultaneous dual receive with the TR7. This makes possible the reception of two different frequencies at the same time. Main and alternate antennas and vhf/uhf converters may also be selected with this switching network.
- **The digital readout** of the R7 may be used as a 150 MHz counter, and is switched from the front panel. Access thru rear panel connector.
- **The built-in power supply** operates from 100, 120, 200, 240 V-ac, 50/60 Hz, or nominal 13.8 V-dc.
- **The R7 includes a built-in speaker,** or an external Drake MS7 speaker may be used.
- **Built-in 25 kHz calibrator** for calibration of analog dial.
- **Low level audio output** for tape recorder.
- **Up to eight crystal controlled fixed channels** can be selected. (With Drake Aux7 installed.)
- ***Optional Drake NB7A Noise Blanker*** *available. Provides* true impulse type noise blanking performance.

Specifications, availability and prices subject to change without notice or obligation.

R. L. DRAKE COMPANY DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA
Phone: (513) 866-2421 • Telex: 288-017

W6JXK 549, W6OA 84, K6UGS 72, WB6UZX 28, KA6ERF 16.

NEVADA: SCM, Ralph E. Covington, W7SK — SEC: WA7KCD. Congrats to WA6VKL, it's a boy. Tara had a fine Christmas pot luck party — a fine way to get around the high cost of living. W7PBV, former Nevada SCM, has moved to Utah; we wish him all the best. Our loss is Utah's gain. As can be seen from traffic total N7AKX is really pounding the brass. Nevada Sage Brush Net meets nightly 7:30 P.M. on frequency of 3905 kHz. Items for publication in this column due by the 5th of the month. Traffic (Nov.) N7AKX 318, W7BS 134. (Oct.) N7AKX 293, W7BS 97.

PACIFIC: SCM, Pat Corrigan, KH6DD — SEC: KH6CKJ. STM: W0KON. ECs: Honolulu, KH6ILR; Maui, KH6H. Congrats to all who did splendid job in SET. Critiques looked good and improvements occur each time. Special thanks for the PTN support. Div. Director, W6ZM, was able to make it for the HARC Fest in Dec. KH6H passes bulletins on Maui Emerg. Net, Mondays 2100 local time on 7020 kHz. A reminder that Pacific Traffic Net meets on MWF (local) at 0300Z on 14110. Everyone is welcome and net members will help newcomers. You might find it fun. For more info contact either W0KON KH6ILR or KH6HIJ. Local hams helped in the Hon. Wheelchair Marathon. Traffic: KH6HIJ 133, KH6H 20, KH6JJP 10.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: WB6GFJ. ASCM: AI6T. The River City ARCS in association with the Fulton-El Camino Park District are holding Novice, General/Tech classes at the Parks-n-Recreation Center. The North Hills RC erected two new Hustler G7-144 two-meter antennas and a 220 MHz Super Stationmaster antenna at their repeater site. While they were at it, they emptied the repeater fund and bought a new micro-processor operated repeater controller. KF6P and others are trying to organize a radio club in the Elk Grove area. WB6GFJ has set up a computer program for a TRS-80 for the Skywarn program. The Telephone Pioneer Radio Club's Newsline (916-484-7388) should now be in operation from the club's new station location. The Northern California Net meets each evening at 7 and 8:30 P.M. local time on 3630 kHz. Traffic: W6RSP 55, W6DEF 12.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: WB6ZRK. STM: K6TP. Officers of Sonoma County RA are K6ANP, pres.; WB6SMY, vice pres.; WD6DPE, secy.; N6DHT, treas. The newly formed Redwood Empire DX Association elected N6DJ, pres.; K6ANP, vice pres.; K6ASI, secy treas. The new EC for Sonoma County is N6BLN; many thanks to W6CYM for the job he did in the past. Congrats to new OTS WB6HZO and new OBS WB6CIE. WA6AUD is back to DXing. Upgrades to Extra WA6SQX (now KS6G) N6AUP; to General KA6EUP. New Novices are KA6MUO KA6MZI KA6NAB. FWRA repeaters worked fine during Eureka earthquake. AA6DX active in Cal. QSO Party. PSHR: W6RNL. Traffic: (Nov.) W6NL 279, W6IPL 177, W6RNL 168, K6TP 98, W6GGR 12, AA6DX 4. (Oct.) W6NL 244, WA6AUD 9. (Sept.) W6NL 222.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. Asst SCMs: WA6YAK WA6HIN W6TRP. New officers Central Valley RC are: K6REZ, pres.; WB6VGZ, 1st vice pres.; KA6CZS, 2nd vice pres.; WD6BVZ, secy/treas. New officers Kings ARC are: WA6TJW, pres.; WB6VFZ, vice pres.; KA6GAF, secy. Congrats to WD6EWP and K6RAU on election to vp and sit of WPSS. WA6URV has an IC2A. WA6IPE has a FT625RD. KB6DI has RM 76. KA6IFI is Extra. WD6DFS KA6CXR KA6JTC KA6LGG are General. KA6HHU is Tech. KA6LGG is N6DNE. KA6IYR is N6DQE. K6PKO WA6JOV K6YK W6YKM WA6IPZ WA6IPE K6XJ W6XP W6BJI WB6ITM AA6S and W6DPD chase DX on 6 meters. W6KRO has started a 10-X Chapter in Fresno. KB6CC is on RTTY. The Central Valley DXers meet the 1st Saturday of the month in Fresno. Plan to attend the ARRL Pacific Division Convention in Fresno on May 15-17, 1980. There will be a Wouff Hong initiation at this one. Traffic: N6AWH 151, WB6TTP 68, WA6YAB 27, WD6FRS 16, W6DPD 9, K9YBM 8, WA6JDB 6.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. New affiliated club is Varian ARC, with WA6KOP as president. Welcome! IZF reports King City disaster drill had the following participants: WD6EKR WD6EKQ K6LFZ and WB6SAT. W6KZJ spent a week in traction, but home now. W6CF busy with work, so little activity on the air. W6AUC working with new Novice to get call of KA6NQG, as well as several nets. Because it was hard for WA6PDN to get to NPSARC meetings, they had meeting at his home, 39 showed up. Club members also helped install a large rhombic ant. at WB6TIJ's QTH. New members of the SCCARC are K6UPX and KA6MIQ. An ATV group from Santa Cruz consists of WB6QHF WB6PCC N6KO and WB6MLY W6ASH WA6LIJ K6MA N7KA KR6O W6TER and WB6OML helped N6ST pour a tower base. EMARC is sponsoring a concentrated course for taking the Novice exam at the Electronic Museum at Foothill College. The Gabilan ARC, in Gilroy, would like to exchange club newsletters — contact AA4RE, 780 Lisa Ct., 95020. PAARA inducted K6TBE as a new member. WB6QXT presented a slide show on the sun eclipse before the SBARA. W6PDD W6SHF WA6IVG WD6EGW and WB6BLA worked on the club ants at WB6FDT (WB6ACI). New club in the section is the United Air Line ARC — hope to hear more of them in the future. With holiday parties over and election of officers, most clubs are in high gear for the new year activities. The annual Pacific Div meeting was held in Concord and had a good turn out. N6NF busy with OO reporting. I would appreciate hearing from each appointee on their activities each month. Traffic: W6YBV 181, W6KZJ 84, W6ASH 50, W6OII 38, W6AUC 30, W6RFF 27, WB6IZF 13, W6CF 2.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ed Stephenson, AB4S — Asst SCM: N4UE. STM: WD8NYN. SEC: WA4BFT. NMs: CN K4GCN, CMN WD8NYN, THEN WD4CNR, JFK WD4CNQ, NCSSBN WB4CES, CNN WD4JJK. Thanks to Bill Parriss, AA4R, for a great job as SCM for the past 4 1/2 years. Congratulations to WD4AIE W4HKB and WA4QQN on recent upgrades to Advanced. Many amateurs in central North Carolina worked hard providing communications for search parties when a 2 year old boy was lost in northern Wake County. Rocky Mount ARC provided demonstration and a message center for the Nashville, NC bicentennial celebration. Congratulations to K4GCN new NM for CN, both sessions. New EC for Orange County is WA4NOT. Traffic: (Nov.) K4GCN 432, WD8NYN 324, W4OWD 303, WD4CNR 290, WD4CNQ 277, AB4J 232, WA4UTC 218, WB4WII 189,

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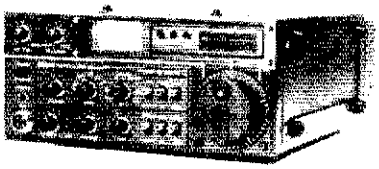

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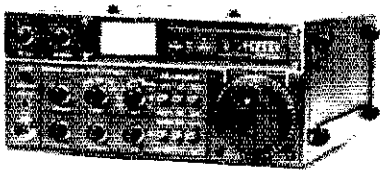

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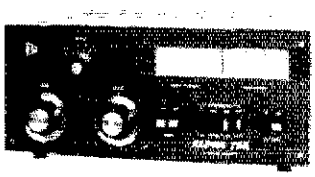

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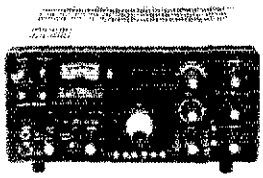

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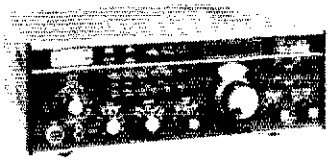

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SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — SEC: WD4HLZ. STM: W4ANK. Asst SCM: WB4UDK. NMs: W4ODE WA4SJS. Congrats to new upgrade WB4QHF. Spartanburg Club participated in annual Christmas parade. Silent Keys: WB4LUF & WB4SML, they will be missed by all. In this new year, I solicit your support again as you gave me in the last two years. Check-ins/traffic: SC SSBN 142/1176; Blue Ridge 2-Meter Net 1089/56; CN 704/608; SCNTN 276/101; Lancaster County 2-Meter Net 91/7; Western SC Emergency Net 150/19; Newberry County ARES Net 74/3; CNN 370/49; Dixie 6-Meter SSBN 31/0; SC 2-Meter SSBN 33/0; SC ARES Net 23/0; (Oct) 17/0. Traffic: (Nov.) K4ZN 439, W4ANK 270, W4ODE 239, W4NTO 142, W4FMZ 89, W7NQL 79, K4ZB 75, K4FRX 39, W4MTK 33, WB4UDK 28, WB8TCT/4 22, KA4AUR 21, AF4E 15, W4DRF 15, WA4MIY 13, K4LYU 12, K4RVC 12, K4KEP 11, N4EE 5, WD4OLV 5, WA4VYS 5, WB4NBK 4, WD4DOL 3, WB4QHF 2. (Oct.) K4ZB 56.

VIRGINIA: SCM, Luck Hurder, WA4STO — SEC: N4AZI. Chief OO: W4HU. Chief OVS: N4CD.

Net	kHz	Time-PM	Sess.	QNI	QTC	Mgr.
VSBN	3947	6:00	29	620	367	KY4K
VSN	3680	6:30	30	375	185	WB4KSG
VN	3680	7/10	31	318	149	W4SUS
VLN	3947	10:15	28	388	140	WA4YIU
VNTN	7260	Noon	30	287	100	WD4FTK

EVERYONE should circle May 9/10 on their calendars and plan to attend the League planning meeting at the Ramada Inn, Tyson's Corner, Fairfax. All clubs should send delegates, as matters that affect all amateurs will be discussed, debated, and decided upon! My personal thanks to K4BKX for leaving the section files in such super shape! And to all the active section members who are continuing their efforts at making Virginia topnotch, my sincere appreciation. N4LE is catching up on DX and even some reading. N4OT continues to be active in MARS, the VN, and DX contests. KØJH is visiting Germany. Guess what? K4BAV is moving the shack downstairs to make room for a new ham in the family! W4YVG ran 276 overseas phone patches for MARS. WA1VRL is working DX on 10 meters. The SVEN again showed their valuable public service worth by reporting election returns as they have for many years. The Dolby family has done it again — WB4PNY has made BPL again, but not to be outdone, her OM, WA4EQW did likewise, mobile, and all cw at that! Congrats. The Virginia Section Training Program is in high gear now, and the increasing traffic proficiency of the trainees indicates a great degree of success. This program provides not only the inexperienced operators a chance to improve their capabilities, but also the old hands a chance to review procedures that will enable the section to function more smoothly. Anyone wishing to participate may contact WA4STO for complete details. Traffic: (Nov.) WB4PNY 839, WA4CCK 564, WA4STO 484, W4JK 448, WD4FTK 339, K4KNP 322, WA4EQWM 203, N4AZI 198, WB4FLT 159, KZ4K 150, K4KDJ 144, K4JM 131, W3BBN 130, N4RF 113, W4SUS 111, W4NWM 107, W4YVG 103, WA4YIU 76, N4YO 74, KB4WT 68, WA4LJI 65, K4JST 60, KY4K 59, W3ATO 48, W3BBQ 48, K4EJ 43, WB4ZTJ 41, KØJH 37, K4DHB 35, WA4OWG 35, WB4DQZ 33, KB4PW 29, KA4ETG 23, WB4KIT 22, WB4RWY 21, W4LXB 20, W4SVG 20, KA3DTE 19, K4VWK 19, W4OKN 18, N4BJX 17, W4DM 14, WA4PBG 14, WA1VRL 13, WD4DUU 12, KB4OF 12, WA4ONR 12, KC4QL 11, WB4ZNB 8, KA4ERP 7, WA4JUO 7, KC4HN 6, WD4KOJ 5, W4KYE 5, N4LE 5, WA2WDT 4, WB4LAB 2, WA4WQG 2, K4JRT 1, N4OT 1. (Oct.) K4KDJ 121, N4RF 114, N4NK 12, AA4CK 10, W4YE 3, WA4WQG 2, K4BAV 1.

WEST VIRGINIA: SCM, Karl Thompson, K8KT — SEC: K8QEW. STM: KD8G. NMs: K8MHR, KD8G, W8FZP, WD8LDY. Fayetteville H. F. Feb. 15, at Nat'l Guard Armory. Contact WA8YTM for details. Next State Radio Council Mtg will be March 28, at Jackson's Mill. Very nice recognition dinner was held by Tripple States ARC at Wheeling on Dec. 9. VK4AFF has been visiting WV hams before returning home on Dec. 18.

Net	Freq.	Time(Z)	Ck-in	QTC	Sess.
Hillbilly	14290	1600 Su	193	56	5
Phone	3990	2300 Dy	825	60	30
Phone(MD)	3990	1700 Dy	245	39	29
WVN	3567	2400 Dy	155	49	29
Blk-Dia	28/85	0100 Tu	21	8	5

Traffic: KD8G 114, KC8C 64, N8AJC 45, WD8DIN 33, W8FZP 33, W8CKX 28, W8JYX 27, WD8LDY 25, WD8PQG 20, AI8I 18, KA8ETV 12, WD8FMS 12, W3DNG 8, W8JM 7, K8JQ 7.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Poirier, KØDJ — SEC: WØACD. STM: WBØMCL. NM: KØCNV WØHE WØHXB KBØZ WDØAIT. New Rocky Mountain Division Director is KØPGM and AGØX new vice director. Lamar area repeater now linked with 28/88 in Buelah according to WØYCD. WØHE calling it quits as HNN mgr. after 16 yrs. New mgr. is NØAXQ. Our sincerest thanks to WØHE for his dedicated service. Six-meter net very active in Denver area on 50.110 MHz. OVS WØETT reports much F2 propagation during the month. District 13 ARES was activated on Nov. 12 as gasoline leaked into the city sewage system causing the evacuation of 32 homes in the area. 12 amateurs took part using the Northglenn 31/91 machine. The 439.25/421.25 ATV repeater will be moving to a higher location soon. New SEC will be K3PUR beginning Jan. 1 with WØACD assuming the SCM position. Nets: Columbine 25 sess, QNI 1095, QTC 76, Informals 250, QNF 1025; CWN 30 sess, QNI 220, QTC 219, QNF 989; CWN (Oct.) 36 sess, QNI 1442, QTC 102, Informals 234, QNF 1100. Traffic: (Nov.) WØWYX 1961, NØBOP 1855, WAØHJZ 1210, KØDJ 374, WDØAIT 356, WØHXB 242, KBØZ 110, WØEJD 94, WØLQ 90, WØRE 90, WØNFW 68, KDØM 53, NØBLU 45, WØLAE 24, WØGW 3. (Oct.) KBØZ 146, WØTX 30.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs: WB5NNG & KG5L. Southwest Net (SWN) meets daily on 3583 kHz, at 1930 local and handled 191 msgs with 224 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 kHz at 1800 local and handled 176 msgs with 1240 stations in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local,

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handled 71 msgs with 794 checkins. Yucca 2-Mtr Net handled 20 with 751 checkins. Caravan Club ARC Swap Net 147.66/06 reports good swaps at 7:30 P.M., 1st Sunday of every month. Socorro, Los Alamos, and ABQ report several SAR missions. W5UR doing good job as OO. Santa Fe, Caravan Club and ABQ ARC's plan big Christmas parties. Traffic: W5UH 282, W5DAD 196, KA5DDW 196, W5ENI 187, W5JOV 165, N5NG 140, KG5L 87, WA5MIY 40, KB5LI 12.

UTAH: SCM, Royce Henningson, K7QEO — STM: W7OCX. K7QEO, SCM, enjoyed a visit with the Odgen ARC on the 17th of Nov. It was a good meeting and a great chance to meet a bunch of the hams from the Odgen area. K7WG, the EC for Washington County, reports a Simulated Emergency Test was conducted by the Dixie ARC members of ARES on Nov. 3rd in coordination with the Dixie Medical Center, the St. George Police Dept and the Dixie College School of Nursing. K7EDU WB7NJB WB7SMI K7WG W7JSX N7BUO took part in the test. The simulated aircraft crash was designed by the Dixie Medical Center and the Dixie College School of Nursing. The emergency services of the county, including the hospital, the police paramedical services and the ARES members were not advised in advance. The response by all concerned was immediate and effective. Traffic: K7HLR 239, WA7KHE 97,WA7MEL 77, W7OCX 40, WA7JRC 28, W7RO 25.

WYOMING: SCM, Chester C. Stanwarty, W7SDA — A group of the Big Horn Basin amateurs is working on a project to put a repeater upon the Big Horn mountains east of Lovell. The Cedar Mountain ARC is going to operate their Christmas message program again this year. WB7OFK is new General in Cheyenne. WB7NHR reports the Wyoming Cowboy Net held 20 sessions with 637 QNI and 23 QTC. WA@PFJ reports the Jackalope Net held 24 sessions with 496 QNI and 2 QTC. Traffic: WB7NHR 170, WA7GYQ 146, K7VWA 93.

SOUTHEASTERN DIVISION

ALABAMA: SCM, James M. Bonner, K4UMD — Nov 11th Veterans Day Parade in B'ham had 12 hams participating: N4DRK N4DMA KC4LV WA4WYA KB4IX WB4ZAG N4AHN KC4HC KA4IMI K4IR WB4CXD WA4RNP. Vulcan Run held B'ham Nov. 23rd, 219 people, hams covered timing, helped officials. 15 local hams covered the event via 2-mtrs. K4HJM reports the CCARA furnished radio communications for Anniston, AL annual Christmas Parade. 150 units were involved. New officers of Chattahooce Valley ARC: KA4PZY, pres.; KA4BKD, vice pres.; W4DGN, secy.; WA4CZY, treas. BARC held annual Christmas party on Dec. 18th; Twin Base ARC held theirs on Dec. 5th. HARC party, on Dec. 4th. All the clubs reported a good time had by all. TBARC also operated on 2-mtrs playing Santa for shut-ins in local nursing home by WB4TKU and WB4UAY. Enterprise ARC holding Novice classes, K4HKR doing the teaching Ala. running 100% into Gulf Coast Net stations: N4AZO KA4EEE KB4GA KA4GIA KA4IBI KB4KZ KA4NSV WD4ODO W4USB and W4VDL. CAND reports 218 mess., 30 sess. Ala. 100% in DRN5 by W4CKS. AENM Net QNI 2667, QNC 206 in 35 sess. AENM new Net Manager is KA4PIZ, congrats. The net thanks N4AWW, past AENM manager, for a job well done. AEND: QNI 174, 96 messages AENR, six mtrs net, QNI 58 in 9 sess., liaison was WB4EKJ. W4IBU, SEC, needs more ECs and DECs, if your City does not have an EC, then you can help, so let your SEC or SCM hear from you. Traffic: (Nov.) WA4JDH 1022, W4CKS 260, WA4PIZ 87, K4AOZ 66, W4IBU 36, WA4ZPZ 30, AA4J 27, K4UMD 23, K4HJX 18, WD4DHI 12, WA4JPK 11, KC4GS 8, WB4EKJ 7, K4HJM 6, KA4NXG 6, WB5TVY 6. (Oct.) WA4ZPZ 29, WB4EKJ 3.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM/SEC: K4VHC. ASEC: WA4PUP. STM: W4WXA. Chief OBS: W4BIA.

Net	Freq.	Time (EST)	Mgr
GCN	3995	0700 Dy 0800 Su	W4HON
GSN	3595	1900 & 2200 Dy	W4PIM
GTN	3718	1815 MWF	WA4ZBR
GSSBN	3975	1830 Dy	WB4ZVX
ARES	3975	1700 Su	N4BGH
GA TFC	7243	1200 Dy	W4GH
GERN (RTTY)	3620	2030 Fri	WA4ZHC

Once again we have NMs for all section nets. Tnx to all for the FB support. If any of you hear of a Silent Key please forward info to me ASAP. New Central GA ARC officers: WA4HON, pres.; WD4GDV, vice pres.; N4AMJ, secy/treas.; N4BHB, prog./chmn. Alford Memorial RC reports another successful Famvention & new leadership will be: W4NEB, pres.; K4ZYK, vice pres.; WA4PUW, secy.; WD4KDT, treas. MATS & Atlanta area hams received letters of commendation from Senator Sam Nunn and FCC Chairman Charles D. Ferris for outstanding job of communications during July 4th running event. K4VHC is making great progress with ARES program & tnx all for cooperation. WA4ZHC has a real "Green Keys" net going on GERN. Won't you check in on Fri. evenings. OBSs doing fine in disseminating bulletins. Southeastern DX Club continues to have fine programs and encourages DXers to join. WB4ZNH & WN4FVU back from Uganda with terrific war stories. W4YWP still with us after 3 kV jolt & sending him to the hospital. Harris County ARC reports following leadership for 1981. WD4MJV, pres.; WD4BDU, vice pres.; N4AZV, secy.; KA4CEK, treas. The annual Columbus Hamfest kicks off the 1981 tour with the same site on March 28th & 29th. Please get your activity reports in to me so that I can have them by the 6th of each month. I have a 7th of the month deadline for my reports. See you on the nets. Traffic: WA3NAZ/4 265, W4WXA 205, W4PIM 183, K4EV 78, N4UZ 68, WB4LBM 54, WB4NTW 48, KA4ATM 44, W4CMX 30, W4GH 30, K4JNL 25, W4HON 23, KA4PBD 22, W4FIZ 20, K4BAI 18, K4VHC 17, WB4RUJ 7, WA4GPY 1.

NORTHERN FLORIDA: SCM, Billy Williams, N4UF — SEC: WA2GIN. STM: N4WA. Beginning Jan. 1 the SCMs of N & S Fla. will offer a Certificate of Merit to stations performing outstanding public service. See Fla. Skip for details. WA2GIN WB3EKM WD4MFJ WB4TRZ provided communications for Escambia Search & Rescue during search for lost boaters. N4DLL upgraded to Extra & KA4RQV and KA4RQW new Novices. WB4QBB active in tone SS from K7TBT. SHARC had satellite station presentation at meeting and now has 3rd Mon of the month as meeting night. KA4CEP now Advanced. AA4US has 250 sticker for his DXCC. TARS handled communications for March of Dimes Bike-a-Thon. KD6GK now KC4OO and also AEC for Jax Beaches working with WA4NKA. KA4RDQ & KA4OQQ now Technicians. KA4NKA. KA4RDQ & KA4OQQ now Technicians. KA4MLQ is General. OARC planning FB slate of programs for ARRL National Convention March 13-15 at Sheraton Twin Towers. K4JRY in-charge of forums and

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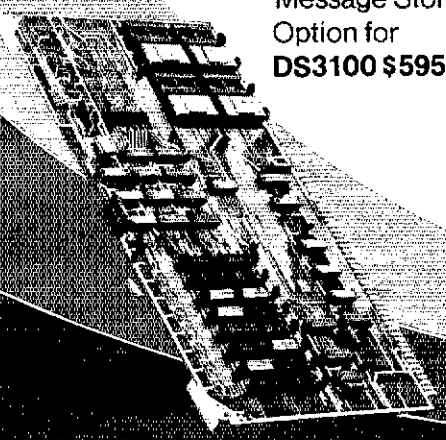

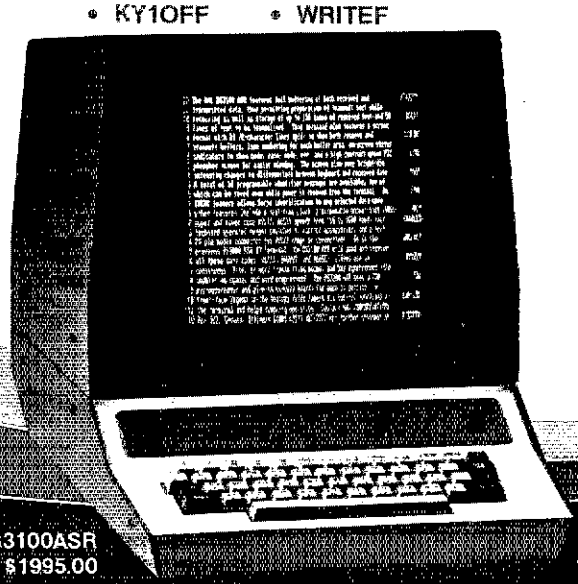

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2N2876	18	200	13.5	TO60		12.35
2N3375	3	400	28	TO60	4.8	6.50
2N3553	2.5	175	28	TO39	10	1.40
2N3866	1	400	28	TO39	10	1.25
2N3924	4	175	13.6	TO39	6.0	2.20
2N4427	1	175	12	TO39	10	1.35
2N4428	.75	750	28	TO39	10	1.75
2N4429	1	1000	28	TO117	5.0	7.65
2N4430	2.5	1000	28	TO129	5.0	10.55
2N4431	5	1000	28	TO129	5.0	14.50
2N5109	CATV	1200		TO39		2.50
2N5641	7	175	28	MT71	8.4	5.40
2N5642	20	175	28	MT72	8.7	10.45
2N5643	40	175	28	MT72	7.6	14.35
2N5945	4	500	12.5	MT90	8.0	11.75
2N5946	10	500	12.5	MT90	10	13.90
2N5589	3	175	12.5	MT71	8.2	6.75
2N5590	10	175	12.5	MT72	5.2	7.80
2N5591	25	175	12.5	MT72	4.4	11.50
2N5913	1.75	175	12.5	TO39	12	2.45
2N5945	4	500	12.5	MT90	8	10.75
2N5946	10	500	12.5	MT90	6	12.80
2N6080	4	175	12.5	MT72	12	6.90
2N6081	15	175	12.5	MT72	6.3	9.75
2N6082	25	175	12.5	MT72	6.2	10.95
2N6083	30	175	12.5	MT72	5.7	12.30
2N6084	40	175	12.5	MT72	4.5	14.35
2N6094	4	175	12.5	3804LFL	12	6.95
2N6095	15	175	12.5	3804LFL	6.3	9.95
2N6096	30	175	12.5	3804LFL	5.7	12.95
2N6097	40	175	12.5	3804LFL	4.5	24.95

	WATTS	MHz	VOLTAGE	CASE	GAIN	PRICE
MRF237	4	175	12.5	TO39	12	2.55
MRF238	30	160	13.6	145A09	9.0	9.50
MRF245	80	175	12.5	316-01	6.4	32.50
MRF247	75	175	12.5	316-01	7.0	31.50
MRF449	30	30	12.5	211-07	12	10.50
MRF449A	30	30	12.5	145A09	12	10.50
MRF450	50	30	13.6	211-09	11	11.75
MRF450A	50	30	13.6	145A09	11	11.75
MRF453	60	30	12.5	211-11	13	16.95
MRF453A	60	30	12.5	145A10	13	16.95
MRF454	80	30	12.5	211-11	12	24.40
MRF454A	80	30	12.5	145A10	12	24.40
MRF455	60	30	12.5	211-07	13	15.35
MRF455A	60	30	12.5	145A09	13	15.35
MRF458	80	30	12.5	211-11	12	20.60
MRF472	4	30	12.5	ASE77-03	10	2.45
MRF901		1000		317-01	10	3.95
SD1018-4	40	175	28			14.50
SD1019-5	100	175	28			24.75
SD1074	50	30	12.5	5004LFL	11	21.15
SD1076	70	30	12.5	5004LFL	13	24.00
SD1088	25	450	12.5	5004LFL	6	23.25
SD1089	40	450	12.5	5004LFL	5	27.15
SD1127	4	175	12.5	TO39	12	2.55
SD1143	13	220	12.5	MT72	10	8.25
SD1158	12	220	12.5	MT59	5.3	12.40
SD1272	30	220	12.5	MT72	6	9.60
SD1278	50	30	12.5	MT72	10	14.30
SD1288	50	30	12.5	500SOE	10	19.35
SD1405	75	50	12.5	5004LFL	9	19.10
SD1451	50	50	12.5	5004LFL	5	18.10

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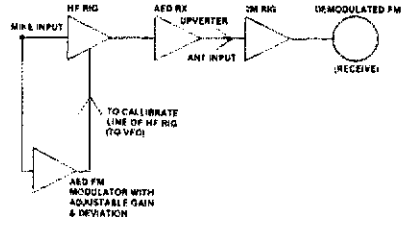

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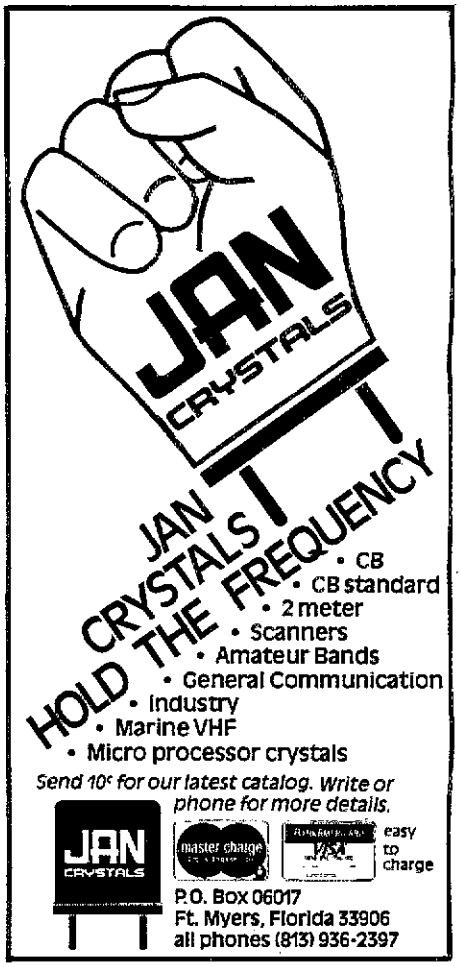

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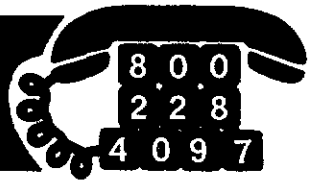

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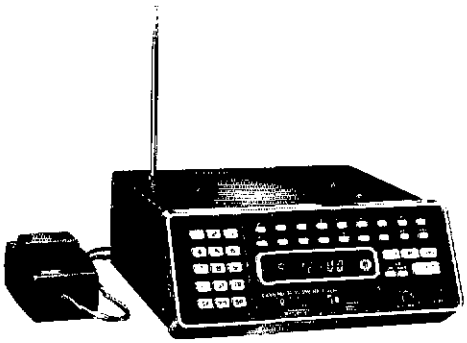

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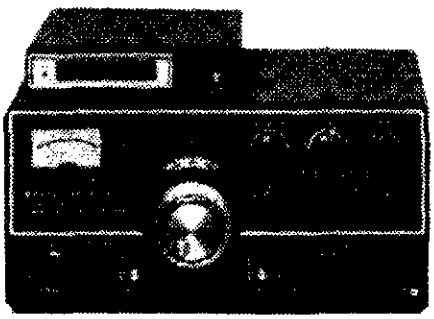

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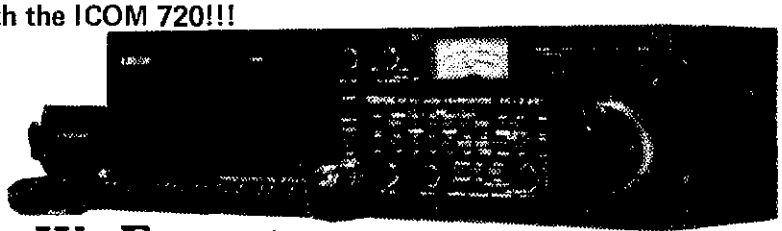

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reports both days booked solid. It promises to be an event we will all remember for a long time. W4WHK active as OVS. WD4OCN presented program at HCARA meeting in Brooksville on Disaster Preparedness. There 115T15 repeater getting new antenna system. KA4FYD WA4OEM & WA8UIO active in this project. K4EAB donated tower to the effort. N8BKL now KB8QK. GCARC getting new repeater site. SSRC happy with FB FD showing. K4GSO club station active from Oscala Courthouse. GARS and WD4ASW got nice writeup in "Gainesville Sun." Officers for NOFARS are N4BZH, pres.; WD4PFN, vice pres.; WD4KKF, secy.; KA4FYC, treas.; WB4REL, act. mgr.; WD4ETG N4UF, dir. LMARA officers are: WD4AKL KW4V KA4ASI KA4ATV KR4Q & W4BSP. Traffic: (Nov.) W4SIZ 683, N4PL 618, WD4HIF 610, AA4FG 549, WD4IIO 460, WA4CRI 299, WB4EXA 295, WA2GIN 164, WA4EYU 160, W4JL 101, W4KIX 96, KC4MM 94, WB4FJY 85, WB4TZR 84, N4BZH 82, N4BBY 81, W4BSP 74, W4MGO 71, KF4U 65, N4AXN 56, WB4ADL 47, N4UF 45, WB4DTS 33, WA4STZ 33, WB4QBB 24. (Oct.) WB4FJY 44.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst SCM: W4KGJ SEC: AA4WJ. STM: K4TH. W4ROA reports Sunrise Emergency Amateur Radio Service activated Oct. 31 at request of Police Chief for Halloween activities. Stations involved were W4ROA W2MXG WB2BEC WD4FOK WB9TRY AA4EE WA4MJI WD4BWE and WD4FCZ on the Motorola ARC repeater 19/79. W4AB, Broward ARC, had radio exhibit at Broward County Fair Nov. 20-30. On Nov. 4, W4ROA showed film "New World of Amateur Radio" to elementary school group and demonstrated 2-meter communications. We were grieved to learn that N4KB suffered loss of a daughter killed in an auto accident in October. As we write this we hear by our 2-meter net that K8PXM is not expected to live more than 10 days due to ruptured esophagus after radiation treatment for cancer. Our heartfelt sympathy goes out to KA8COZ, his XYL. They have both been very active and highly respected members of the St. Pete ARC. Also bad news this week, W4TAS of Bradenton is a Silent Key. He was a real "old timer", very active and highly respected as well as trustee of the Bradenton 22/82 repeater. N4XR reports he is going to Haiti first 2 weeks in December on one of his regular monthly visits and will activate HH2VP from whence he has already worked over 20,000 stations and 140 countries. W4JM wants to hear from hams in Lakeland area interested in joining local QCWA chapter. W3VR says he is overloaded with visitors while W3CUL indicates the annual Chicken Plucking contest and Home Shows helped swell her traffic total to 3337. W4GPL took part in the Simulated Emergency Test conducted by Bay Pines Veterans Administration Hospital. W4UIO is a winter resident of Fort Myers area. Clearwater ARS had their Christmas dinner party Dec. 5th. St. Peter ARC had "annual meeting" Dec 5th and elected officers for 1981: WD4COL, pres.; WA4IIT, vice pres.; N4APZ, secy.; W4VIP, treas. Congrats all. Metropolitan Rptr Assn is having Christmas dinner party Dec 12th while St. Pete ARC and Florida Power Club are both having theirs on Dec. 13th. Got a nice note form KD4Q advising that he had given Novice exam to Ben Barker of St. Pete and he is now KA4SBM. Congrats to both the new ham and his "Elmer." Traffic handlers remember OTS automatically becomes ORS Jan. 1st. No need to request new certificates or change appointments. We are making plans to attend and conduct or participate in forums at Sarasota Hamfest January 17-18, Miami February 7-8 and Orlando March 13-15. Hope to see you there. Merry Christmas and Happy New Year to all. Traffic: (Nov.) W3CUL 3337, WD4AWN 846, WA4PFK 722, W3VR 701, K4SCL 589, WB4FVV 570, K4TH 551, W4LX 433, WB4WYG 381, K4ZK 373, WD4COL 329, NC4H 265, W4GPL 207, WB4AID 191, WA4EIC 143, KA4LNA 139, WB4PIB 138, KA4ASZ 117, KE4O 103, N4ET 75, W4IRA 72, N4KB 70, WD4APM 69, W3TLV 65, KA4FZI 52, W4ESH 47, W4ASJ 44, WA4HXU 44, WB4SNX 44, WB4GCK 41, KB4OW 41, KA4BBA 38, W4KMN 34, WA4FKE 33, N4APE 25, WA1IOG 20, W4MML 16, W4BK 12, WA4BYT 12, W4SMK 10, W4WYR 10, WD4LWT 6, WA4UQO 6, W4UIO 4, W4JM 2, N4XR 1. (Oct.) KM4G 77, N4KB 68.

WEST INDIES: SCM, Julio Negroni, KP4CV — ARRL Board of Directors has approved the forthcoming West Indies Section Convention on Sat. April 25, 1981, in conjunction with the PR Amateur Radio Club annual convention which this year will be held at Palmas del Mar, Humacao, Puerto Rico. Details of activities will appear in future *QSTs* and all section members will receive copies of programs. PRARC held its annual Arecibo semihamfest on Nov. 22. As usual KP4AET KP4BCQ and the rest of the Arecibo gang were most gracious guests. KP4U reports an instance where amateur public service shone at its best. LU8DIP called Cali Colombia with urgent traffic, KP4U was instrumental in hooking up LU3EAR and HK5BCQ via HK1RAC in less than 2 hours in spite of the fact that phone numbers were not known. Traffic: NP4D 173, KP4U 90, KP4DJ 70, KP4FBT 35, KP4EMY 11.

SOUTHWESTERN DIVISION

ARIZONA: SCM, W. L. Haskell, AC7D. SEC: N7EH. STM: W7EP. Coconino Cty. ARC specifically KA7BHF, came up with a vy gud suggestion in clubs news-letter based upon a forest inspection of their mtn. top rpt. "Periodic inspection of rpt. installation, elec. wiring, etc to assure compliance with local codes and to ascertain if all is "ship shape." Apparently, they had such an inspection by the local Forest Svc. Insp. Club members initiated immediate corrective action. NOTE: All repeater owners should give this serious thought. Lake Havasu ARC furnished comm for the Classic National Outboard Races. The purpose — public safety and emergency. Assisting were: W7YHB W7YHC WB7ALO KA7BTC WA7NHZ W7JER W1EFY WA7EXX and W7LVB. N7BYF, his XYL and two friends had a close call during this rptg period. Piloting a Cessna-172 fm Phnx to a field n. of Mt. Lemon, during landing hit unmarked tel lines which forced him to land amongst Palo Verde trees and brush. All walked away with minor scratches and abrasions. (If all walked away — the landing had to be good!) New Novice calls from the OPRC, Tucson: KA7IQZ KA7IRA KA7IVN KA7IZC. All ARC's: pse advise your SCM of your newly elected officers and specifically who your PR electee is! Net Tic: A-10 QNI 983, QTC 200; SWN QNI 224, QTC 191. Traffic: W7EP 211, K7NTG 134, W7LVB 80, W7AMM 80, AF5Z 74, K7NMQ 50, WA7KQE 44, W7OIF 40, KA5DDW 37, K7JKM 28, AC7D 20, W0RIQ 19, W0OPX 11, WA7WEB 11, N7EH 10, W7LBW 10, WA7NXL 5, K7UXB 5, WB7QOM 4.

LOS ANGELES: SCM, Stan Brokl, N2YQ — ASCM: N6UK. SEC: WB6FAK. STM: W6INH. W6AM and W6GC just returned from a trip to China. Unfortunately BY6AM

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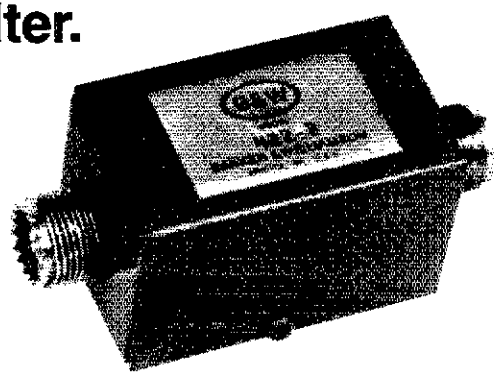

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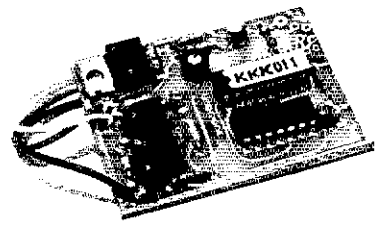

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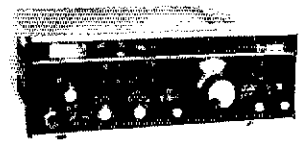

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did not go on the air (HI). They have many interesting tales and sides. Thanks to W6ORG and W6YFT, the So. Cal. ATV club got live action shots of W6VIO and Saturn as the JPL ARC ran its Saturn encounter commemorative. W6VIO made over 8000 QSOs during the commemorative event. QSLs will follow in a few months because of special printing. K5DY assumed the position of acting manager for SCN effective Dec. 1, 1980. KB6FC and KB6OT qualified for PHSR certificates for 12 months of PHSR listings, congratulations. New appointment, WA6JUT OO. I received OO reports from K6KA WB6YID and K6CL. K6CL included an interesting note thanking him for helping detect a problem with hum. WA6LVO reports that operators are needed for RN6D 2145Z 233OZ, also liaison to PAN 223OZ. Traffic: KB6OT 169, W6INH 158, K6INK 144, WA6LVO 128, KB6FC 79, WB6YID 48, W6NKE 45, K5DY 29, W6BRO 25, KA6CTI 19, K6CL 18, WA6OCM 10.

ORANGE: SCM, Fred Heyn, WA6WZO — ASCM: WA6WZN, SEC: W6UBQ, STM: KA6A. DECs (by county): K6GGS (San Bernardino), W6LKN (Riverside), WA6TLE (Orange), WB6YZY (Inyo). The effectiveness of ARES proved itself in the several large fires in which over 100 ARES members under the fine leadership of the ECs supported Red Cross and the Forestry Dept. in addition to other services. KA6HNY appointed EC to assist SEC as liaison to other sections. WA6IKH will take over S.B. RACES District #2 as EC. AECs W6HDY, WA6CNN and WB6SEL appointed OES. Anaheim ARA new officers: WB6ARK, pres.; WB6CKG, vice pres.; KB6HK, secy.; KB6IW, treas. Orange County ARC new officers: WA6VKZ, pres.; KA6HNY, vice pres.; KA6CZI, secy.; WB6KJS, treas. So. Calif. AR Computer Club new officers: AG60, pres.; KA6HRK, vice pres., KA6BTM, secy.; WB6SKE, treas. Bishop ARC new officers: WD6EBI, pres.; WD6EBN, vice pres.; KA6GWI, secy.; KA6HII, treas. Lake Elsinore Valley Radio Club new officers: WA6EPI, pres.; WD6AUY, vice pres.; XYL-W6WPP, secy.; WB6QHI, treas. Fullerton Radio Club new officers: WA6JQN, pres.; WB6UZZ, vice pres.; WB6AYO, secy.; KA6DLG, treas. Riverside County ARA new officers: WD6DGI, pres., N6BAK, vice pres.; WD6HEZ, secy.; N6AXR, treas. Status reports of the Calif. Dept. of Forestry-VIP program headed by EC AI6I are in the Lee DeForest Radio Club bulletin; send s.a.s.e.s to editor KA6CCG. Congrats to WB6OBZ and WB6EIC for BPL. Traffic: WB6EIC 504, WB6QBZ 457, N6ANI, 424, KN6C 200, KA6A 187, W6UBQ 110, WB6BZZ 108, K6ZCE 102, KA4FDC 88, WD6CSL 87, W6NTN 85, WA6QCA 41, KA6HNY 35, W6RE 34, K6WI 28, KA6HJK 8, WB6LGL 6, WA6WZO 2.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW (222-5575). SEC: W6INI (273-1120). Asst SEC: N6RD (224-1574). Public service is talked about by many but practiced by few. If you are one of the "many" why not join the "few" by joining ARES or participate in traffic handling? Daytime NTS nets need operators. Here's an opportunity for the retired to provide a valuable public service. Contact the above for info or check in at 1045, 1345 or 1530 PT on 7275 kHz, any day. New calls: WB6ZEK to KS6L, WB6OZT to KS6S. WB6PVH earned his 11th BPL award. Red Flag alerts in Nov. brought the total of ARES participants to 70 since first of Oct. ARES provided communications to Red Cross for its first aid stations at the El Cajun Mother Goose Parade. K7DCG presented a slide program on radio communications in the Antarctic to the Poway ARS. San Diego City planning provides for ARES assistance in keeping tabs on river levels when rains threaten. Traffic: (Nov.) WB6PVH 549, KM6I 245, W6HUJ 215, N6GW 148, K6HAP 108, N6AT 35, W6DEY 26, WA6UFY 11. (Oct.) WB6MLB 82, W6DEY 33.

SANTA BARBARA: SCM, Robert N. Dyrutt, W6POU — Section planning meeting saw presentations by SCM, SEC WB6BWZ, DEC W6HIC, EC K6DZT. Also incl: ECs WB6QKF, Ventura A. R. Cross and AECs. Specific area plans, training needs were outlined to develop ARES cadres for section-wide use. 40-meter Sunday net now SCTN League Officials Net for all leaders and appointees incl. OBS, OO, OTS (now renamed Ott. Relay Stn). All ARES/NTS members welcome to QNI. New time: Sun 1300 PT 7235 kHz followed by 200 mi. SCTN linkup on vhf thru dedicated work of W6KPS Santa Maria, and associates WB6OEV, Lompoc, W6LIO, King City, Santa Clara Valley Sctn. Pub. Svc: "Crisis Relocation" subj. of SBARC address by Lewis Reed, SBAR City OES based on nuclear and natural disaster threats. NTS: N6WP resigns as SCN Mgr. — doc's orders. Regrets & many thanks! Traffic: WA6MBZ 303, WB6TRP 37, K6YD 86.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — Asst. SCM: AE5C. SEC: W5GPO. STM: W5VMP. NMs AE5I KK5B W5HMR AA5J N5BT. We are in the final stages of the complete reorganization of the ARES here in N. TX; under the leadership of our new SEC, W5GPO, in Wichita Falls. The section has been divided into 20 districts, with a District Emergency Coordinator for each. Among the responsibilities of the DEC is the recruitment of an Emergency Coordinator for each county in his district that has a vacancy. The ECs will now report directly to their DEC, who in turn will forward a composite report to the SEC before the 5th of each month. Some DEC positions are still being filled, and some areas are in desperate need of volunteers to fill in the gaps in our system; the San Angelo and Midland areas in particular need ECs to get units started and operational before the spring weather hits. A detailed map of the districts with a list of DECs is forthcoming. The following amateaurs have been appointed as DEC to date: WB5DUQ W5CBT WA5DTC WD5AFP N5OX WA5GYP AE5U WD5EPC WB5IUT WA5KZA K5HT WB5LAT K5HSZ WD5EYW WB5UZS K5MWC KD5Z and WA5UTA; more to follow. ARES members: please scan this column regularly for the latest info and news. The section emergency freqs. are 3961 and 7290 (ssb), and 3770 (cw). It is encouraged that all reports to the SEC and SCM be made via radiogram, when possible, during the first five days of each month. Another ARES project in the first five days of each month. Another ARES project in the mill is a tactical one that involves emergency procedures in times of disaster, in that emergency and priority traffic out of a disaster site will be handled on voice (primary) on hf, ssb, or via vhf/uhf fm links, and the health and welfare traffic will be sent via RTTY (primary) via vhf links or on hf for the long-haul cases. This will involve a series of portable link stations that will be moved to strategic locations so that two or more repeaters may be "tied together" when needed in an emergency. Those of you that stood in the lobby at the last Texoma Hamarama and heard the auto-patches being made into

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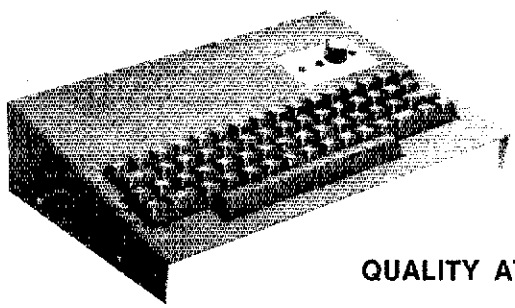

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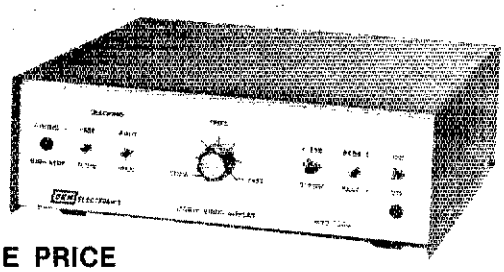

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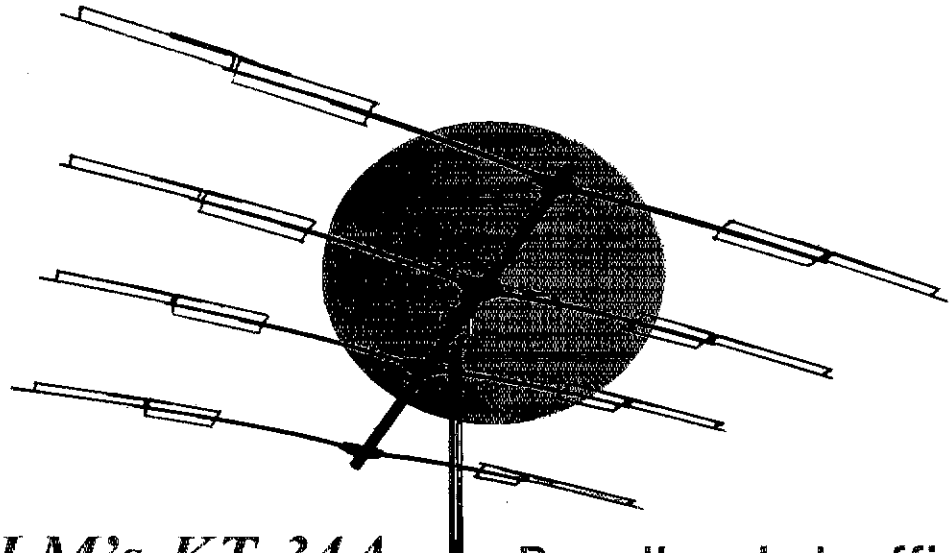
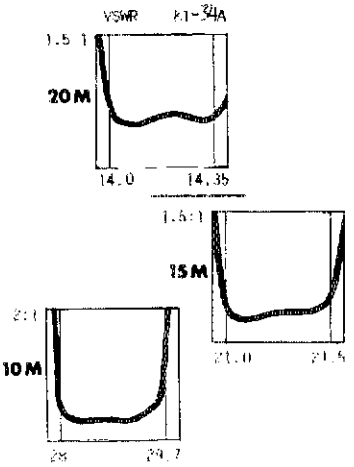
Dallas-Ft. Worth on 1 watt talkies got a preview of things to come in linking our section together to facilitate tactical operations and to supplement ht communicaions when needed. More on all the activity later, in a letter being prepared by the SEC to all ARES units. We invite your participation in this exciting vital service to the public of N. Tx!! D/FW Tfc. Net: ONI 612, QTC 67 in 30 ssns; TSN (Texas Slow Net): 3745 kHz @ 8:00 P.M. local daily ONI 259, QTC 50 in 30 sens. PSHR: WD5JYI WD4SIH WA5QFD AA5J KA5AVO W5CTZ N5BT WD5EUE N5CEK W5VMP W5HMR and KK5B. Attention clubs: I would appreciate a copy of your club newsletter each month, or the info on your club and its officers. My address is on page 8, this issue. Traffic: W5TI 484, N5BT 336, K5BNH 225, W5CTZ 181, AA5J 132, WB5BKM 114, WD5EUE 112, KK5B 79, WA5QFD 76, WD5JYI 68, KA5AZK 65, N5CEK 53, W5HMR 51, WA5KHE 50, WD4SIH 43, KA5AVO 29, WA5INJ 27, W5ERT 26, W5VMP 26, KB5UL 25, K5KQG 20, K5PC 12, AE5I 8, W8DCX 4, K5HSZ 1.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Asst SCM: W5REC. SEC: WA5MLT. Our congrats to KA5DDE K5GBN K8JRM/5 and W5VGJ on making WAS on 6 meters. A special tip of the hat to K5GBN and W5VGJ for their patience and perseverance; 23 yrs. is a long time from first to 50th contact. Then KA5DDE comes along and does it in 6 months. WB5EAY has been very, very faithful on OLZ. KA5KKT & KA5KLA are new calls at Altus — congrats. Dust Bowl ARC, new club at Guymon, N5CMW WD5DFH N5CCV WD5DFJ & W4ZSL/5 new GPARC (Woodward) officers; KB5EK KA5GFL WA5MLT & WA5RPP, new SCARS (Norman) officers. Great Plains Club is spearheading plans for repeater linking from Texas Panhandle across N. W. Oklahoma to S. W. Kansas. Getting everything in readiness for the storm season. It is time to begin setting up, regrouping, testing equipment. 28 OTS reports; 4 PSHR reports; 2 OO reports; 1 OVS report received for the month of Nov. This count includes Thanksgiving traffic. Traffic: WB5NKC 298, W5REC 287, KF5A 247, WB5NKD 205, W5RB 163, K5CXP 104, KB5EK 104, W5AS 82, WD5IRB 78, WA5FSN 74, WA5QUV 71, W5UYH 71, W5UYH 71, W5IQL 66, WD5DYI 65, W5SUG 46, WB5ELG 45, W5VXU 40, W5VLW 32, K5CAY 28, W5VOR 28, WB5EAY 26, WD5IFB 26, WD5IRR 25, WD5ETB 22, W5FKL 20, K5MGD 18, WB5ACH 8, NØIN 7.

SOUTHERN TEXAS: SCM, Roger Coday, N5FN — ASCM/STM: N5TC. SEC: AK5N. WA30VC/5, OO reporting this month. It's great to have K5OWK operating from the STX Section. N5AF, OVS sending lots of good reports of vht activity. WB5UYV, OTS reports that the Del Rio 2-meter repeater is on 22/82. It's nice to have N5AFA reporting ARES activity from Angelina Cty. It looks like vht has been hopping with the receipt of another good report from WA5QCP, OVS. He also reports a homebrew project of crystal control at microwave frequencies, and is trying for stability of .01 ppm. Congrats to the following on their appointments as ORS: KB5NX KB5KZ KM5J and WD5AAH. Also, WB5TKQ is the new EC for Travis County. K5DG, ORS continues to send in good reports from the Harlingen area. WB5SHU is the new president of Houston ARC. WA5RFT has been elected as NM for TTN. There are not many who devote as much time to Amateur Radio and public service as he does. Congratulations! It was really a pleasure to attend the Sam Houston ARC meeting in Cleveland. They have a lot of activity going up there in the Piney Woods. Here is wishing all of you and yours the very best for the upcoming year. Traffic: W5SHN 810, W5KLV 673, WB5YDD 516, N5TC 280, K5OWK 225, W5TFB 164, WB5TAY 134, KB5TC 127, WB5MMI 89, WA5RVT 71, KB5NX 69, WD5GKH 55, K5RG 45, WB5YRV 35, K5HZR 27, WD5JIM 23, W5BGE 22, N5FN 19, WD5AAH 18, KA5CSM 15, KA5GYJ 13, AK5M 13, KA5BSN 8, WB5UYV 8, KD5O 7, WD5OQR 6, WD5FGY 3.





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Two driven elements are employed to make the KT-34A unusually **broadbanded** (a concept applied to most KLM antennas). VSWR and performance remain nearly constant across each of the three bands (see the VSWR charts). A KLM balun is supplied to allow direct feed from your 50 ohm coax.

Structurally, the KT-34A is built tough. No boom support is required. All the aluminum, including the boom, is strong weather resistant 6063-T832 alloy. All the hardware is stainless steel except for the mounting U-bolts. Virtually indestructable Lexan insulators support the elements and insulate them from the boom. Rotation is possible by most any ham rotor. Wind balance and wind survival are excellent. Boom length is only 16 feet.

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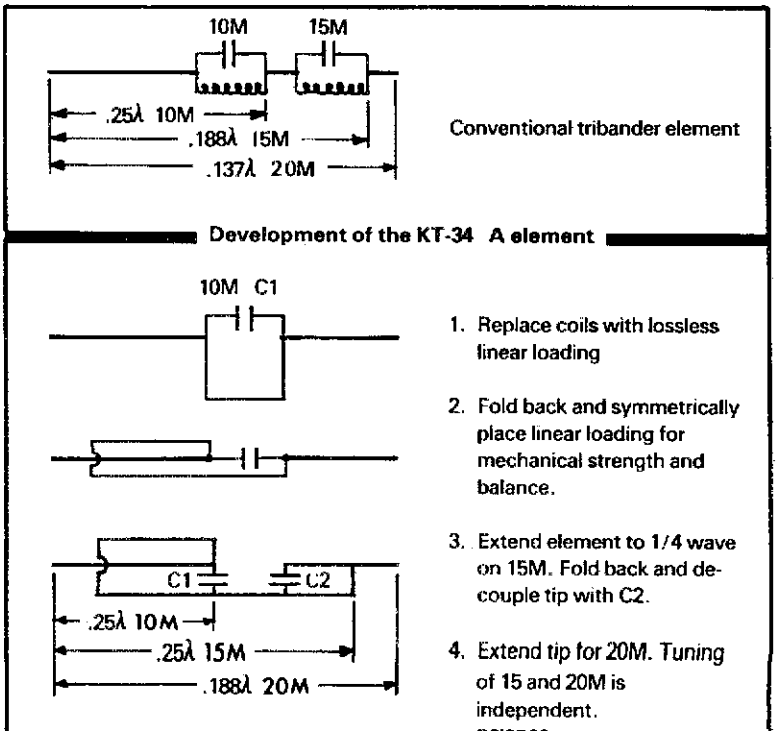
A great deal of thought and care has gone into the design of this antenna. It's not just another "me too" tribander, but one developed from modern techniques, materials and engineering. We hope you will give it a try. We know you won't be disappointed . . . .

KT-34A SPECIFICATIONS

Frequencies of operation:
14.0-14.350 MHz
21.0-21.450
28-29.750

Feed impedance: 50 ohms with balun supplied
Power rating: 4KW PEP
Boom: 16 ft. x 3" O.D.
Mast: for 2" O.D. (standard)
Element length: 24 ft. average
Turning radius: 16 ft.
Wind area: 6 sq. ft.
Wind survival: 100 MPH
Suitable Rotors: TR-44, Ham "M", HD-73, KR-400, etc.
Price: $389.95



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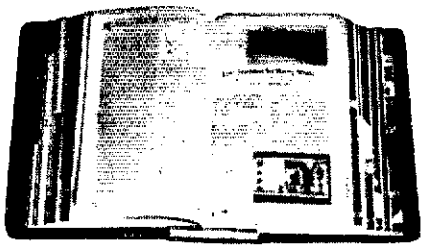

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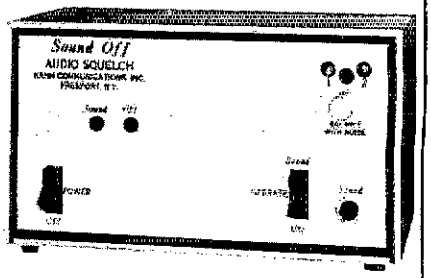

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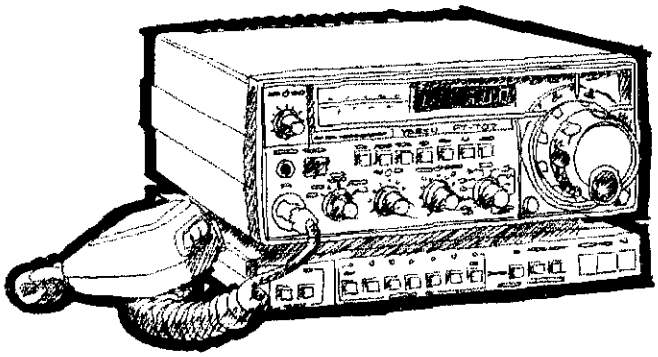

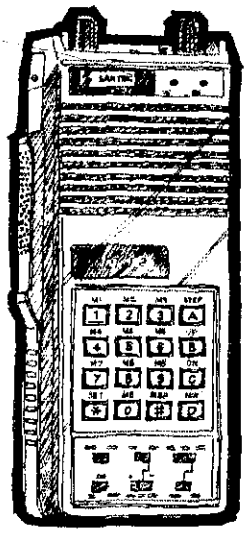

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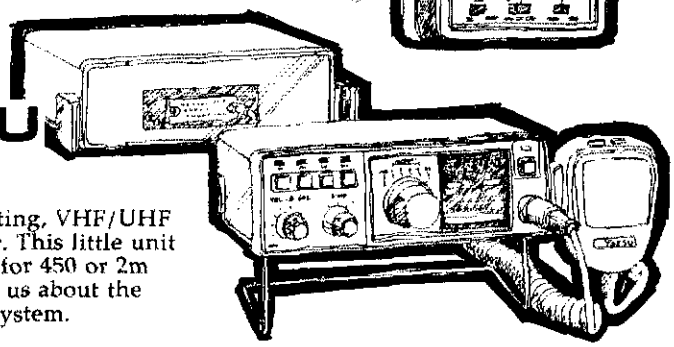

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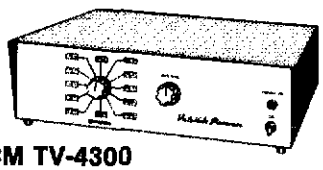

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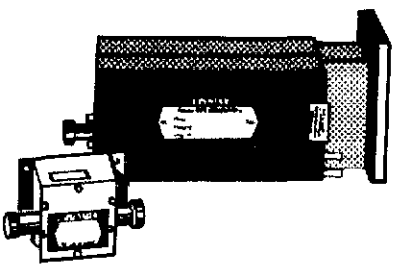

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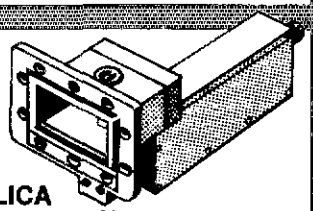

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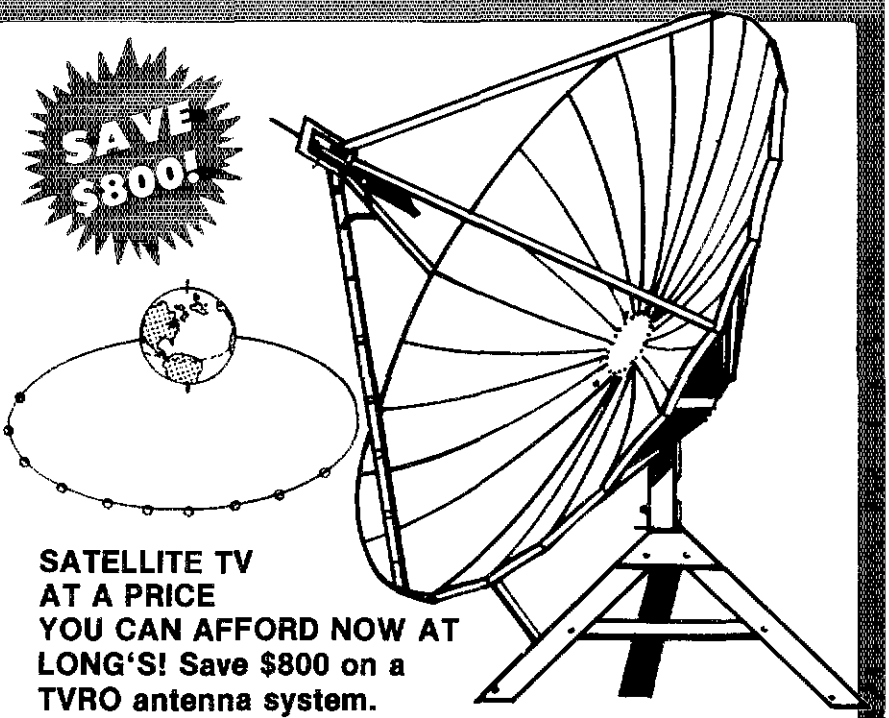

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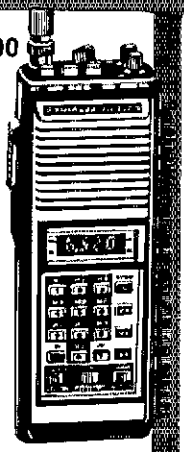
KENWOOD HAM EQUIPMENT



KENWOOD TR-2400 synthesized 2m hand-held transceiver

Features LCD digital readout, 10 memories, auto and manual scanning and mode switch for standard repeater ±600 kHz, offset, simplex and nonstandard repeater splits. Has touch tone pad selection of 5 kHz chs. from 144 to 148 MHz. Mars 1.5 W., RF output; NiCad battery pack and AC wall charger.

349.10 List Price 395.00

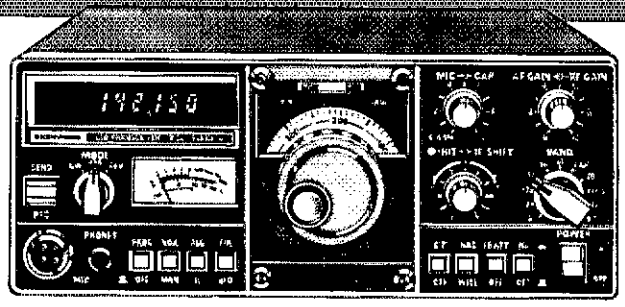
$20! OFF!

KENWOOD TS-180S HF SSB transceiver with digital frequency control

This all solid-state transceiver covers 160-10 meters and features 4 memories that can be tuned in 20 Hz steps. Has a built-in microprocessor, RF speech processor, dual IF filter, dual RIT, tunable noise blanker, and VOX. Adaptable to 3 new bands. Requires 13.8 VDC @20A. Modes SSB/CW/FSK. 200 W. PEP.

939.95 List Price 1140.95

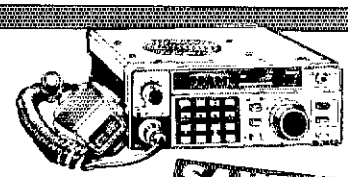
SAVE $76!



KENWOOD TS-130 S HF SSB transceiver

An incredibly compact, full featured, all solid state HF SSB/CW transceiver for both mobile and fixed operation. It covers 80 through 10 meters (including 3 new bands on SSB and CW. Loaded with features such as digital display, IF shift, speech processor, narrow wide filter selection (on both SSB and CW) and optional DFC-230 digital frequency controller. The TS-130S runs high power. Easy operation. Weighs only 12 lbs. 13.V DC.

683.95 List Price 759.95

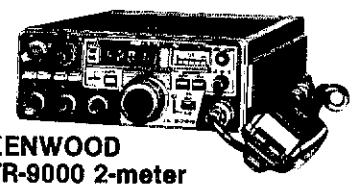


SAVE $40!

KENWOOD TR-7800 2-meter mobile transceiver

Features 15 memory channels, priority alert, built-in autopatch DTMF Touch-Tone encoder, autoscan, digital readouts, up and down scan mic, and repeater reverse switch. Covers 143.900-148.995 MHz, 5KHz or 10 KHz steps. Output 25 W. Hi/5W. Low.

359.95 List Price 399.95

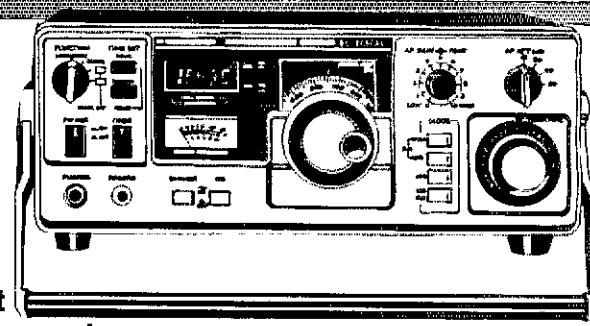


KENWOOD TR-9000 2-meter all-mode transceiver

Covers all 2m freq. plus MARS and CAP. freq. 143.90 thru 148.99. Features digital dual VFOs with selectable tuning of ,100HZ, 5kHz and 10kHz, 5 memories; auto busy stop scan and free scan, RIT, noise blanker and AGC. RF power output: Hi (SSB, FM, CW)-10W, Lo (FM,CW) 1W. Requires 13.8 VDC at 2.9 A.

449.95 List Price 499.95

SAVE $49!



KENWOOD R-1000 compact communications receiver

Covers 30 bands from 200kHz to 30 MHz. Features PLL synthesizer, digital display quartz digital clock with timer, RF attenuator, noise blanker, IF filter, and built-in speaker. AC power 100, 120, 220 or 240 VO. Has calibrated S meter and AF gain control. LSB/CW, USB, narrow AM or wide AM.

449.96 List Price 499.95

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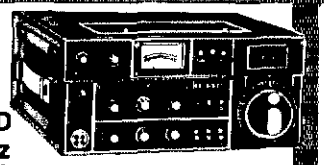
BE AN ICOM OPERATOR

ICOM IC-551 50 MHz all-mode transceiver

A compact, easy to use all mode 6-meter transceiver which uses a built-in microprocessor for frequency control and scanning. Features 3 memories, memory scan, 2 digital VFO's, built-in AC/DC power supply and varible scan speed. Freq.: 50-54 MHz. Power output: 1-10W adjustable.

431.10 List Price 479.00



ICOM IC-551D 50 MHz all-mode transceiver

Features built-in microprocessor, freq. control & scanning, 3 memories, dual VFO's & LED dig. readout. Modes: SSB (USB/LSB), CW, AM. Power: 13.8 VDC @ 18A or optional PS-20 AC power supply. Power output: 1-80W adjustable.

629.10 List Price 699.00

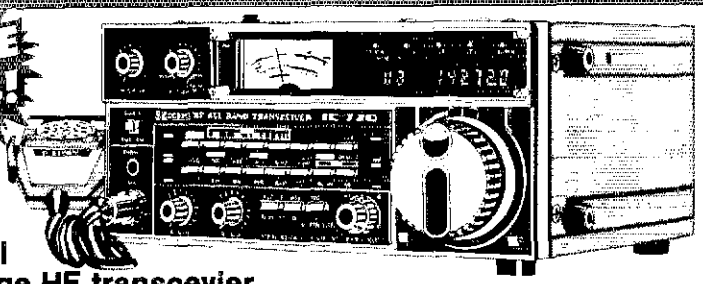
The ICOM PS-20 power/supply speaker console for the IC-551D may be purchased for **179.10**

ICOM IC-260A 144 MHz multimode mobile transceiver

Enjoy VHF mobile at its best. Sideband, FM, or CW. Features 3 built-in memories, memory scan, and programmable band scan. Plus, two seperate VFO's mobile mic, LED freq. readout, built-in CW monitor, and battery saving Hi/Lo power output levels. Modes USB, LSB, CW, and FM. Power output: 10W Lo. Power requirements 13.8 V DC.

449.10 List Price 499.00

SAVE $134!

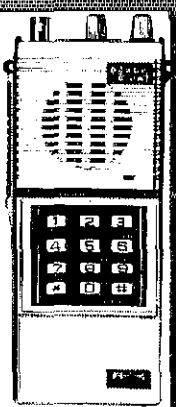


ICOM IC-720 general coverage HF transcevier

For those of you who want it all. Covers all 9 HF bands with 100 kHz (min.) each side. The IC-720 features all solid state, broadband tuned and low pass filters and digital readout. Plus two VFO's, RF speech processor, CW filter RTTY, noise blanker, and fast and slow AGC. Matching mic included. Power requirement 13.5 V DC @ 20A. Output 0-100 W.

1214.10 List Price 1349.00

ICOM PS-15 12V power supply for IC-720 **134.10**

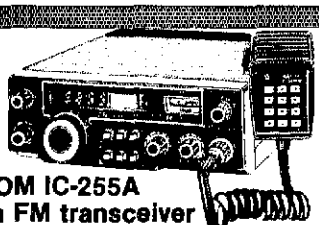


ICOM IC-2AT 2m hand-held transceiver

Features 800 synthesized ch. (no crystals) ±600 KHz repeater offset, simplex duplex switch, 5 or 10 KHz ch. selection, built-in condenser mic and more. Freq.144-147 995 MHz Power: 1.5 W at 8.4 V (Hi) & 15W (Low) NiCad pack, wall charger, touch tone pad, rubber antenna & belt clip included.

242.55 List Price 269.50

IC2A with NiCad and wall charger **List Price 239.50 . . 215.55**



ICOM IC-255A 2m FM transceiver with HM8 8 pin mic

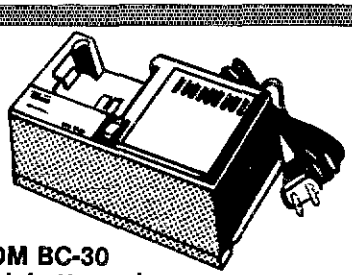
A full 25 watts of mobile power! Features a 5-channel memory, complete with memory scan, adjustable scanning speed, and auto-stop. Comes with 2 built-in VFO's for standard and programmable splits. Covers 144-148 MHz and most MARS freq. Power requirement 13.8 V DC @ 6A. Complete with the HM8 8 pin mic.

359.10 List Price 399.00

ANNOUNCING

THE NEW ICOM IC 2KL SOLID STATE AMPLIFIER!

Power: I KWDC
Size: Same as IC-720
Power Supply: 40V at 25A
Power Supply Size: Same as IC-720
Available: Late Feb. 1981
Price: **$1795.00**



ICOM BC-30 desk battery charger

Can be used for the IC-2AT, this charger automatically stops charging when batteries are charged. Features indicator lamp. Charging time 1-1½ hrs. Fits all ICOM battery packs. Runs off of 110 AC or 220 AC. Has micro-switch to program charging.

69.00

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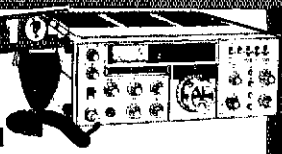
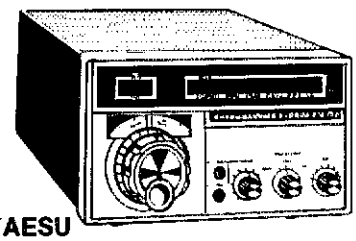
SAVE $10



YEASU FT-107M HF SSB transceiver

Covers 160-10 meters with 2 aux. bands available for future expansion. Input power 240 W SSB/CW, 80 W AM/FSK. Features digital plus analog freq. display, VOX, RF speech processor, SWR meter and variable band width. Remote scanning possible with YM-35 mic if radio is equipped with optional memory shift (DMS). Power required 135 V DC at 20 amps.

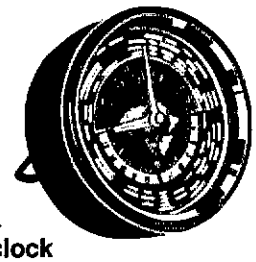
1034.10 List Price 1149.00



YAESU FV-107 external VFO

The FV-107 is an attractive, versatile accessory for your FT-107 station. Besides the velvet-smooth main tuning dial mechanism, it features 6 fixed channels and a clarifier for transmit, receive or transceive frequencies.

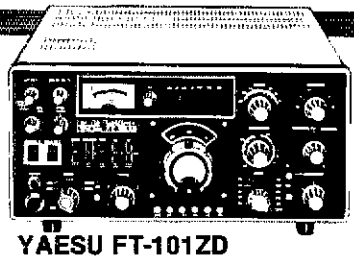
135.00 List Price 150.00



YAESU QTR-24 world clock

Features world time at a glance. Time in any principal city or time zone can be coordinated with local time on a 24-hour basis. The Time Zone Hour Disc automatically retains the correct time. Uses one "C" battery.

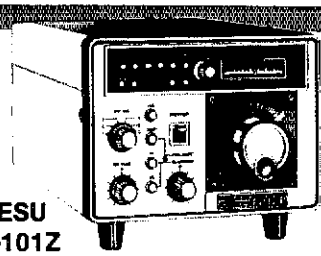
49.00



YAESU FT-101ZD high performance HF transceiver

Covers 160-10 meters on SSB and CW with WWV/JJY (receive only). Features built-in power supply, digital plus IF bandwidth, 6146B final tubes, auto semi break-in CW with sidetone, freq. counter, VOX and WARC bands.

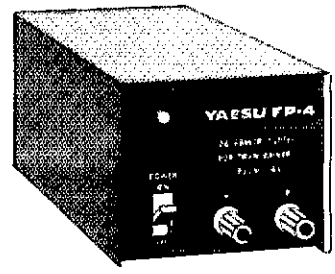
800.10 List Price 889.00



YAESU FV-101Z external remote VFO

A compact remote VFO for the FT-101ZD and FT-901 series. It features an analog frequency display, a unique VFO shift that allows ±8KHz shift of the main dial freq. Up to 6 fixed channels may be installed for crystal controlled operation.

157.50 List Price 175.00

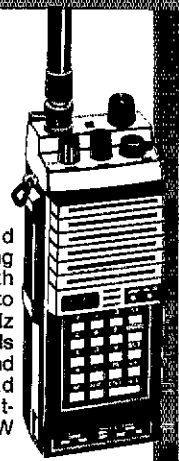


YAESU FP-4 power supply

This power supply is designed for use with VHF equipment. As a DC outlet of 13.8 volts at 4 amps. overload and short circuit protection of 5 amps.

50.00

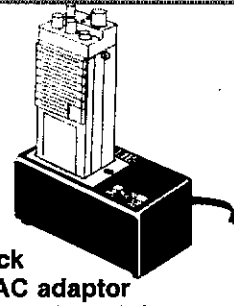
$84 OFF!



YAESU FT-207R Synthesized handie-talkie

A CPU controlled handie-talkie covering 144-148 MHz with up/down manual or auto scan in 5 or 10 kHz steps. Has 4 channels of freq. memory, and ±600 kHz or odd repeater splits. RF output 2.5 W. Hi 200 mW Low.

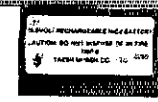
269.10 List Price 299.00



YAESU NC-3 quick charger/AC adaptor

The NC-3 quick charger/AC adaptor is designed expressly for your Yaesu hand-held transceiver. The NC-3 provides charging of your NiCad battery pack in as little as three hours, and the AC/DC adaptor allows base station operation.

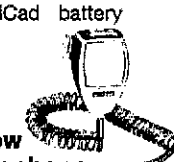
90.00



YAESU NBP-9 NiCad Battery Pack

The NBP-9 NiCad battery pack fits the Yaesu FT-207R. It is a 10.8 volt rechargable NiCad battery pack.

23.00



YAESU YM-35 low impedance microphone

The YM-35 is a low impedance microphone of 600 ohms. It features down, fast and up scanning buttons which controls scanning of the unit. Also features push to talk button.

20.00

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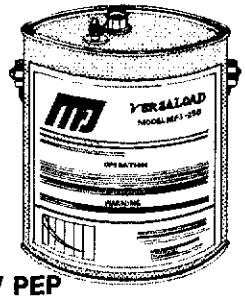
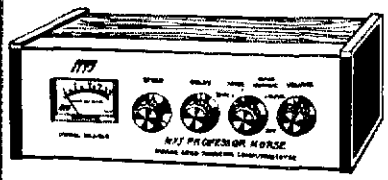
DISCOVER MFJ FOR QUALITY!

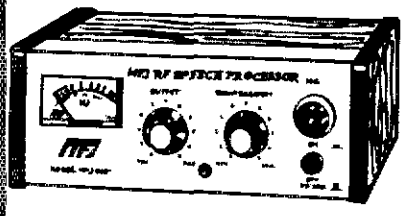


MFJ 2KW PEP 50-ohm dummy load
Tune up off the air and cut down the QRM factor. SWR less than 1.5:1 up to 300 MHz, less than 2:1 300-400 MHz. Comes complete with high grade cooling oil.
29.95

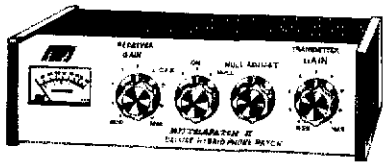
MFJ-408 deluxe Electronic Keyer II with speed readout
Read up to 50 WPM. Has socket for Curtis memory, random code generator & keyboard. Uses Curti 8044 1C & features dot-dash memories, weight, speed, volume, tone controls & speaker. Sends iambic, auto., semi-auto. & manual. RF proof keying. Battery operated. 2.5 mm phone jack for external power. (6-9 VDC) Optional AC adaptor.
79.95



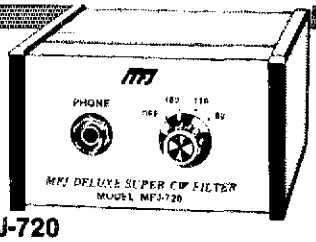
MFJ 410 "Professional Morse" random code generator/keyer
The 410 sends out unlimited supply of precision morse code in random groups. Send alpha only or alphanumeric. Full feature keyer with speed readout (5-50 WPM). AC adaptor optional 7.95
134.95 List Price 149.95



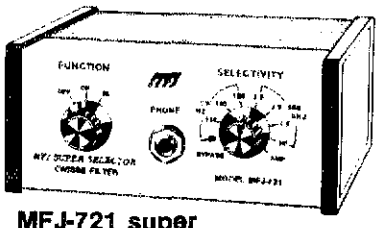
MFJ 525 Speech Processor
Plugs between mic and rig. Has VU meter, 4 pin mic jack, 6 db SSB power, bypass switch. 12-18 VDC or optional AC adaptor.
107.96 List Price 119.95



MFJ-624 telephone patch
The MFJ-624 is a telephone patch for crisp, clear audio. Features VU meter monitoring line level and null adjustment.
59.95

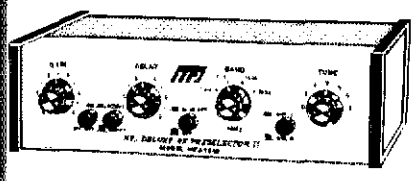


MFJ-720 deluxe super CW filter
For the ultimate in performance. Features 80 Hz CW filter, SSB filter, and selectable peak and through noise limiting. Plugs into phone jack and has 2 watts per speaker. Speaker and phone jacks, inputs for 2 rigs and aux. 2 watt amp. 20 db. Requires 9-18 VDC.
44.95



MFJ-721 super selector CW/SSB filter
For the ultimate in performance. Features 80 Hz CW filter, SSB filter, and selectable peak and through noise limiting. Plugs into phone jack and has 2 watts per speaker. Speaker and phone jacks inputs for 2 rigs and aux. 2 watt amp. 20 db. Requires 9-18 VDC.
59.95

MFJ-751 tunable SSB/CW filter
Instantly zero in on a SSB/CW signal and eliminate QRM. Features: peak for CW/SSB AM/SSTV/RTTY, notch rejects QRM, and lowpass removes hiss, splatter. Simply plug into phone jack. Phone and speaker jacks included. 2 watts per speaker. 100-volt AC adaptor supplied.
69.95



MFJ-1040 shortwave accessory
Receiver preselector 1.8-54 MHz, 20 db. gain, built-in 20 db attenuator. Works with 2 antennas and two receivers.
89.96

VISA

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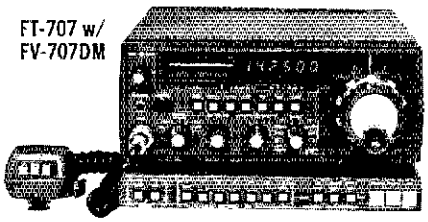


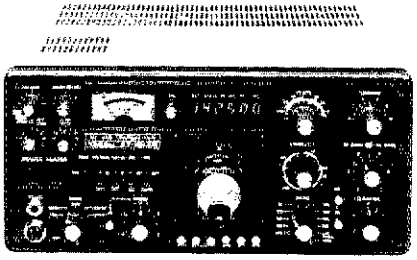
FT-707 w/ FV-707DM

FT-707 8-band, 3.5-30 Mhz digital Xcvr... $810.00
FP-707 Power supply 162.00
FV-707DM Dig VFO w/12 memories 279.00
FC-707 8-band antenna tuner, 150w..... 110.00
FRB-707 Relay box..... 39.00
MMB-2 Mobile mounting bracket 20.00
MR-7 Mounting rack 20.00

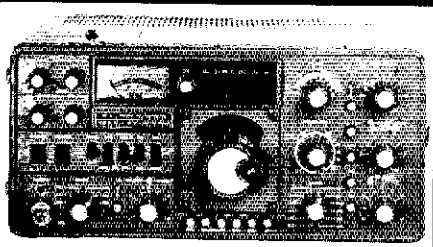
FT-107M/DMS (WARC) 9-band Dig. Xcvr .. 1149.00
FP-107 Internal power supply 139.00
FP-107E External power supply 145.00
FC-107 9-band ant tuner, 250w..... 150.00
FV-107 Remote VFO 150.00
SP-107 Speaker..... 29.00
SP-107P Speaker/patch 76.00
XF8.9B/XF8.9GA AM filter 45.00
FTV-107R Transverter w/2m..... 284.00
6 meter module only 110.00
70 cm module only..... 255.00
FT-107M service manual..... 25.00

Other accessories for FT-707/107M:

XF8.9HC 600 Hz CW filter..... 45.00
XF8.9HCN 350 Hz CW filter..... 50.00
YM-34 Desk microphone 31.00
YM-35 Scan noise canx mic..... 20.00
YM-36 Noise canx mobile mic 20.00
YM-37 Mobile microphone 10.00



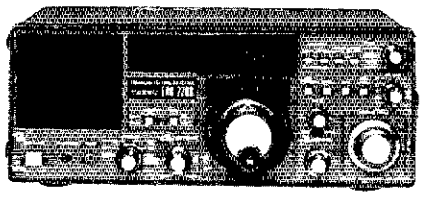
FT-101ZD (WARC) 9-band digital Xcvr 889.00
DC-101ZD DC converter..... 60.00
YE-7A Hand microphone..... 17.00
FT-101ZD series service manual..... 25.00



FT-902DM 9-band digital Xcvr..... 1535.00

Other accessories for FT-101ZD/902DM:

FA-9 Cooling fan 22.00
SP-901 Speaker..... 35.00
SP-901P Speaker/patch 76.00
YO-901P Mon. scope w/bandscope..... 515.00
FV-101Z Remote VFO..... 175.00
FV-901DM Remote VFO w/memory..... 415.00
FC-902 9-band ant. tuner, 500w PEP... 199.00
FTV-901R Transverter w/2m..... 389.00
6 meter module only..... 110.00
70 cm MHz module only 255.00
YR-901 CW/RTTY decoder 730.00
YK-901 ASCII Keyboard 155.00
YVM-1 Video monitor 199.00
CL-901 60 ma. Loop/YR-901 ..... 30.00
XF8.9HC 600 Hz CW filter..... 45.00
XF8.9HCN 350 Hz CW filter..... 50.00
XF8.9B/XF8.9GA AM filter..... 45.00



FRG-7700 150 KHz-29.99 MHz dig. Rcvr.. 549.00
MU-7700 Memory unit 149.00
FRG-7 0.5-29.9 MHz Shortwave receiver .. 299.00
YH-55 Lo-Z headphone 15.00
YS-200 1.8-150 MHz wattmeter/SWR..... 79.00
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FT-480R 2m SSB/FM/CW Xcvr..... 529.00
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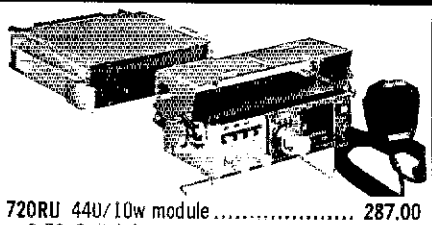

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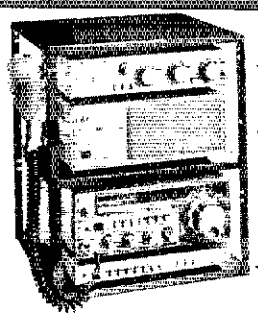

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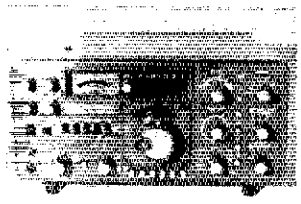

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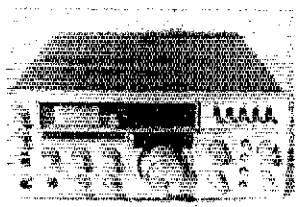

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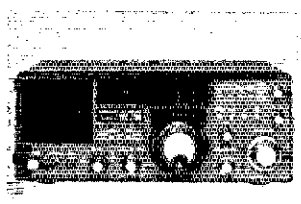

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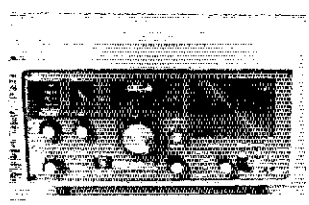

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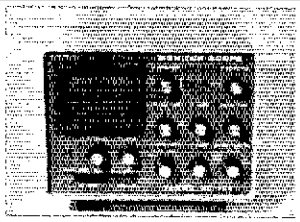

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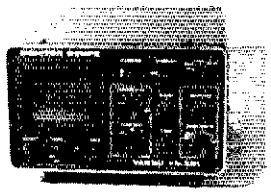

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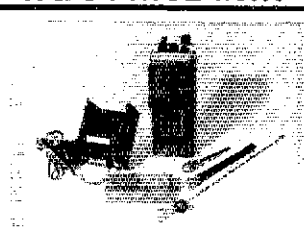

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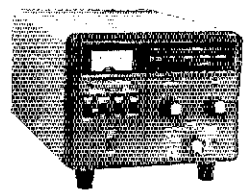

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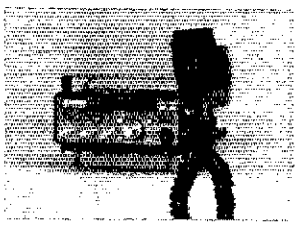

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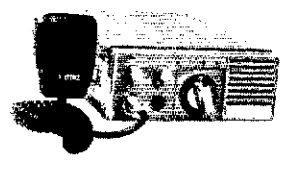

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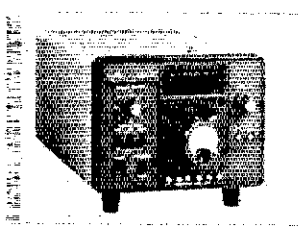

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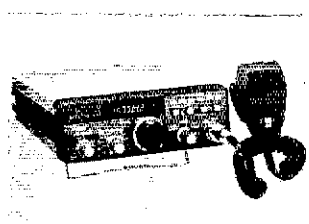

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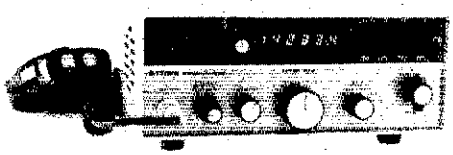

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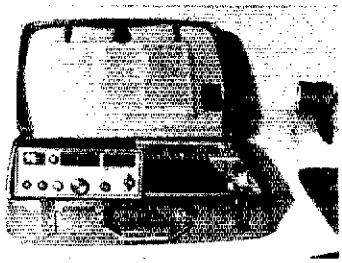

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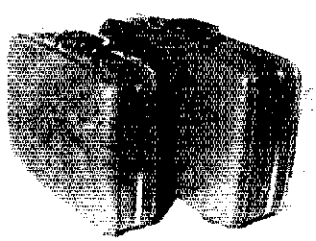

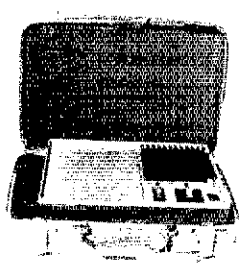

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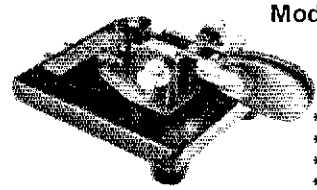

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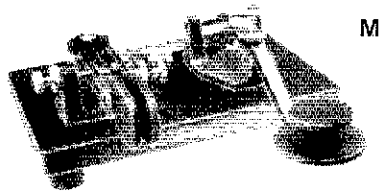

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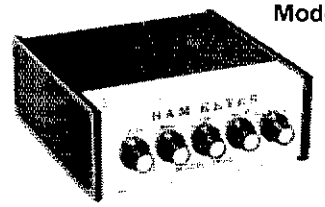

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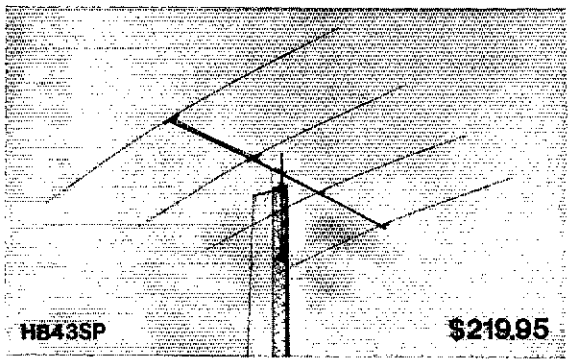

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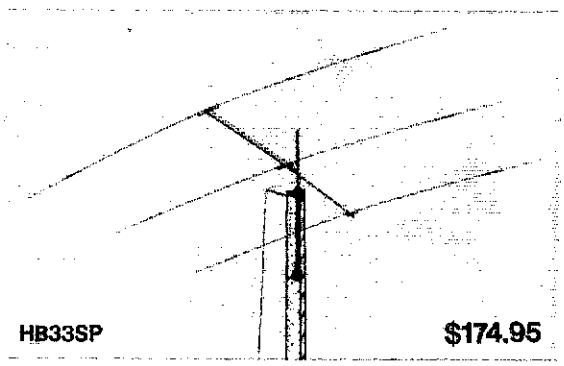

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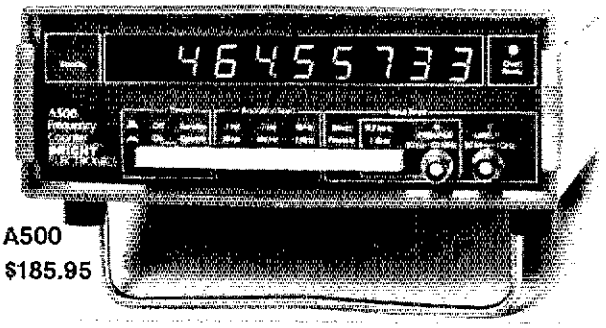

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MRF458	(MOTO)	80W	12.5V	Flange	19.88

VHF
150-175 Mhz

B40-12	(CTC)	40W	12.5V	Stud	13.75
2N5591	(SSM)	25W	12.5V	Stud	8.50
2N6083	(SSM)	25W	12.5V	Stud	9.95
2N6097	(SSM)	40WPNP	12.5V	Flange	15.50
MRF247	(MOTO)	75W	12.5V	Flange	33.00
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RF13,RF23 also replaces 2N6084-MRF224					13.00

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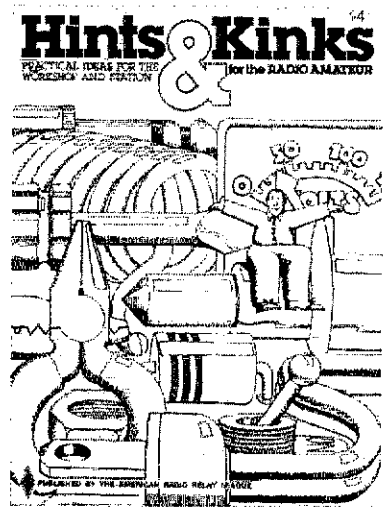

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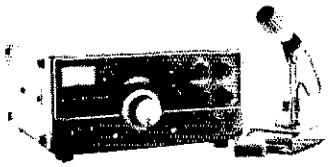

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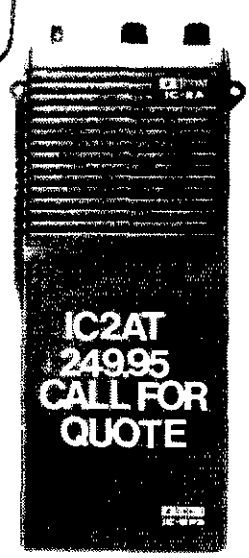

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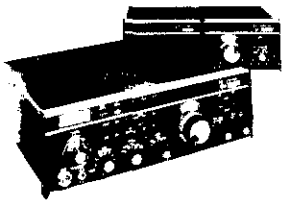

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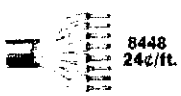
		100	5.8	19
		200	8.5	28
		300	10.3	34
		400	11.8	38.5
RG8/u Foam .81VF	8214 32¢/ft.	50	1.6	5.2
		100	2.3	7.5
		200	3.5	11.5
		300	4.3	14
		400	5.0	16.5
RG8/u Regular .66VF	8237 28¢/ft.	100	2.0	6.6
		200	2.8	9.2
		400	4.2	13.8
		900	7.8	25.6
RG8/u Non-contaminating	8267 36¢/ft.	100	2.0	6.6
		200	3.0	9.8
		400	4.2	13.8
		900	7.8	25.6



8448 24¢/ft.

No. of Cond — 8
AWG (in mm) —
6-22 (7 x 30)
2-16 (16 x 30), (1.19)

9405 38¢/ft.

No. of Cond — 8
AWG (in mm) —
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6-18 (16 x 30) (1.17)

MINI RG-8 19¢ FOOT

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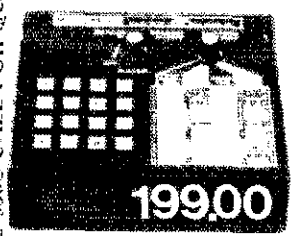

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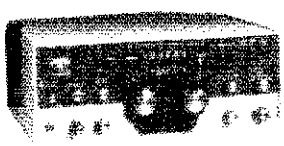

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SL-40	40,15	33'	$34.95
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Q20,15	10 Ft.	21	5.1 Ft.	20,15	$109.95
Q20	10 Ft.	18	5.1 Ft.	20	$105.95
Q15	7½ Ft.	18	4.2 Ft.	15	$ 95.95
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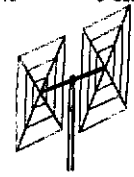

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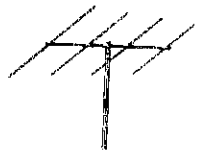
Y202	2 EL 20 M	21	17'2"	10'	5.1 Ft.²	99.95
Y154	4 EL 15 M	27	15'4"	20'	6.8 Ft.²	99.95
Y153	3 EL 15 M	21	16'7"	15'	6.1 Ft.²	79.95
Y105	5 EL 10 M	24	13'3"	20'	6.4 Ft.²	99.95
Y104	4 EL 10 M	19	11'4"	15"	5.1 Ft.²	89.95
Y103	3 EL 10 M	14	10'1"	10'	4.3 Ft.²	79.95
Y66	6 EL 6 M	21	11'2"	20'	5.1 Ft.²	99.95
Y65	5 EL 6 M	17	8'8"	15'	4.7 Ft.²	89.95
Y64	4 EL 6 M	13	7'1"	10'	3.4 Ft.²	79.95
Y212	12 EL 2 M	20	8'	15'	4.2 Ft.²	79.95



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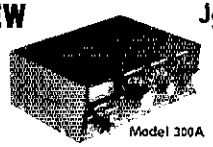

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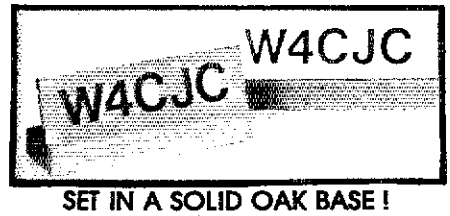

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SELL: Model 28, table model, Reperforator, and TD all sync motored also new 28 motor, XFK exciter, all working. Make offer, also full set technical manuals. W4AIS, 4 Homewood Ave., Taylors, S.C. 29687.

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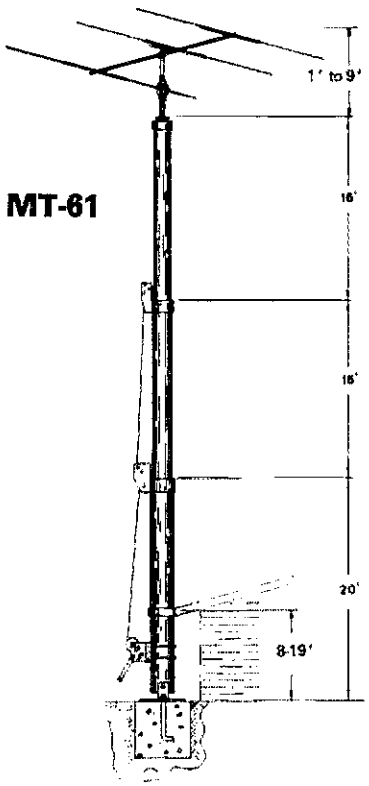

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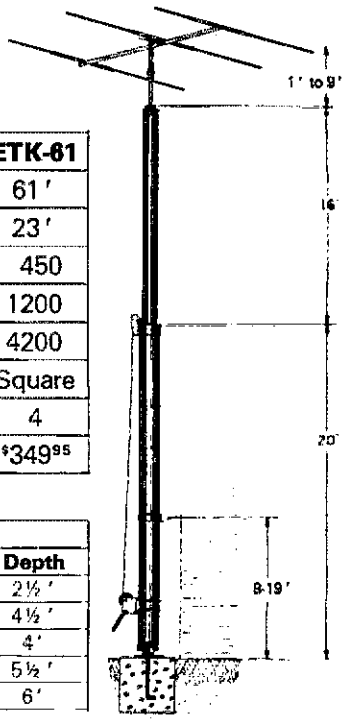


MODEL	TT-45	ETK-45	MT-61	ETK-61
Max. Height . .	45'	45'	61'	61'
Min. Height . .	22'	22'	23'	23'
Weight (lbs.). .	250	250	450	450
Winch (lbs.) . .	1200	1200	1200	1200
Cable (lbs.) . . .	4200	4200	4200	4200
Tubing	Round	Square	Round	Square
Sections	3	3	4	4
Price	$399.95	$249.95	$614.95	$349.95

Wind Loading		
Tower	Height	Sq. Ft.*
ETK-45	37	15
	45	10
TT-45B	37	18
	45	12
ETK-61	53	15
	61	10
MT-61B	53	18
	61	12
ST-77B	69	16
	77	10

* Square Footage Based on 50 MPH Wind.

BASE CHART		
Tower	Width	Depth
45'	12" x 12"	2½'
FB/RB	30" x 30"	4½'
61'	18" x 18"	4'
FB/RB	36" x 36"	5½'
77 + RB	42" x 42"	6'

The ETK towers offer the ham a chance to have a 45 or 61 ft. tower at a very economical price. The tower is shipped to you in kit form. You do the final assembly and painting. You do not have to do any welding, just bolting together the parts. We supply you with the cold galvanizing compound to put the protective coating on the tower. This is not just paint, but the full galvanizing coating that will give your tower years of service.

Using square tubing, the assembly is fast and easy. It can still be mounted against the house for a non-guyed installation. Or you may use the fixed base for away from the house and completely free-standing installation.

TT-45, MT-61, ST-77

Wilson Systems uses a high strength carbon steel tube manufactured especially for Wilson Systems. It is 25% stronger than conventional pipe or tubing. The tubing size used is: 2" & 3½"-.095; 4½" & 6"-.125; 8"-134. All tubing is hot dip galvanized. Top section is 2" O.D. for proper rotor and antenna mounting.

The TT-45B and MT-61B come complete with house bracket and hinged base plate for against-house mounting. For totally free-standing installation, use either of the tilt-over bases shown below.

The ST-77B cannot be mounted against the house and must be used with the rotating tilt-over base RB-77B shown below.

WILSON ELECTRIC WINCH

Now you can raise and lower your Wilson Tower electrically. The electric winch will replace the hand operated winch. Available for use on the TT-45, MT-61 and ST-77 towers.

EW-45 (TT-45)
EW-61 (MT-61)
EW-77 (ST-77)
$249.95

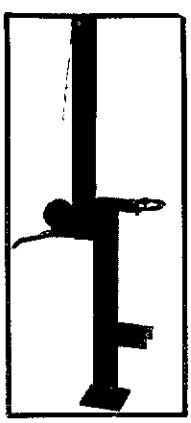
Remote Switch. $24.95

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.

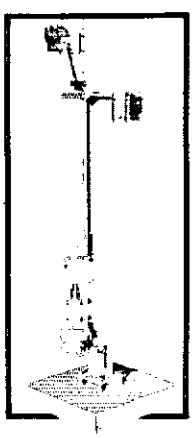
FB-45 ... 112 lbs. ... $189.95
ETB-45 ... 112 lbs. ... $164.95
FB-61 ... 169 lbs. ... $269.95
ETB-61 ... 169 lbs. ... $244.95

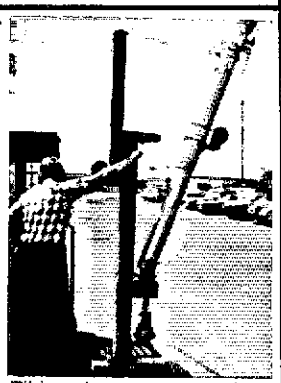


ROTATING BASE

The RB Series was designed for the amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system.

RB-45B ... 144 lbs. ... $259.95
RB-61B ... 229 lbs. ... $344.95
RB-77B ... 300 lbs. ... $514.95





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

Prices Effective 1-1-81 thru 1-31-81

WSI WILSON SYSTEMS, INC.
4286 S. Polaris Ave., Las Vegas, Nevada 89103

WILSON SYSTEMS, INC. MULTIBAND ANTENNAS

WV-1A $59.95

FACTORY DIRECT

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a hot dipped galvanized base mount bracket to attach to vent pipe or to a mast driven in the ground.

NOTE: Radials are required for peak operation. (See GR-1 below)

SPECIFICATIONS

- 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

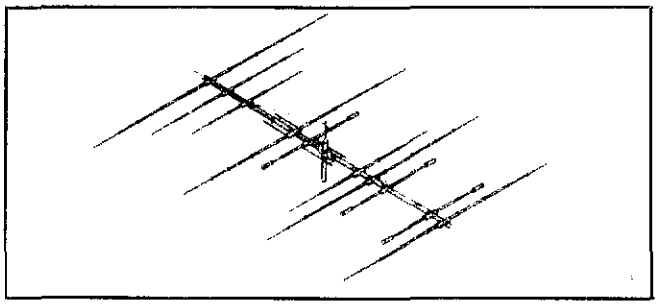
The GR-1 is the complete ground radial kit for the WV-1A. It consists of 150' of 7/14 stranded aluminum wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the WV-1A by providing the correct counterpoise.

33-6 MK $59.95

Now you can have the capabilities of 40-meter operation on the SYSTEM 36 and SYSTEM 33. Using the same type high quality traps, the 40-meter addition will offer 150 KHZ of bandwidth 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 15' 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.

SY-40A $337.95

- ★ 3 MONOBANDERS on 1 Boom
- 4 elements on 20 mtrs FULL SIZE
- 4 elements on 15 mtrs
- 5 elements on 10 mtrs

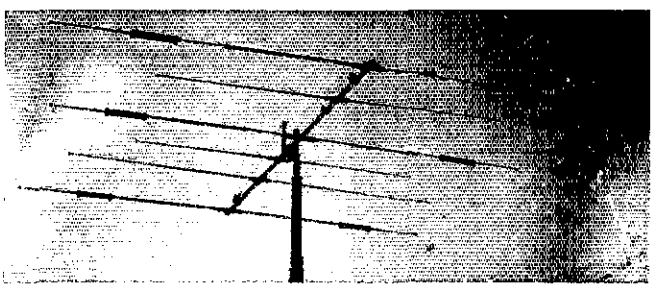


The System 40A is the answer to the DXer who does not have space to stack monobanders yet wants the advantages they offer. Through the use of a switchable matching unit, only one feed line is required and complete coverage of both the phone and cw bands are available with only one setting.

SPECIFICATIONS

Max. Pwr. Input ..... Legal Limit	Matching Method ..... Split Beta	Surface Area ..... 12.1 sq.ft.
VSWR @ Res. 1.2:1	F/B Ratio ..... CALL FACTORY	Wind Loading @ 80 mph ..... 309 lbs.
Impedance ..... 50 ohm	Boom ..... 2" x 26'	Assem. Weight ..... 75 lbs.
Feed Method ..... Balun Supplied	Longest Element ..... 36'	Shipping Weight ..... 84 lbs.
Gain ..... CALL FACTORY	Turning Radius ..... 22'6"	

SY-36 $199.95

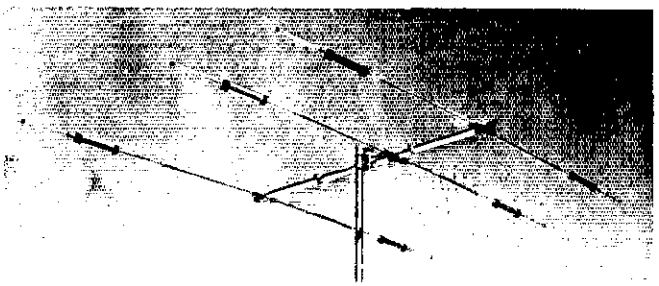


A trap loaded antenna that performs like a mono-bander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. 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 weatherproof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.

SPECIFICATIONS

Band MHz 14-21-28	Boom (O.D. x Length) ..... 2" x 24'2½"	Wind Loading @ 80 mph ..... 215 lbs.
Maximum Power Input ..... Legal Limit	Number of Elements 6	Maximum Wind Survival ..... 100 mph
Gain (dBd) ..... CALL FACTORY	Longest Element ..... 29'6½"	Feed Method ..... Coaxial Balun (Supplied)
VSWR @ Resonance 1.3:1	Turning Radius ..... 18'6"	
Impedance ..... 50 ohm	Maximum Mast Diameter ..... 2"	Assembled Weight (approx) ..... 53 lbs.
F/B Ratio ..... CALL FACTORY	Surface Area ..... 8.6 sq. ft.	Shipping Weight (approx.) ..... 62 lbs.

SY-33 $149.95



Capable of handling the Legal Limit, the SYSTEM 33 is the finest compact tribander available to the amateur. Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excels with the SYSTEM 33. 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 performance 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 Loading @ 80 mph ..... 114 lbs.
Maximum Power Input ..... Legal Limit	Number of Elements 3	Assembled Weight (approx) ..... 37 lbs.
Gain (dBd) ..... CALL FACTORY	Longest Element ..... 27'4"	Shipping Weight (approx) ..... 42 lbs.
VSWR at Resonance 1.3:1	Turning Radius ..... 15'9"	Direct 52 ohm feed ..... No Balun Required
Impedance ..... 50 ohm	Maximum Mast Diameter ..... 2" O.D.	Maximum Wind Survival ..... 100 mph
F/B Ratio ..... CALL FACTORY	Surface Area ..... 5.7 sq. ft.	

ORDER FACTORY DIRECT
1-800-634-6898

Prices Effective 1-1-81 to 1-31-81

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice.

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  Replaces all model TTY's with silent video. Operates in ASCII or Baudot on high voltage current loop. Over 6,000 in use! Partial kit includes MK3870 CPU, Sockets, Crystal, PCB and Assembly Manual. *You furnish TTL and RAMs!!!*
  $99 Partial Kit . . . . . $169 Full Kit . . . . . Add $30 For Assembly
- **MORSE TRANSCEIVER MRS-100**
  Use in your RTTY Loop to add CW. Works with any TTY or video terminal such as the SCT 100. Send from your keyboard or key and auto copy 1-150 wpm. CPU controlled, 32 character buffer; 80 Hz active filter plus sidetone. *Enclosure included with kits!!!*
  $99 Partial Kit . . . . . $225 Full Kit . . . . . Add $40 For Assembly
- **COMPLETE VIDEO KEYBOARD STATION KIT SKT-100**
  Includes GRI 56 key Keyboard Kit, SCT 100 Full Kit, assembled power supply board with RS232, drilled 18" enclosure, assembled cables and full mounting hardware. The alternative to your TTY.
  $347 Full Kit . . . . . Add $40 For Assembly
- **ASCII KEYBOARD KIT GRI 757** **$69**
  Use with SCT-100 56 Keys - Upper & Lower Case Add $20 For Assembly
- **KEYBOARD ENCLOSURE** **$39**
  Cut out for Keyboard and Wiring, Will house SCT-100, 18" x 6" x 4"
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- **SMART TU FOR RTTY AND MORSE COMBINED UDT-170**
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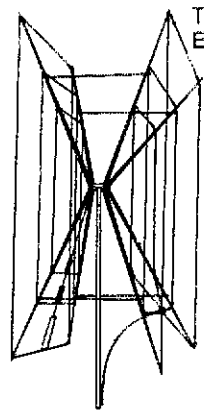

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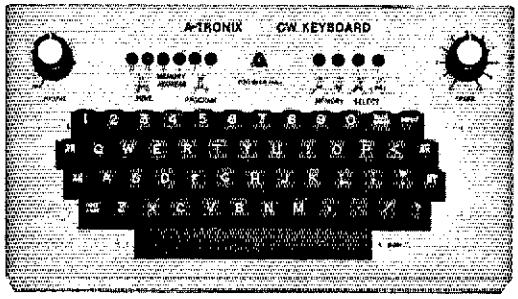

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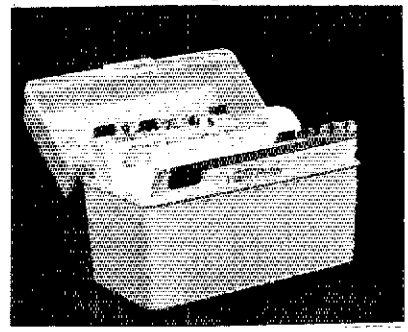

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MECHANICAL FILTERS new 455 kc 2.1 kc bandwidth, $7 each plus shipping. K6TVN 2818 Joaquin, Burbank, CA 91504, 213-845-6131.

COLLINS PARTS: filters, F455FA08-75, F455J05 (75A4) $95. Cabinets, 312B4 $25, 651S1 — $50, 62S1 — $65, 30L1 — $75, KWM 380 $60. Also overlays, knobs, etc. W9ZR, 1-414-532-6643.

FT-101B: Mint condition, 10-80 m. Total operating hours very low. First reasonable offer will take it. Herb Haynes, 3 Sutherland Road, Montclair, NJ 07042.

COMPLETE Heathkit station: SB-104-A, cw filter, HP1144 supply, SB604 speaker, mike, all manuals, good condition, $500. John, WA3WFW, 1873 Newton St., N.W., Washington, DC 20010 202-667-5867.

FOR SALE: Complete Drake C-line station in mint condition. R-4C, T-4XC, MS4, FR-4 counter, C4 console, and YO-100 scope. $1950. Will not separate. KA1EHB. P. O. 721 Goshen, N.H. 03752 603-863-5455.

FOR SALE: HW-8, HWA-7-1 pwr sply, factory aligned, mint condx, $125. firm. Certified check/money order only. Will ship UPS. R.S. Crowell, 640 Stonehenge Drive, Mary Esther, Florida, 32569. 904-244-0307.

ROSS' Used good to mint gear: KDK 2015R $199. 2016R $229. KLM 2700 $389. Kenwood TS520 $499. TS820S $650. TS900 $450. TS600 $429. TS700A $439. TS120S $520. TV-506 $199. TR7600 $249. National NCX5 power supply $299. NCL 2000 $575. Robot 80A camera, 70A monitor $399. Swan SS200A PSU 1 $449. 500C $309. Ten-Tec Triton II $339. Triton IV digital CBU $439. Century 21 $249. Omni D Series B new display $679. Yaesu FTDX401 $389. FT101E $600. FT 221R $378. FL101, FR101S $650. YO301 $199. FTV650B $199. Ross Distributing Company, 78 South State Preston, Idaho 83263 208-852-0830 FT101F new display $689.

QSTs 580 different 1928 thru 1980, 98 spare copies 1929 to 1973. CQs 67 different 1945 to 1973 Best offer. S.a.s.e. for list Paul Block, KB9IJ, 1819 McKinley, Beloit, WI 53511 Phone 608-362-4258.

ICOM: IC-RM2, IC-701, IC-701PS, IC-EX1, IC-245/SSB, Heath: SB-220, K4VDQ, 901-352-5117.

SELL: Heath HW-101, cw filter, HP23, new tubes, MARS capability, just tuned, $335. Swan 500, 117XC power supply, 410 external VFO, 405 xtal oscillator, w/MARS, VOX, new tubes, recently tuned, $425. Knight T-175, 25-60 MHz linear, 300W pep, $90. Standard C-118, 2mtr HT, 6 Xtal pairs, duckie, charger, ni-cads, $120. All items in exc. cond. w/manuals, I ship. WA1LZA, 617-275-8020, aft. 6P.M.

DENTRON MT3000A tuner $250. SBE C.B. (conv. to 10 meter ssb) $150. 815-626-0231 KA9BEN.

NEW Rohn FK 25-58 foldover tower, thrust bearing, rotor plate, $650. WB8WBW, 1610 Reynolds Road 294, Lakeland, FL 33801 813-665-3023 No collect calls please.

SWAN MOBILE antenna complete with 20, 40, 75 meter HI-Q coils, base and spring mount, $50. Fred W6QQB, 213-664-2388.

SALE — AN/GRT3, 100W transmitter (225-399.9 MHz) with power supply, cables, matching rcvr $175. New AN/URC 45 six channel xcvr with accessories and manual, 115 VAC, 25W, 152-174 MHz fm, Hammarlund, $150. VFO-820 $100. HV power supply PS5/PP 2766A/URA 36 $100. IBM dictaphone unit Model 273 $20. WANTED Heavy duty tower about 100 feet with large monoband 40 m beam and rotator. Also need heavy duty linear. Call 301-672-3872. T. L. Nickle.

HEATHKIT SB-301 receiver, am filter, $200 WBØEFP 616 Windrush, Kirkwood, MO 63122.

NEW TR7/DR7, PS7, RV7, MS7, 2 ea. FA7, SL-500, SL1600 and service manual. $1700. Mint L4B low hours with 10 $750. Vomax processor $120. FL-500, 500 cycle filter for R4C $35. Sherwood R4C B&C mods kit $10. 110 Buck knives new $22 shipped. All above mint one owner. WB4ZCD, 606-441-9684.

HAMMARLUND SX-140 sale or trade $175. Works good. Yaesu mobil mount for FT-101/FT-901 $12. Scanner: Tennelec 16 channel programmable — 4 band. Works great — sell or trade $125. Yaesu FT-901DM super exc. cond. New bands — all modifications, just back from Yaesu Cincinnati. Better than new — $1195. 615-573-3596 WD4NYU.

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WANTED: Heathkit DX-10SB ssb adapter & instructions on how to connect to the Heathkit DX-100B. Stu Ballinger WA2BSS, 57 S. Clinton St., Poughkeepsie NY 12601.

LIKE NEW Yaesu FT-227R with manual $195. 12 volt regulated power supply 2.5 Amp $15. K4AOZ 205-822-0585.

HEATH HW101, cw filter, heavy duty power supply, $375. WB2FDN 607-785-6136.

KENWOOD TS-820S with cw filter, $735. VFO-820, $80. AT-200 antenna tuner, $90. All mint in original cartons with manuals and dust covers. KA7BMB, 602-298-4820.

GALAXY 5 MK3, power supply, cw filter, speaker, remote VFO, accessory console, all manuals and cables. W8TIV, 4107 Middlebrook Dr., Dayton, OH 45440. 513-429-1341.

SELL: Hallicrafters duplicates! SX-122, excellent $195. HT-32A, exc. $195. HT-40 $40. S-20R, exc, $125. Also Drake SSR-1, exc. $275. National 1-10 + p.s., no coils, above average $55. Wollensak 1500 reel tape $45. Need catalogues, schematics, buy or borrow for my Hallicrafters book! Ed Romney, N4DFX, Box 5247, Spartanburg, SC 29304.

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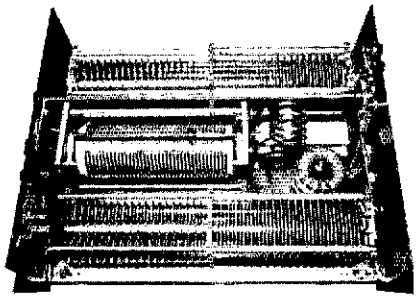

Specifications

- *Continuous tuning 10-160 meters
- *Front panel function switch -in and out - dummy load (not supplied) - ground
- *Handles any antenna system, dipoles, random wires verticals, whips, beams open wire line
- *Built in heavy duty 4 to 1 balun. 3 cores
- *Ceramic rotary inductor, #8 gauge wire
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- *Gray cabinet dark gray panel
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UT2000A - 10-80 meters - $159.95 & shipping
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Installation is easy!

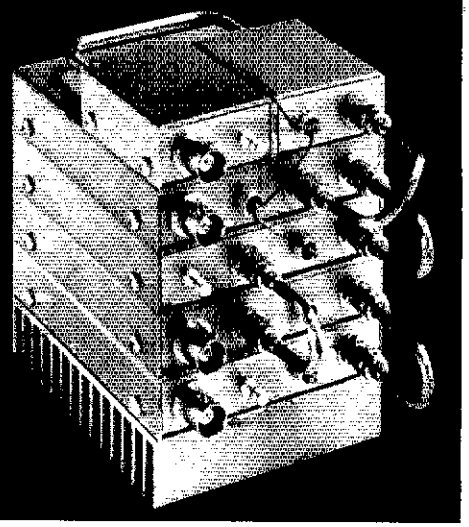
Just connect the Lunar 220/TV to a 220 antenna, your 2 meter transceiver, and a 13.5 power supply; select your mode and GO!

The new Lunar 220/TV is Linearized for maximum utilization of all authorized modes. In addition, it has automatic T-R functions, either RF sensed or hard keyed. In the repeat mode the 1 MHz offset adds to the 600 KHz in your 2 meter radio to give you the 1.6 MHz required on 220 MHz.

BASIC SPECIFICATIONS

Rx N.F.: 2.5 dB nom.
Rx Conversion Gain: 25 dB nom.

with Lunar's new 220/TV transverter



RF Pwr Out: 10 W nom. (CW & PEP)
Power: 13.6 VDC @ 4 A nom.
2 meter drive: 10 W nom.
(Other drive levels available on special order.)

Examples of frequency conversion in the following modes:

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Function	2 Meters	220 MHz
Rx Freq.	146.5	223.5
Tx Freq.	146.5	223.5

SIMPLEX II (Nat'l SSB Call Freq.)

Rx Freq.	144.1	220.1
Tx Freq.	144.1	220.1

REPEATER MODE (2 Meter—600 KHz Offset Required)

Rx Freq.	147.94	224.94
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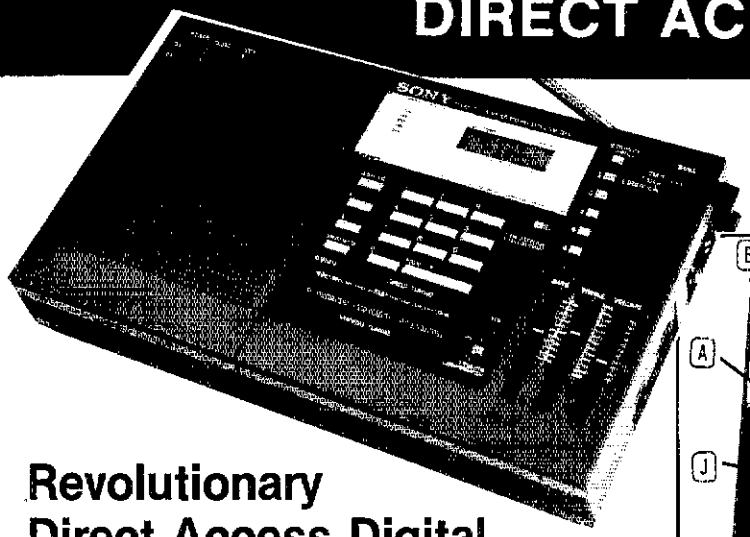

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Compare the following features against any receiver currently available and you will have to agree that the Sony ICF 2001 is the best value in shortwave receivers today:

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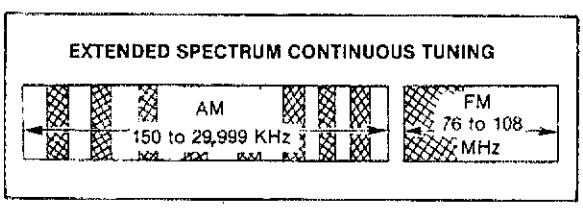

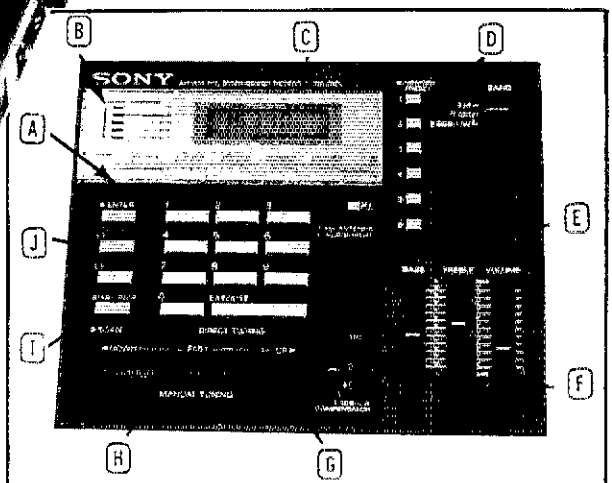

A Enter Button
B Signal Strength Indicator
C Liquid Crystal Display
D Memory Preset Buttons
E Antenna Adjustment Dial
F SSB/CW Compensator
G Execute Bar
H Manual Tuning Buttons
I Scan Button
J High/Low Limit Buttons

OPERATIONAL FEATURES

INSTANT FINGERTIP TUNING with the calculator-type key board enables the operator to have instant access to any frequency in the LW, MW, SW, and FM bands. And the LCD digital frequency display confirms the exact, drift-free signal being received. **AUTOMATIC SCANNING** of the above bands. Continuous scanning of any desired portion of the band is achieved by setting the "L_1" and "L_2" keys to define the range to be scanned. The scanner can stop automatically on strong signals, or it can be done manually. **MANUAL SEARCH** is similar to the manual scan mode and is useful for quick signal searching. The "UP" and "DOWN" keys let the tuner search for you. The "FAST" key increases the search rate for faster signal detection. **MEMORY PRESETS.** Six memory keys hold desired stations for instant one-key tuning in any mode (AM, SSB/CW, and FM), and also, the "L_1" and "L_2" keys can give you two more memory slots when not used for scanning. **OTHER FEATURES:** Local, normal, DX sensitivity selector for AM; SSB/CW compensator; 90 min. sleep timer; AM Ant. Adjust.

SPECIFICATIONS

CIRCUIT SYSTEM: Fm Superheterodyne; AM Dual conversion superheterodyne. **SIGNAL CIRCUITRY:** 4 IC's, 11 FET's, 23 Transistors, 16 Diodes. **AUXILIARY CIRCUITRY:** 5 IC's, 1 LSI, 5 LED's, 25 Transistors, 9 Diodes. **FREQUENCY RANGE:** FM 76-108 MHz; AM 150-29,999 KHz. **INTERMEDIATE FREQUENCY:** FM 10.7 MHz.; AM 1st 66.35 MHz., 2nd 10.7 MHz. **ANTENNAS:** FM telescopic, ext. ant. terminal; AM telescopic, built-in ferrite bar, ext. ant. terminal. **POWER:** 4.5 VDC/120 VAC **DIMENSIONS:** 12⅛ (W) X 2¼ (H) X 6¾ (D). **WEIGHT:** 3 lb. 15 oz. (1.8 kg)

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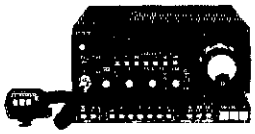

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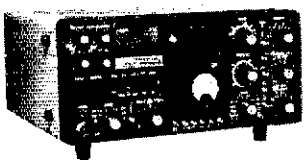

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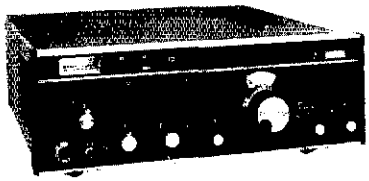

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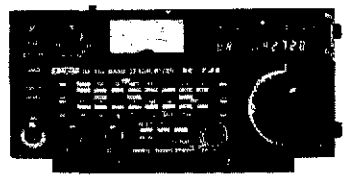

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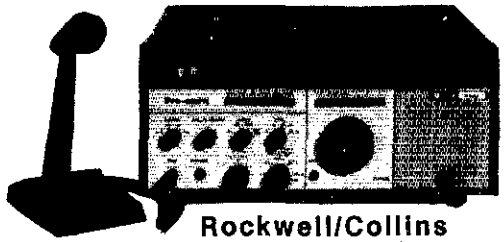

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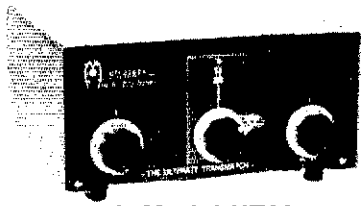

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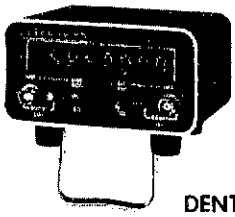

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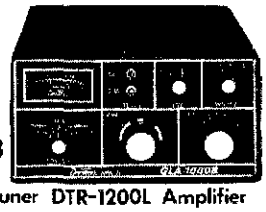

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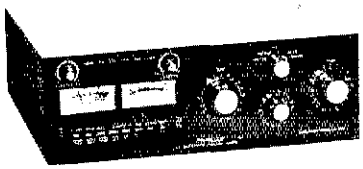

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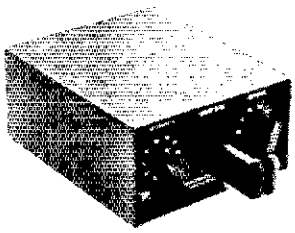

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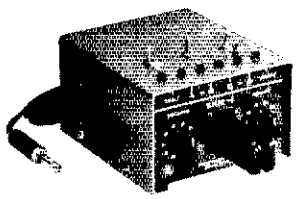

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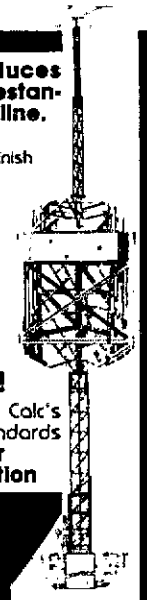

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P-4	C-4	4
P-5	C-5	5
P-6B	C-6B	6, 7, 8
P-91	C-91	9, 10, 11
P-10	C-10	10
4P-12	4C-12	12, 13, 14
P-14	C-14	14
OP-16	OC-16	16, 18, 20
P-22	C-22	22

CAT. # Plain lang	CAT. # Code grps.	WPM
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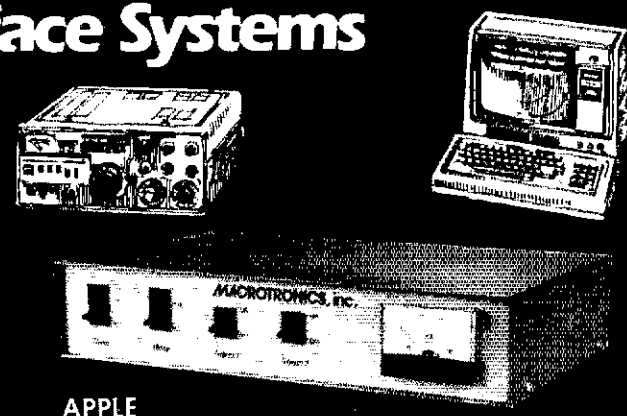

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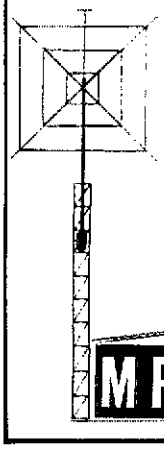

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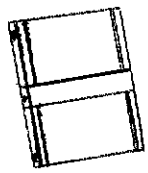

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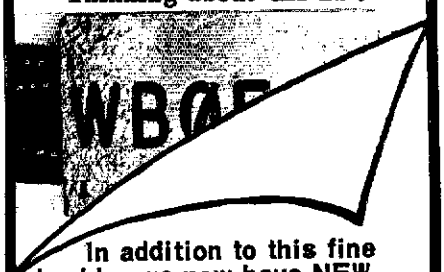

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720/PS	9 band HF Xcvr, AC & 12V Sup/Mic-PS15 9 band HF Xcvr, AC & 12V Sup Mic PS15	1499.00

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22S	2M FM 10W 22CH Programmable	299.00
255A	2M FM 25W Synthesized	389.00
260A	2M MBL, SSB,FM,CW	499.00

PORTABLE TRANSCEIVERS

2A/NiCD	2M 800 CH, HT w/Nicad, Chgr.	239.50
2AT/NiCD	2M 800 CH, HT w/Nicad, TT pad, Chgr.	269.50
202S	2M SSB Portable	279.00
402	430 MHz SSB Portable	389.00
502A	6M SSB Portable	239.00

POWER SUPPLIES

3PE	AC to 12V Supply 3A/Spkr 3A/Spkr	95.00
PS15	12V Power Supply	149.00
PS20	12V Power Supply	199.00

ACCESSORIES

HM8	8 pin mike w/TTN	49.50
SM2	Desk mike	39.00

DRAKE

COMMUNICATIONS RECEIVERS AND ACCESSORIES

R-7/DR-7	General Covr. Rcvr.	$1449.00

2KW AMPLIFIERS

L-7	160-15 M Amplifier	1090.00
3-500Z	Tube for L-7 (2 req'd ea.	120.00

HF TRANSCEIVERS AND ACCESSORIES

TR-7/DR-7	Dig HF transceiver 160-10M	1549.00
NB-7	Noise blanker for TR-7	90.00
SL-300	300Hz CW filter for 7-line	55.00
SL-500	500Hz CW filter for 7-line	55.00
SL-1800	1800Hz RTTY filter for 7-line	55.00
SL-6000	6000Hz AM filter for 7-line	55.00
AUX-7	Auxiliary range program board for TR-7	45.00
FA-7	Fan for TR-7/PS-7 DL-1000	29.00
RV-7	Remote VFO for TR-7	195.00
MS-7	Speaker for 7-line	39.00

LOW PASS AND HIGH PASS TVI FILTERS

TV-3300LP	1000 watt low pass filter	26.60

CUSHCRAFT

BOOMER ANTENNAS		List Price
32-19	144-146MHz 19 ele.	$ 99.95

BOOMER STACKING KITS

32-SK	Stacking Harness & P.D., 2 Boomers	44.95
PD-2	Power Divider, 2 Boomers	22.95

CUSHCRAFT (cont'd)

MULTI BAND HF ANTENNAS		List Price
A-3	3 element	$ 219.95
ATB-34	Tri-Band 4 ele. beam	319.95
ATV-3	Tri-band vertical	64.95
ATV-4	2,14,21,28MHz Vert.	112.95
ATV-5	3,5,7,14,21, 18MHz Vert.	119.95
R-3	Tri-Band Ringo	299.95
A-3SK	Stainless Hardware for A3	39.95

FM ANTENNAS

A147-4	146-148 MHz 4 el.	29.95
A147-11	146-148 MHz 11 el.	44.95
A147-20T	144 & 147 MHz 20 el	74.95
A147-22	146-148 MHz 22 el.	129.95
A220-7	220-225 MHz 7 el.	32.95
A220-11	220-225 MHz 11 el.	42.95
A449-6	449 MHz 6 element	24.95
A449-11	449 MHz 11 element	42.95
AFM-4D	144-148 MHz four pole	79.95
AFM-24D	220-225 MHz four pole	72.95
AFM-44D	440-450 MHz four pole	67.95
AR-2	135-170 MHz Ringo	27.95
AR-6	50-54 MHz Ringo	44.95
AR-220	220-225 MHz Ringo	34.95
AR-450	440-460 MHz Ringo	34.95
ARX-2K	135-170 MHz Ringo Rgr.	21.95
ARX-220	220-225 MHz Ringo Rgr.	44.95
ARX-450	435-450 MHz Ringo Rgr.	39.95

BLITZ BUGS

LAC-1	Coax lightning arrester, inline	5.95
LAC-2	Coax lightning arrester double female	5.95

VHF / UHF BEAMS

A50-3	50 MHz 3 element	54.95
A50-5	50 MHz 5 element	74.95
A50-6	50 MHz 6 element	89.95
A144-7	144 MHz 7 element	32.95
A144-11	144 MHz 11 element	44.95
A430-11	432 MHz 11 element	42.95

HUSTLER

		List Price
5-BTV	5-band vertical	$139.95
CG-144	2-meter mobile with without mount	28.95
CGT-144	2-meter mobile w/mount	45.95
G6-144B	6 dh fixed station, 2 m	89.95
G7-144	7 dh fixed station, 2 m	139.95
MO-1	54" mast for fender	22.95
MO-2	54" mast for bumper	22.95
QD-1	Quick disconnect	16.95
RM-10	10 meter strd. resonator	10.95
RM-10S	10 meter sup. resonator	17.95
RM-11	11 meter strd. resonator	10.95
RM-11S	11 meter sup. resonator	17.95
RM-15	15 meter strd. resonator	10.95
RM-15S	15 meter sup. resonator	17.95
RM-20	20 meter strd. resonator	14.95
RM-20S	20 meter sup. resonator	21.95
RM-40	40 meter strd. resonator	16.95
RM-40S	40 meter sup. resonator	24.95
RM-75	75 meter strd. resonator	18.95
RM-75S	75 meter sup. resonator	38.95
RM-80	80 meter strd. resonator	18.95
RM-80S	80 meter sup. resonator	38.95
RSS-2	Res. spring-stainless steel	6.95
SSM-2	Commercial stainless bell mount	18.95

HY-GAIN

	List Price
TH6DXX	$ 329.95
TH5DX	269.95
18AVT	105.95

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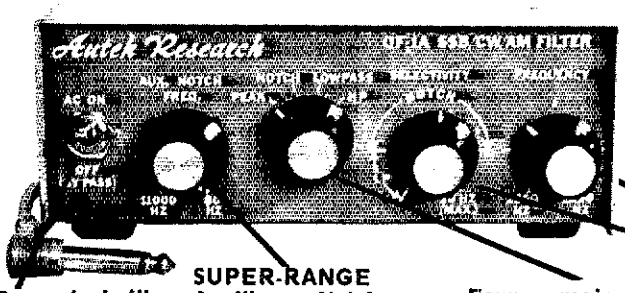

115 VAC supply built-in. Filter by-passed when off.

SUPER-RANGE Auxiliary Notch rejects 80 to 11,000 Hz! Covers signals other notches can't touch.

Four main filter modes for any QRM situation.

Continuously variable main selectivity (to an incredible 20 Hz!)

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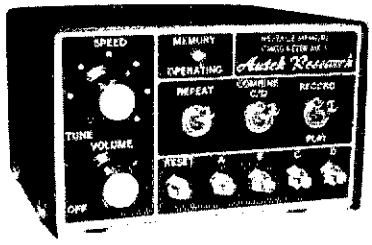
AUTEK pioneered the **ACTIVE AUDIO FILTER** way back in 1972. Today, we're still maintaining that engineering leadership. Our **QF-1A** evolved from suggestions from thousands of owners, and years of dedication to making the "ultimate" filter. No gimmicks — just something that really "works" like the ad says, You're in for a treat!

Autek filters gained their reputation by using a costly **INFINITELY VARIABLE** design. Yet, mass-production (we sell only **ONE MODEL** — the best) makes it a tremendous bargain. You're not limited by a few fixed positions. You vary selectivity 100:1, and vary frequency over the entire usable audio range. **PEAK CW** (or voice) with an incredible **20 HZ BANDWIDTH**, but also variable all the way to "flat." Imagine what the **NARROWEST CW FILTER MADE** will do to **QRM!** Reject whistles with the most flexible **NOTCH** you've heard. Wide or narrow. Depth to 70 dB. **LOWPASS** helps you cope with **SSB** hiss and splatter. Skirts exceed 80 dB. Most above features were in the popular QF-1 (See excellent review in March, 1977 **QST**.) The new "A" model is more selective, adds a **HIGHPASS** mode for **SSB**, and a great **AUXILIARY NOTCH** (35 to 60 dB) to give **TWO NOTCHES, NOTCH/PEAK, NOTCH/LOWPASS,** or **NOTCH/HIGHPASS!** If this doesn't convince you, please **ASK ON THE AIR.** Owners are our best salesmen!

Due to cost and panel-space limitations, even the latest rigs only include a fraction of the **QF-1A** features. We recommend you buy the best rig you can afford, spend $3,000 or more, then add a **QF-1A** and listen to the improvement! **WORKS WITH** Yaesu, Kenwood, Drake, Swan, Atlas, Tempo, Collins, Heath, S/1, etc., **ANY RIG!**

Hooks up in minutes. Plug into your rigs phone jack, or attach to speaker wires. Plug speaker or phones into **QF-1A** rear-panel jack. That's it! Filter supplies 1 watt to fill a room. No batteries rqd. (+12 VDC hookup possible.) 6½x5x2½". Handsome light/dark grey styling. Get yours today.!

CMOS PROGRAMMABLE KEYER MAKES CW FUN!



Calls CQ while you relax.
Also remembers name, QTH, contest exchanges.
Record anything you want in seconds!

Model MK-1 $99.50 ppd. U.S.A.

Our classic **MK-1** should make you wonder why anyone would buy an ordinary keyer, when memory costs so little! Records 4 messages. Just select "record," tap the A, B, C, or D message, and start sending at any speed! Record over old messages as easily. Playback by tapping the same button. Each message holds about 25 characters (letters, numbers). Total 100 characters. Handy repeat switch repeats message forever until reset. Very useful for **CQ's. YOU SIT BACK AND WAIT FOR A CALL!** Another switch combines two messages for 50 characters. "Memory-saver" feature standard.

This "state-of-the-art" keyer pleases beginners and CW "pros" alike. **DOT AND DASH MEMORIES. TRIGGERED CLOCK. IAMBIC. SELF COMPLETING. JAM PROOF.** 5 to 50+ **WPM. LATEST CMOS FOR LOW CURRENT.** Built-in monitor, speaker. Widely adjustable tone, volume. Perfect weighting at all times. No fiddling with an adjustment that varies with speed. **NEW: DUAL TRANSMITTER OUTPUTS** key **ANY** modern (post 1963) ham rig directly without a battery or relay, including difficult-to-key solid-state rigs. **115VAC** supply built in, or connect **9-14 VDC** to rear panel. Use with **ANY** paddle. 6x3½x5". Burned-in and tested. Sockets for IC's. Full instructions.

NOW AVAILABLE. 4096 BIT MEMORY EXPANDER (ME-1) allows 16 messages, 400 chars. & "combine" for longer messages. Plugs into memory socket of **ANY MK-1** ever made. Installs in 10 to 30 mins. Full instructions. Buy your **MK-1** now and easily add memory later if you wish!

FLASH! MK-1 used to set new world's CW record. A single operator worked 3992 DXQSO's & 275 band-countries in only 48 hours! Get the choice of champions — AUTEK.

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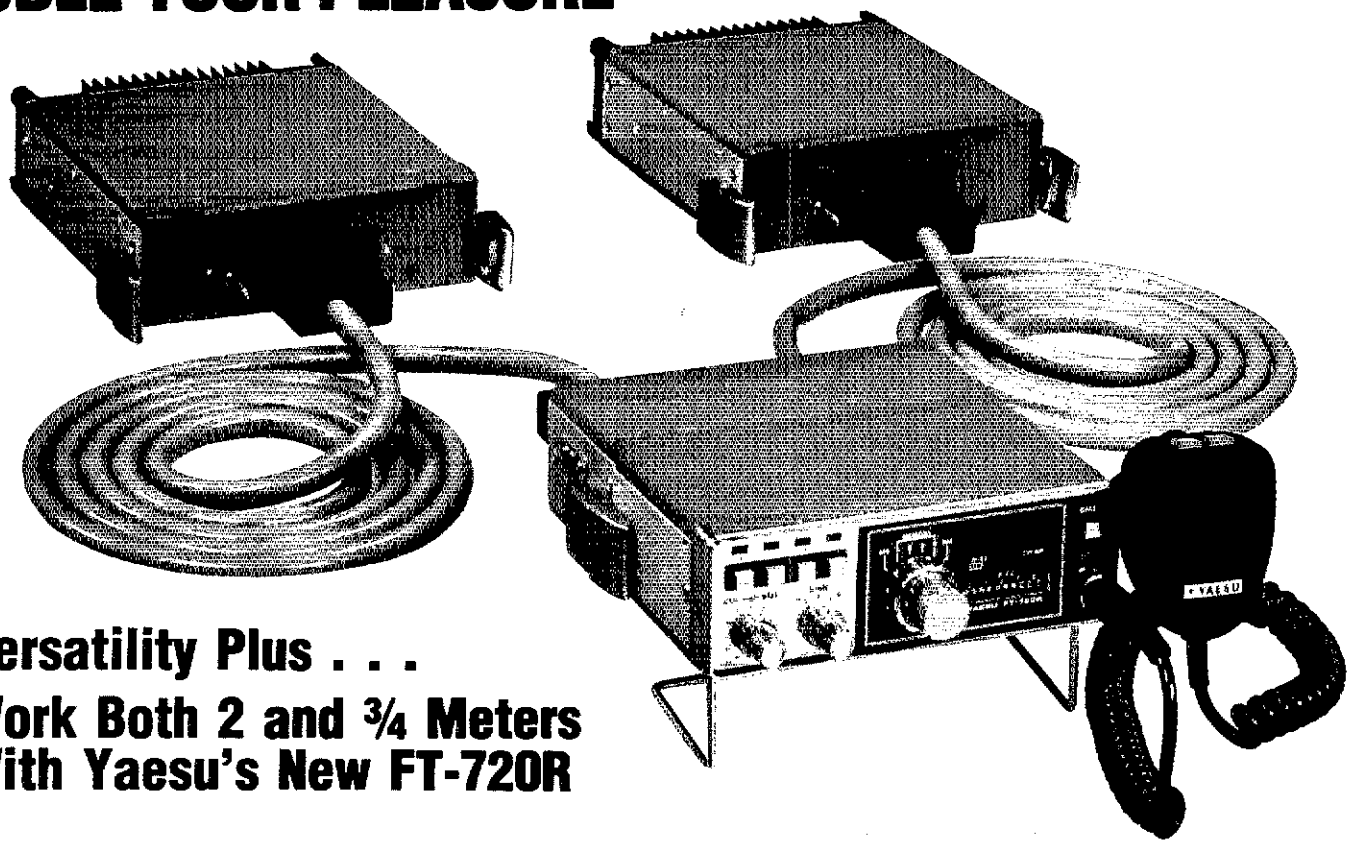

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The FT-720R series is a compact VHF/UHF mobile transceiver that harnesses the incredible power of the microprocessor to bring you top-operating flexibility. Start with the FT-720R Control Head, then add either the 10 watt FT-720RU 440 MHz or 25 watt FT-720RVH 2 meter RF Deck. You can clamp the Control and RF Deck together or use an optional remote cable to hide the RF Deck.

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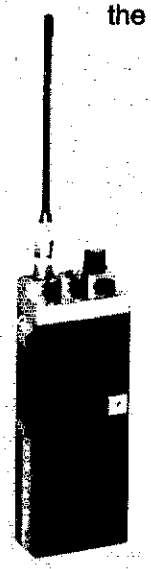
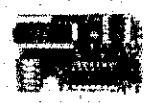
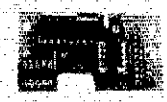


FT-404R
6 Channel, 3 Watt
UHF Hand-held

FTT-1
16 Key
DTMF Encoder

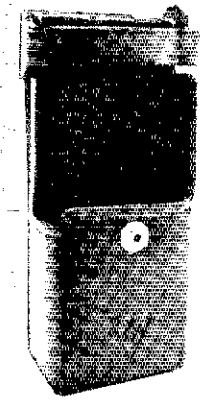


FTS-32ED
CTCSS Encode/Decode
32 Tone Selection



FTS-32E
CTCSS Encode Only
32 Tone Selection

LCC-4
Shorty Case



LCC-2/LCC-3
Heavy Duty Case

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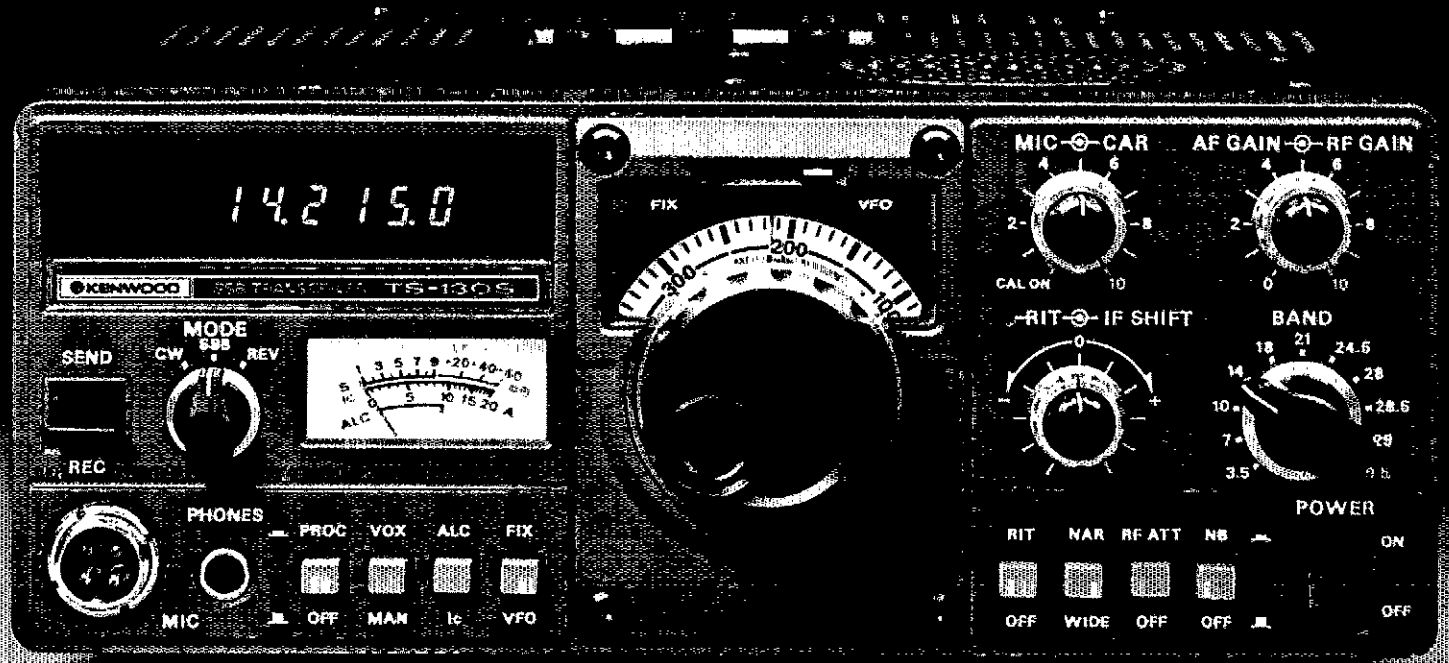

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An incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 29.7 MHz (including the three new Amateur bands!) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (on both SSB and CW), and optional DFC-230 digital frequency controller. The TS-130S runs high power and the TS-130V is a low-power version for QRP applications.

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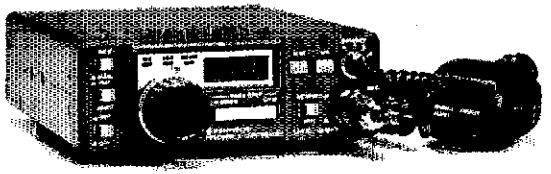

Optional DFC-230 Digital Frequency Controller
Allows frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Includes four memories (handy for split-frequency operation) and digital display. Covers 100 kHz above and below each 500-kHz band. Very compact.