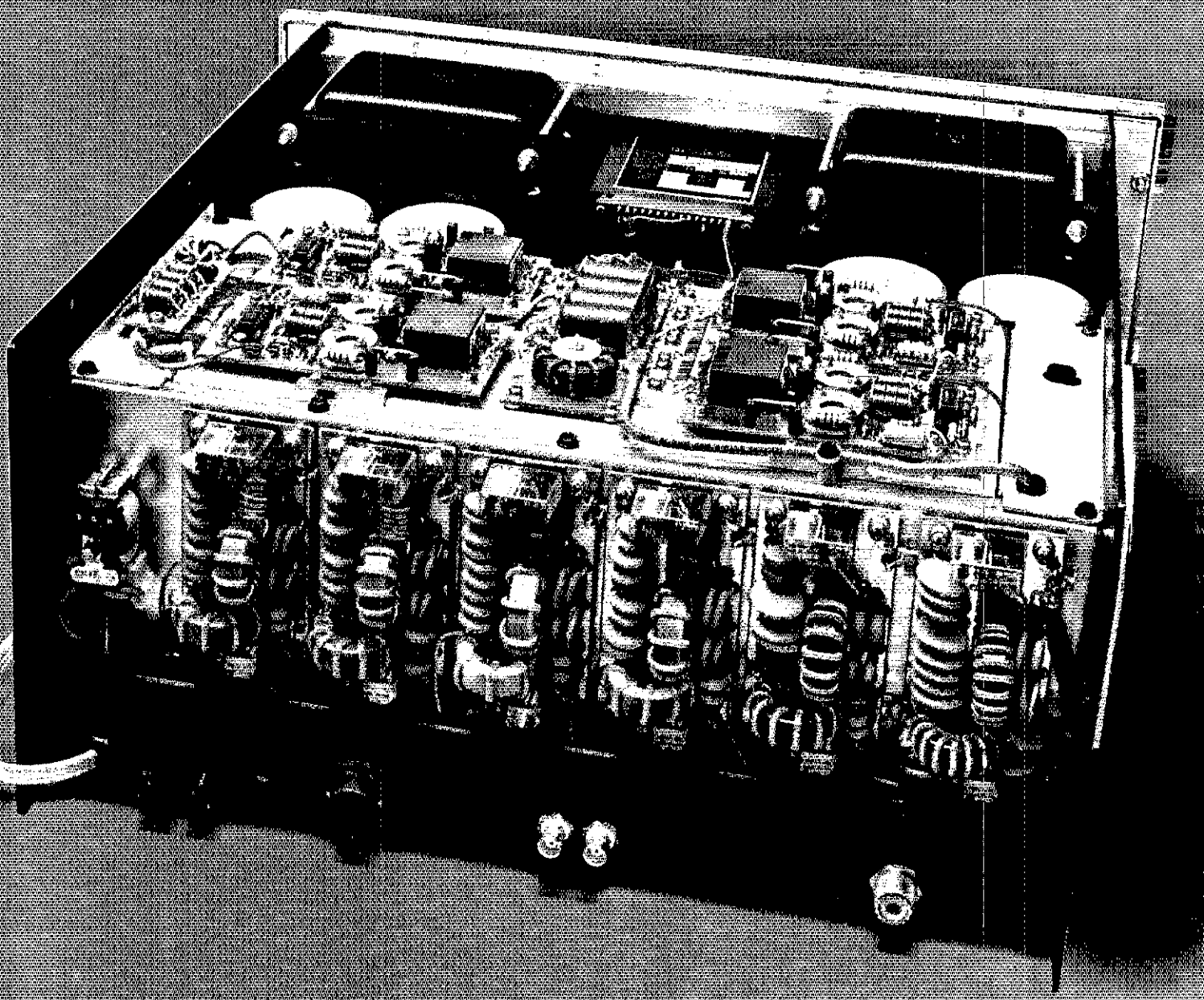
QST

December 1982 $2.50

Devoted Exclusively to Amateur Radio



Published monthly by the American Radio

the tempo S-15

...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

The S-15 is the kind of hand held most people want. Simple, rugged, reliable, easy to use...it's the hand held for today and tomorrow. The S-15 offers a full 5 watts of power...power that extends your range and improves your talk power. The S-15 operates from 140 to 150 mHz (and 150 to 160 on export models). Compare that to the others. Its state-of-the-art integrated circuitry provides far more reliability and ease of maintenance than conventional circuitry...just one more indication of the kind of quality that goes into the S-15.

Consider all of these features before you decide on any hand held:

- **5 watt output (1 watt low power switchable)**
- **10 MHz frequency coverage: 140-150 MHz (150-160 for export)**
- **Electrically tuned stages. Receiving sensitivity and output power are constant over entire operating range.**
- **Three channel memory. (1 channel permits non-standard repeater offsets. 200 micro amp memory maintenance (standby)).**
- **A new "easy remove" battery pack**
- **One hour quick charge battery supplied (450 ma/HR)**
- **Plug for direct 13.8 volt operation**
- **Speaker/microphone connector**
- **BNC antenna connector and flex antenna**
- **Extremely small and light weight (only 17 ounces).**
- **Ample space for programmable encoder.**
- **Fully synthesized**
- **Extremely easy to operate**
- **Its low price includes a rubber antenna, standard charger, 450 ma/HR battery (quick charge type) and instruction manual.**

OPTIONAL ACCESSORIES: 1 hour quick charger (ACH 15) • 16 button touch tone pad (S 15T) • DC cord • Solid state power amplifier (S-30 & S-80) • Holster (CC 15) • Speaker/mike (HM 15)

TEMPO S-2
Use 220 MHz repeaters nation wide. Synthesized, field tested and dependable. Add a power amp and build a small station or powerful mobile rig.

TEMPO S-4
The first 440 MHz hand held and still a winner...offers the perfect way to get into an uncrowded band. Reduced price!

TEMPO M-1
Superb quality VHF marine band hand held. Synthesized for world wide use...all marine channels & 4 weather channels. Ch 16 override. All offsets built in.

Boost the power of your hand held or mobile unit with a Tempo solid state power amplifier. Top quality, excellent selection. Please write for literature.

Available at your local Tempo dealer or from....

54 YEARS OF SERVICE

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HAVE RTTY—WILL TRAVEL

Yes, now you can take it with you! The new **HAL CWR-6850 Telereader** is the smallest RTTY and CW terminal available, complete with CRT display screen. Stay active with your RTTY and CW friends even while traveling. Some of the outstanding features of the CWR-6850 are:

- **Send and receive ASCII, Baudot, and Morse code**
- **RTTY and Morse demodulators are built-in**
- **RTTY speeds of 45, 50, 57, 74, 110, and 300 baud**
- **High or Low RTTY tones**
- **Send and receive CW at 3 to 40 wpm**
- **Built-in 5 inch green CRT display**
- **Four page video screen display**
- **Six programmable HERE IS messages**
- **Pretype up to 15 lines of text**
- **External keyboard included**
- **Runs on +12 VDC @ 1.7 Amperes**
- **Small size (12.75″ × 5″ × 11.5″)**

Write or call for more details. See the CWR-6850 at your favorite HAL dealer.

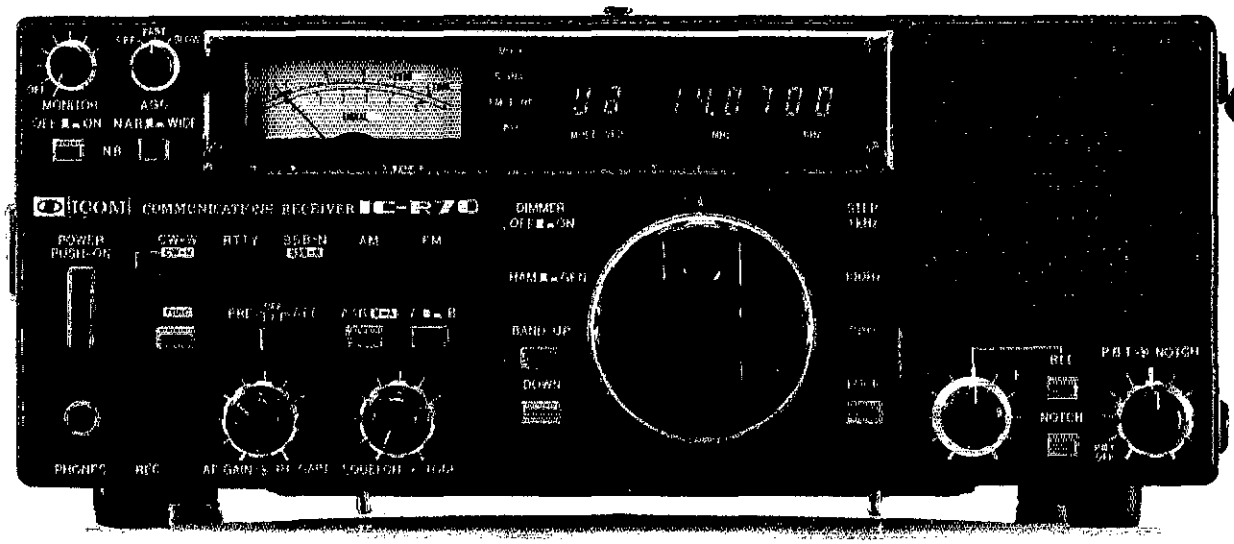
HAL COMMUNICATIONS CORP.

BOX 365
URBANA, ILLINOIS 61801 **217-367-7373**

IC-R70

NEW!

The Commercial Grade Communications Receiver that everyone has been asking for..... at a price you can afford!



GENERAL COVERAGE RECEPTION AT ITS BEST

Listen to the world of HF with the R70, a 100KHz to 30MHz commercial grade receiver designed by ICOM Incorporated, the leader in advanced receiver design. Built from knowledge gained by designing receivers for commercial, marine, and amateur use, the R70 surpasses other receivers on the market...even receivers costing more than twice as much.

Utilizing ICOM's DFM (Direct Feed Mixer), the R70 is a receiver which in normal usage is virtually immune to intermodulation distortion or cross modulation, yet still maintains superior sensitivity. Whether you are a SWL (short wave listener), Ham (amateur radio operator), maritime operator or commercial user, the R70 provides the features you need.

DESIGN

The R70 incorporates an UP conversion system, utilizing a direct feed mixer proven to be the best design for minimizing interference from strong adjacent signals. A preamp is provided for making the weakest of signals readable. High grade filters in conjunction with the built-in PBT (pass band tuning) system and notch filter, provide the ultimate in interference rejection. Selectable AGC (fast/slow/off), noise blanker (wide or narrow), and tone control improve readability under the worst conditions. An AGC derived squelch, operative in all modes, adds to operating ease.

Dual VFO's with three tuning rates provide quick QSY (frequency change), memory for an important station, or by equalizing the VFO's (A=B), a digital RIT. 13.8 VDC operation is provided as an option, 117 VAC is standard.

HAM'ING

The R70 is an ideal general coverage receiver to complement any ham shack. Use it with your existing tramsmitter or transceiver to provide dual receiver capability.

The R70's built-in monitor system lets you listen to your own transmitted audio and a mute input automatically protects the R70's receiver from your signal.

An option for FM allows listening to the 10 meter FM activity.

As an additional plus to ICOM IC-720A owners, the R70 has an optional interface that will allow the R70 to control the transmit frequency of the 720A for the ultimate in hamming versatility.

SWL'ING

For the short wave listener, the readout section of the R70 gives all the information for logging a station to be returned to at a later time. Frequency, mode, VFO, signal strength are all displayed. A dial lock prevents accidental loss of a signal.

A front mounted speaker provides 3 watts of crisp clear audio. A record jack allows easy attachment of a tape recorder.

ICOM SYSTEM

Like all ICOM HF products, the R70 fits into the ICOM system concept of accessories allowing you to use previously purchased accessories such as the HP1 headphone, SP3 external speaker, and AH1 auto bandswitching antenna.

PRICE

Check with your local ICOM dealer for pricing on the R70. You will be amazed.

ICOM

The World System

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

December 1982 *Volume LXVI Number 12*

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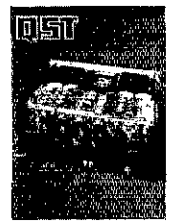
CONTENTS



OUR COVER
Power your next hf broadband amplifier with power FETs. The article beginning on page 13 deals with design philosophy. Part 2, to be published later, will treat *practical aspects and give* performance data.

TECHNICAL

BEGINNER'S BENCH

NEWS AND FEATURES

OPERATING

DEPARTMENTS

Our numbers talk

424B

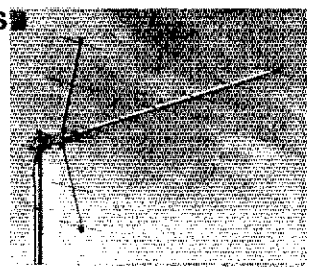
They have talked to winning scores in many important amateur activities including the 1979, 80, 81 June VHF contests, 1981 Central States antenna measuring contest, 1981, 82 EME contests and many more. Now there are three new numbers: the 424B, 24 elements for 432 MHz; the 410B, 12 elements at 432 MHz;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

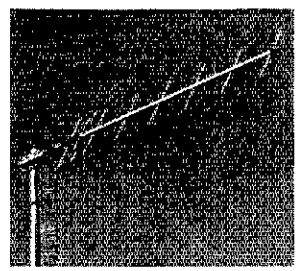
SPECIFICATIONS AND FEATURES

424B:
424-435 MHz, 7.6λ, gain *maximized, F/B ratio *excellent, beamwidth 19°, length 17.42 ft. 5.2 m.

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

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





MORE BOOMER NUMBERS

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

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

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cushcraft CORPORATION

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*Gain and F/B ratio cannot be published in QST. They are included in Cushcraft specification sheets and other publications.

Scan the World.

NEW

SSB, CW, AM, FM, digital VFO's, 10 memories, memory and band scan, dual 24-hour clocks...

R-2000

The R-2000 is an all mode SSB, CW, AM, FM receiver that covers 150 kHz–30 MHz in 30 bands. New microprocessor controlled operating features and an UP conversion PLL circuit provide maximum flexibility and ease of operation to enhance the excitement of listening to stations around the world. Key features include digital VFO's, ten memories that store frequency, band, and mode information, memory scan, programmable band scan, fluorescent tube digital display, and dual 24-hour clock with timer.

R-2000 FEATURES:

- **Covers 150 kHz–30 MHz in 30 bands.** Uses innovative UP-conversion digitally controlled PLL circuit. UP/DOWN band switches (1-MHz step). VFO's continuously tuneable across 150 kHz–30 MHz.
- **All mode: USB, LSB, CW, AM, FM.** Provides expanded flexibility in receiving various signal types. Front panel mode selector keys, with LED indicators.
- **Digital VFO's for best stability.** 50-Hz step, switchable to 500-Hz or 5-kHz, using front panel pushbutton switches. F. LOCK switch provided.
- **Ten memories store frequency, band, and mode data.** Complete information on frequency, band, and mode is stored in memory, assuring maximum ease of operation. Each memory may be tuned as a VFO. Original memory frequency may be recalled. AUTO. M switch for automatic storage of current operating data, or, when off, selective storage of data using M. IN switch.
- **Lithium battery memory back-up. (Est. 5 yr. life.)**
- **Memory scan.** Scans all memories, or may be programmed to scan specific memories. HOLD switch interrupts scanning. Frequency, band, and mode are automatically selected in accordance with the memory channel being scanned. The scanning time is approximately 2 seconds per channel.
- **Programmable band scan.** Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish upper and lower scan limits. HOLD switch interrupts scanning. Frequency may be adjusted, using the tuning control, during scan HOLD.
- **Fluorescent tube digital display (100-Hz resolution).** Built-in 7 digit fluorescent tube digital display indicates frequency or time, plus memory channel number. DIM switch provided. The display may be switched to indicate CLOCK-2, FREQUENCY, CLOCK-1, and timer ON or OFF by the front panel FUNCTION switch.
- **Dual 24-hour quartz clocks, with timer.** Permits programming two different time zones. Timer for ON and OFF programming. Timer REMOTE output on rear panel (not for AC power).
- **Three built-in IF filters with NARROW/WIDE selector switch. (CW filter optional.)** 6 kHz wide or 2.7 kHz narrow on AM. 2.7 kHz automatic on SSB. 2.7 kHz wide on CW, or, with optional YG-455C filter installed, 500 Hz narrow. 15 kHz automatic on FM.
- **Squelch circuit, all mode, built-in, with BUSY indicator.**
- **Noise blanker built-in.** Eliminates pulse-type noise on SSB, CW, and AM.
- **Large front mounted speaker.**
- **Tone control.**
- **RF step attenuator. (0-10-20-30 dB.)** Four step attenuator, plus antenna fuse.
- **AGC switch. (Slow-Fast.)**
- **"S" meter, with SINPO "S" scale.**
- **High and low impedance antenna terminals.** A high impedance (500 ohm) terminal, and a low impedance (50 ohm) co-axial connector are provided.
- **100/120/220/240 VAC, or 13.8 VDC operation.** (Optional DCK-1 cable kit required for 13.8 VDC.)

Other features.
- RECORD output jack.
- Audible "beeper" (through speaker).
- Carrying handle.
- Headphone jack.
- External speaker jack.

Optional accessories:
- HS-4, HS-5, HS-6 headphones.
- DCK-1 DC cable kit.
- YG-455C 500-Hz CW filter.
- HC-10 World digital quartz clock.

More information on the R-2000 is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street
Compton, California 90220.

KENWOOD

...pacesetter in amateur radio

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

NEW

"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.
Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz-30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC bands, on SSB, CW, FSK, and AM. Features 150 kHz-30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch in 1-MHz steps. A new, innovative, quadruple "UP" conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 50-kHz spacing, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuits with cooling fan, SWR/Power meter built-in.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for smooth, quiet operation. Switchable to semi-break-in.
- **Automatic antenna tuner, built-in.**
  Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection. HIGH/LOW cut control rotation not affected by selecting USB or LSB modes.
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100 kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Six digit readout to 100 Hz (10 Hz modifiable), plus digitalized sub-scale with 20-kHz steps. Separate two digit indication of RIT frequency shift. In CW mode, display indicates the actual carrier frequency of received as well as transmitted signals.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power," improved intelligibility.
- **One year limited warranty on parts and labor.**

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- SO-1 commercial stability TCXO (temperature compensated crystal oscillator). Requires modifications.
- MC-60A deluxe desk microphone with UP/DOWN switch, pre-amplifier, 8-pin plug.
- TL-922A linear amplifier (not for CW QSK).
- SM-220 station monitor (not for pan-adapter).
- HS-6, HS-5, HS-4, headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

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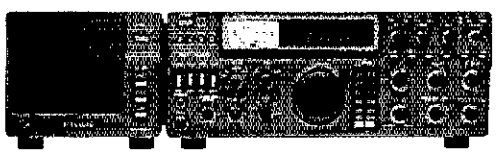

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*Executive Committee Member

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Delta Division

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

Great Lakes Division

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Ohio — Allan L. Severson, AB8P, 1275 Ethel Ave., Lakewood 44107 (216-521-1565)

Hudson Division

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N.Y.C. & Long Island — John H. Smale, K2IZ, 315 Kensington Ct., Copiague 11726 (516-226-4835)
Northern New Jersey — Curtis R. Williams, W5DTR/2, RD 3, Box 175, Fox Run Rd., Califon 07830 (201-832-2821)

Midwest Division

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Kansas — Robert M. Summers, K@BXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Missouri — Larry G. Wilson, K@RWL, 5415 E. 97th St., Kansas City 64137 (816-966-8953)
Nebraska — Shirley M. Rice, KA@BCB, 510 East 16th St., Scottsbluff 69361 (308-632-4337)

New England Division

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

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

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Nevada — William J. Marshall-Gratrix, KA7Q, 304 Bret Harte Ave., Reno 89509
Pacific — R. A. "Army" Curtis, AH6P, P.O. Box 4271, Hilo, HI 96720 (808-959-8985)
Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland, CA 95695 (916-666-1465)
San Francisco — Robert Odell Smith, NA6T, 320 Park St-P.O. Box 1425, Fort Bragg, CA 95437 (707-964-4931)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Ross W. Forbes, WB6GFJ, P.O. Box 1, Los Altos, CA 94022 (415-948-5193)

Roanoke Division

North Carolina — Ian C. Black, WD4CNR, Rte. 5, Box 79, Murphy 28906 (704-837-5684)
South Carolina — James G. Walker, WD4HLZ, Rte. 2, Box 432, Marion 29571 (803-423-3845)
Virginia — Phil Sager, WB4FDT, 1829 Stanley Pl., Falls Church 22043 (703-734-2987)
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr., Charleston 25312 (304-776-4352)

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

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Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave., Columbus 31904 (404-322-2856)
Northern Florida — Billy F. Williams, Jr., N4UF, P.O. Box 9673, Jacksonville 32208 (904-744-9501)
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Orange — Fred Heyn, WA6WZO, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Robert N. Dyruff, W6POU, 1188 Summit Rd., Santa Barbara, CA 93108 (805-969-3073)

West Gulf Division

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Oklahoma
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La., Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

Volunteer Examining: The Ideal, the Real and *You*

The process has begun. Public Law 97-259 has been signed. ARRL has petitioned the FCC (RM-4229) to amend Part 97 to reflect the now-authorized use of volunteers in the amateur license examination program. A Notice of Proposed Rulemaking is expected within a few short weeks.

One thing is very clear: The Commission will not, indeed cannot, give upgrade exams at a level of frequency that is acceptable to the Amateur Service, nor will it be able to oversee individual volunteers directly (see April 1982 Happenings and June 1982 In Training). The funding, and consequently the manpower, is simply not there. Volunteer examining, in some form, is inevitable. What form will it take?

The Ideal

Ideally, any new examination program should improve on the present state of affairs. Exam opportunities should be frequent and convenient; the exams must be secure; the exams must validly and reliably test knowledge; standards must be uniform and objective; testing opportunities must be open to anyone who is a valid candidate; any organization chosen to coordinate volunteer examining must be able to sustain the program over time (i.e., the program must represent a long-term commitment). Ultimately, anyone who passes an exam and is thereby awarded a license must have *earned* the concomitant privileges and be familiar with the material for which he is responsible. This is central to the existence of the Amateur Radio Service.

The Real

Any such program will cost a significant amount. Printing, postage, manpower and computer-based management of up to 100,000 exams annually simply are not free. And to spice the problem up a little, no organization that the FCC taps on the shoulder to coordinate volunteer examining will be able to charge a mandatory fee! How can one reconcile the ideal with the real and come up with a practical program in which the integrity of the amateur exam process is restored? After a long, hard look at the alternatives and their consequences, here are the details of the ARRL's proposed approach as it has evolved so far.

The Practical

1) Exam questions will be multiple choice with four possible answers, and will be based on the present FCC Study Guides. Specific exams, consisting of 50 questions each, will be created centrally from an FCC-approved pool of at least 500 questions per license class.

2) Exams will be changed monthly, and more than one version of a particular exam will be issued each month.

3) The FCC will release all question banks into the public domain.

4) Exams will be given by teams of three volunteer examiners in open, well-publicized sessions, a situation least likely to lead to a repetition of past abuses.

5) In most cases, the teams will be made up of Extra Class licensees, as they are the ones able to give all exams. Other arrangements can be made in sparsely populated areas.

6) For volunteer exam teams not equipped to do it themselves, Morse code receiving tests, in some version of a fill-in-the-blank or solid-copy format, will be sent to the team on cassette tape with the written test package for a particular session. Applicants will also be required to take a sending test.

7) Participation as volunteer examiners, session sponsors or applicants for upgrading will not be based on ARRL membership or club affiliation.

8) Registration for a particular exam session will likely be handled in the field by the examining team and/or the sponsoring group.

9) Though this has not yet been firmly decided, to be considered for accreditation as a Volunteer Examiner, one might have to be nominated by, say, 10 licensed amateurs from his or her local area.

Your Role

Whoever eventually coordinates the Volunteer Examining Program, be it ARRL or some other organization, your cooperation and participation are needed. The stakes are high: Our integrity and viability as a responsible, self-policing service is on the line more than ever before. What can you do?

When the time comes, nominate only those hams in your area who are conscientious and reliable. If you are nominated to be a volunteer examiner, serve. Ensure that testing sessions in your area are frequent and at times that accommodate those with tight work schedules. Radio clubs, particularly those ARRL-affiliated clubs that intend to work within the ARRL field organization as Special Service Clubs, should schedule exam sessions monthly or more often as one of their ongoing programs. Coordinate your schedules with others in your area who also plan to hold exams.

Take it upon yourself to monitor sessions in your community and report responsibly any real instances of wrongdoing. Encourage your club to reimburse local expenses such as return postage, hall rental, volunteer exam travel expense, pencils, coffee and the like.

Most importantly, continue to share your ideas and suggestions. Your expressions of support to date have been heartening. Your suggestions have shown us more efficient ways of handling such a major undertaking without sacrificing integrity. The ball is in our court — let's show them we can return service. — *Steve Place, WB1EYI*

League Lines...

FCC opens new WARC band! Effective immediately, U.S. amateurs holding General, Advanced and Extra Class licenses may use up to 250 watts input and A1 and F1 emissions in the band segments 10.100-10.109 and 10.115-10.150 MHz. These emissions include CW and RTTY operation; voice modes are not permitted. Details appear in this month's Happenings.

Commercial radiotelegraph operators now receive full Morse code examination credit for all Amateur Radio licenses. According to the FCC, since commercial radiotelegraph examination requirements exceed even the most rigorous telegraphy examination requirements of the Amateur Radio Service, persons who hold an FCC commercial radiotelegraph operator license or have held one within the last five years from the date of their Amateur Radio license application, will be given telegraphy examination credit.

The FCC, on its own initiative, has proposed to delete the requirement that an account of operation be maintained in a station log for every Amateur Radio station. However, the Commission would still require licensees to maintain in their station "records" certain non-routine information pertaining to repeater operation, auxiliary operation, operation under remote control, and operation by a control operator other than the station licensee. The Commission also believes that it may be desirable to delegate authority to FCC Engineers-in-Charge to require individual station licensees to maintain a log with certain items and information that are currently required. This authority would be used on occasions when it would clearly benefit Commission enforcement activities. The proposal is a Notice of Proposed Rulemaking in PR Docket 82-726. Additional information appears in Happenings, page 69.

ARRL has filed with the FCC a proposal for volunteers to prepare and administer all Amateur Radio license examinations. The League's petition for rulemaking, RM-4229, proposes that the Commission grant qualifying nonprofit organizations the authority to accredit volunteer examiners. These examiners would, in turn, have the authority to administer and grade amateur examinations. Details of the League's proposal appear in June 1982 QST, page 79, and members' comments were reported in September 1982 QST, page 62. ARRL members wishing to receive a copy of the League's proposal should send a business-sized, self-addressed stamped envelope to ARRL, RM-4229, 225 Main St., Newington, CT 06111.

The FCC has proposed new procedures for the administration of amateur Novice examinations. The Notice of Proposed Rule-making in PR Docket 82-727 would change the rules so that a volunteer examiner would give an applicant a 5-word-per-minute code test. Next, the volunteer examiner would prepare and administer a written examination based on the FCC's syllabus. Finally, the examiner would grade the examination. If the applicant passed the test, the examiner would certify the test results to the Commission which would then issue a license. The examiner would be required to keep a copy of the written examination available for inspection for one year. Details will appear in next month's Happenings.

Automatic control of beacons to be authorized. The FCC has decided that one-way beacon transmissions will be permitted without requiring a control operator to be on duty. However, automatically controlled beacons will be limited to operations within designated frequency subbands and limited to 100 watts maximum input. Manually operated beacons (those with a control operator on duty at all times) will be permitted to operate outside the special beacon subbands; however, the Commission is adopting a special rule to authorize any FCC engineer-in-charge to order the cessation of beacon operation if any beacon causes undue interference. The effective date and further details were not available at press time. See next month's Happenings for more information.

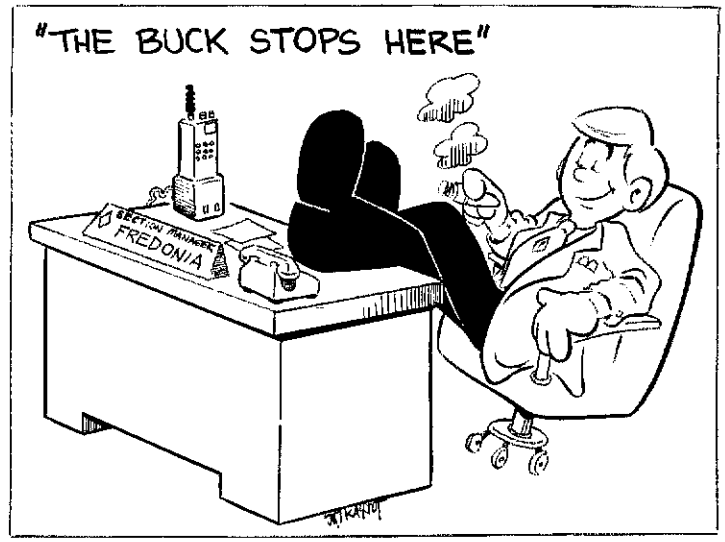
Last year the FCC began permitting manufacturers of short-range security devices (garage-door openers and burglar alarms) to use any frequency above 70 MHz, including amateur frequencies. Recently, the Commission took action at the request of ARRL and modified its earlier action. The FCC will adopt "strong language" in Part 15 of its rules and urge manufacturers to consider the effect of high-powered transmitters located in close proximity to their products, should they choose to use amateur frequencies. ARRL believes the effect of this action will be to cause many manufacturers to avoid use of amateur frequencies for their products.

A reminder! When you change calls (by upgrading, for example), please notify your incoming QSL bureau of your new call. Also, be sure your bureau has envelopes for your new call and old call. For a list of ARRL incoming QSL bureaus, see page 77 of this issue.

Who's in Charge Here?

Larry Lunchbucket finds personal fulfillment in the League's expanded field-organization structure.

As told to Robert Halprin,* K1XA



Call me Lunchbucket.[1] I was born and raised in Fredonia City, USA, but I left the comfort and security of home to seek my fortune in the big city. Things didn't work out so well. I was fired from a prestigious job as a reporter on a major midwestern newspaper. Following that, I knocked around a bit. It's no secret; I had some problems. I don't mind admitting that I was seeing a psychiatrist. He helped me get over the disgrace that I felt as a result of losing my job. He also assisted me in getting rid of some paranoid notions I had about the ARRL.

My frame of mind was so improved that I came home to Fredonia City, caring not what people might say about my less-than-glorious return. I wasn't the conquering hero, but I vowed to start over again, to put my life back together. Things started looking up when, despite generally lackluster economic conditions in Fredonia City, I secured a good job — a management position at a sewage-treatment plant. At last, I was on my way. I had achieved some stability and tranquility in my life. Or so it seemed.

The Road Warrior

Fate was destined to change everything. One sub-zero winter evening, while driving home from work on a lonely country road, I hit a patch of ice and lost control of the car. I crashed through a guardrail and over into an embankment. Painfully, I dragged myself out of the ruined vehicle, and checked my vital statistics. They were still valid, but in a world of hurt.

Salvation was, it seemed, clipped onto my belt: my 2-meter fm hand-held. Luckily, it had a scanning feature, as it was a major effort just to flip the switch to the ON position. In any case, the rig locked into a busy frequency upon which, coincidentally enough, the Southern Fredonia Emergency Net was going full steam. I immediately felt a lot less isolated; moreover, both the Section Emergency Coordinator (SEC) and the Section Traffic Manager (STM) frequented that net, so I knew I was in good hands.

I had to stand by for a substantial amount of time, as it turned out, while numerous amateurs on the net expressed themselves in great detail about a variety of personal ailments (although my ailment had more immediacy). I eventually got the opportunity to check in, at which time I briefly explained my predicament and asked that someone notify the state police. Suddenly, the Section Emergency Coordinator broke in and instructed net control not to help me unless I slapped a number on my message and made it formal radiogram traffic.

I found this slightly unusual, in view of my condition — rapidly freezing to death in the snow, not so lightly sprinkled with large quantities of my own blood. But you can bet I composed a radiogram right quick. Shortly thereafter, I was permitted to pass the message to a station on the net. As soon as I finished, the Section Traffic Manager asked to be recognized and thereupon disagreed with my "check" (the number of words in the message). A lengthy discussion ensued, with each ham on the rollcall asked to render an opinion: Is *frostbite* one or two words? Finally, the STM told me he would write a letter to ARRL Headquarters for a "ruling," and that my rescue would commence as soon as a reply was received from Newington. At this point, I lost consciousness.

The Recovery Room

I awoke in Fredonia City General Hospital. The doctor told me I was okay, thanks to a passing REACT member who had radioed for help. I was certainly grateful for that. The doctor indicated that I would be in the hospital for at least two weeks while my wounds healed.

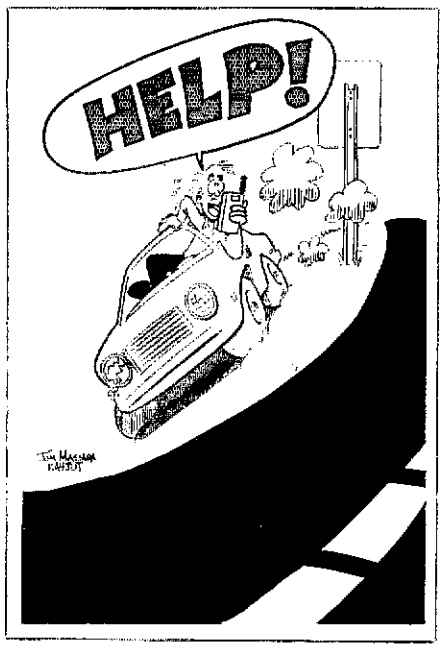
During this period of recuperation, I had an opportunity to catch up on my reading, primarily *QST*. I should mention first that my animosity toward ARRL had resurfaced; after all, "their" SEC and STM had practically "planned" me into oblivion. How, I wondered, could these feeble-minded bureaucrats in the Ivory Tower back East make those two guys leadership officials? I intended to write a scorching letter to Newington about it.

Well, I stumbled across an article in June 1982 *QST* called "New Life for ARRL Sections." Heck, if there was anything that needed new life, it was the ARRL Fredonia Section, which was in worse shape than I was.

In the article I found out that ARRL leadership appointments, such as STM and SEC, are *not* made by ARRL Hq., but by the ARRL Section Communications Manager. While our SCM was a nice chap, he was only accessible to the 50 or so hams that were regulars on the

[1][Editor's Note: The preceding three installments of the Larry Lunchbucket series appear in *QST* in June 1979, April 1980 and April 1981.]

*Deputy Communications Manager, ARRL



Fredonia cw net. The remaining 1500 League members in the section, and the hams who were *potential* ARRL members, had no contact with the SCM or the STM/SEC, and were left out in the cold, if you'll pardon the expression.

I had plenty of time on my hands, so I decided to revise my scorcher to Newington, severely chastising them for appointing our SCM. But as I got deeper into the article, I realized that SCMs aren't appointed at all; they are *elected* by the League members in each section. Every two years, the position is up for grabs, and all it takes is a nominating petition signed by five League Full members to get a new person in the running. Instead of complaining, all I would have to do is submit a petition for a candidate of my choice and let the democratic process prevail. But this was old information.

The real news of the article was that the ARRL Board of Directors had approved a revitalized section structure. A new position, Section Manager, with expanded responsibilities, will replace the SCM in each section over a two-year transition period.

The Section Manager will manage *all* League activities in the entire section. While National Traffic System and Amateur Radio Emergency Service functions will continue in full swing, the Section Manager will spearhead other section activities that are of major importance to Amateur Radio and the League. To be an effective mainstream field organization, the volunteer force will delve into RFI problem-solving, affiliated-club support, liaison to state government, encouragement of technical activities, and a stepped-up campaign of volunteer monitoring and bulletin dissemination. Not all of these goals are directly operational as such; hence the title of Section Manager.

Interestingly enough, I noticed that the Fredonia Section had an SM election coming up pretty soon. Since I was now up on all my reading, I figured, what the heck, they could do a lot worse than me. I'd run for it myself. (I cut down to two packs of cigarettes a day, so I was able to afford to maintain my ARRL membership continuity.)

The Real Campaign

My ham friends came to visit me in the hospital, and all of them signed my petition. Unfortunately, this left me three signatures short. I advertised my quest on 2 meters and eventually obtained the required number of signatures. Just as I was being discharged from the hospital, I fired off the petition to League Hq. Later, I was informed that the signatures were valid, and an election would be conducted.

I had some heavy-duty competition; my opponent was the vice president of the Fellowship of Wireless Aardvarks. The vote was close, but I managed to squeak into office. I credit my victory to a debate between him and me on 75 meters; there was a solar flare and no one could hear a thing! In any case, when I was informed that I had won the election, I thought to myself — in the words of the character played by Robert Redford in *The Candidate* — "What do I do now?"

The Roster Evolves

Clearly, the first major task was to assemble a team of lieutenants to get things happening in the Fredonia Section. I needed a hand-picked group of capable section leaders. In addition to personnel to modernize the traffic and emergency-preparedness end of things, other slots needed to be filled. Someone was needed to intensify the volunteer monitoring function, especially with respect to the Amateur Radio legislation recently passed by Congress and signed by President Reagan. An amateur was needed to keep a "receiver" on matters affecting Amateur Radio at the state government level; another to work with radio clubs in creating a more effective local presence of Amateur Radio. A League enthusiast was required to promote Amateur Radio aggressively in the media. An electronics whiz would be asked to encourage technical activities, while a section historian would be asked to supervise an on-the-air bulletin program containing news of both a local and national nature. Seek, it is written, and ye shall find:

For the post of *Official Observer/RFI Coordinator,* I appointed a no-nonsense, take-charge kind of guy, who most recently was a security guard for the U.S. tour of the Rolling Stones. He loves HBO.

The *State Government Liaison,* an attorney who works in the Capitol vicinity, is an avid ham and amateur photographer who installed a 250-foot tower on his property, which adjoins a nudist colony.

An *Affiliated Club Coordinator* was the hardest to place, but I eventually found a well-qualified person; he was the maitre d' and part owner of the Boom Boom Club in Fredonia's version of the Combat Zone.

A former broadcaster and p.r. man agreed to become *Public Information Officer;* he's a real image-maker who never wears shorts with black shoes and socks in public (or in private, as far as I know).

My *Technical Coordinator* was an amateur who won a *QST* cover plaque for his article on the differences in radio-wave propagation between imported and domestic beer-can verticals.

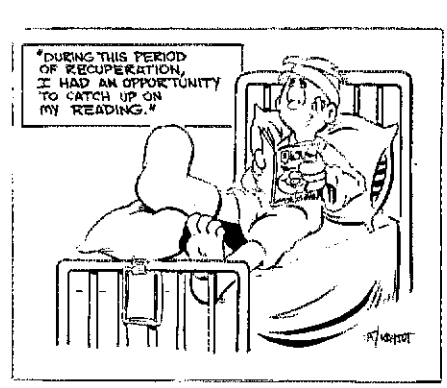
Of the 25 Official Bulletin Stations in Fredonia, only one was able to copy W1AW direct. Since this is essentially a broadcasting function, I was fortunate enough to find an amateur who committed George Carlin's Seven Dirty Words to memory. I appointed him *Bulletin Manager.*

Now you probably expect that I sacked the STM and SEC on day one. Wrong! I don't have a vengeful bone in my body (those that weren't shattered in the accident, anyway). Both these folks had good leadership skills and an extensive background in NTS and ARES activities that no ham in the section could match. When I asked them to continue in office, I recommended that they start thinking in terms of being mobilizers rather than *im*mobilizers. Thankfully, they agreed to stay on (besides, they had such nice, form-fitting jumpsuits).

The Right Stuff

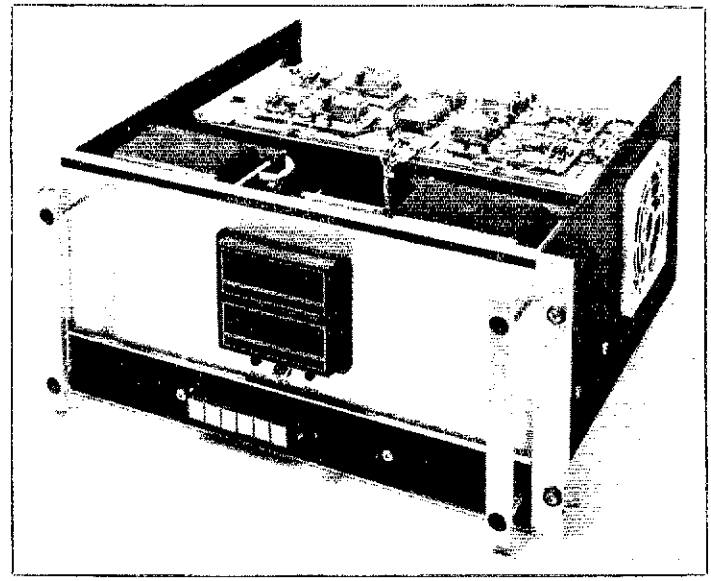
I really can't claim total credit for the Fredonia Section's running so smoothly. The credit goes to these highly motivated leadership officials; they deserve all the accolades. They have already distinguished themselves in the section. To wit, the State Government Liaison headed off an attempt to remove the lightning bolt from call letter plates; our Public Information Officer was interviewed on local television and didn't once use phonetics; our OO/RFI Coordinator solved a serious

Continued on page 58 . . .



MOSFET RF Power: An Update

Part 1: Power FETs are now practical for 2-30 MHz broadband-amplifier use at the kilowatt level. How do they compare with vacuum tubes and bipolar transistors? This report by ARRL TA Granberg provides some interesting answers.



By Helge Granberg,* K7ES/OH2ZE

Interested in power-FET technology? This paper combines a status report with some useful application notes for MOS power devices. It is intended to document the progress that has been made recently in power-FET development and deployment, but it is not meant as a construction article. The data presented are, however, suitable for amateur designers who wish to develop their own power-FET amplifiers.

Early power FETs were relatively low-level devices, but now these transistors can produce power amounts of 100 to 150 W. In contrast, we now have bipolar devices that yield up to 250 W of rf power (500-600 W in special water-cooled packages from at least one manufacturer). If we compare watts against dollars, using an 8877 tube as an example, a watt from a solid-state amplifier is about twice as expensive. If we include the necessary harmonic filters for broadband amplifiers, the price will be even higher.

Narrow-band solid-state amplifiers are considered feasible only for single-band use. This is because the low impedance levels (typical) make band switching the passive elements impractical. Also, losses will result.

Push-pull solid-state amplifiers aren't difficult to design, and they are desirable because the impedances are higher. Also, rf ground loops are easily eliminated. Other advantages are that the powers of the two devices are combined and the even harmonics are suppressed. Broadband-transformer matching is suitable up to vhf. Other techniques, such as coaxial or other transmission lines (to provide a 180° phase shift) are practical up to the microwave spectrum.

The output harmonic filters of amplifiers usually are designed for 50 ohms, which makes them easy to switch. One low-pass filter usually covers less than an octave, but the frequency can be varied within the filter response without tuning or switching in a new filter. Because the amateur bands are one octave apart (except for 10, 18, 21 and 24 MHz), a separate filter is required for each band. More on this later.

Amplifier Specifics

The components for the circuit of Fig. 1 are not available from a single source. Many are engineering samples that were obtained from various manufacturers. As stated earlier, this treatment is conceptual rather than practical.

This amplifier provides a power output of 1600-to 1800-W PEP or cw, inclusive of the 0.3- to 0.4-dB filter losses, depending on the operating frequency. A nominal 40 W of drive is needed for full output. The input line contains an attenuator (selectable for 1, 2, 3 or 6 dB) to make the amplifier compatible with various commercial exciters, and to comply with FCC regulations. Over 2 kW of output power is possible with the 16 Motorola MRF150 MOS field-effect transistors used, but the power supply is rated only for 2800 W — the limiting factor.

The main power supply, shown in Fig. 2 (60 V no load, 48 V full load), consists of two smaller supplies. Each operates one of the large power modules. A regulated supply would dissipate some 400 to 500 W in the regulating process and would greatly increase the total weight of the system. A switching-mode supply would be rather complex for this power level, and would require RFI shielding.

Why FETs?

Power FETs have these definite advantages over bipolar transistors in this application:

1) More tolerant to load mismatch.

2) Simplified circuit design and biasing.

3) Lower high-order IMD (comparable to vacuum tubes).

4) Easier to make broadband because of higher input Z.

5) Gain can be controlled by varying the bias voltage. This can be used for alc shut-down instead of PIN-diode switches in the rf input. Linear alc can be had for ssb, but excessive bias reduction will deteriorate the IMD.

6) Higher power gain. The increase at 30 MHz can be 3 to 6 dB.

Industrial interest in power FETs probably relates to item 3. High-order IMD (9th order and up) causes adjacent-channel "splattering." This would also happen with an over-driven or mistuned tube amplifier. Low-order IMD (3rd and 5th) can be as high as −20 dB, and the signal will sound good if the high-order products are absent. Thus, the FCC specification is for only −25 dB on the 3rd-order product, and −60 dB or more for the 9th-order product and above (Marine).

*Motorola Semiconductor Products, Inc., Phoenix, AZ 85062

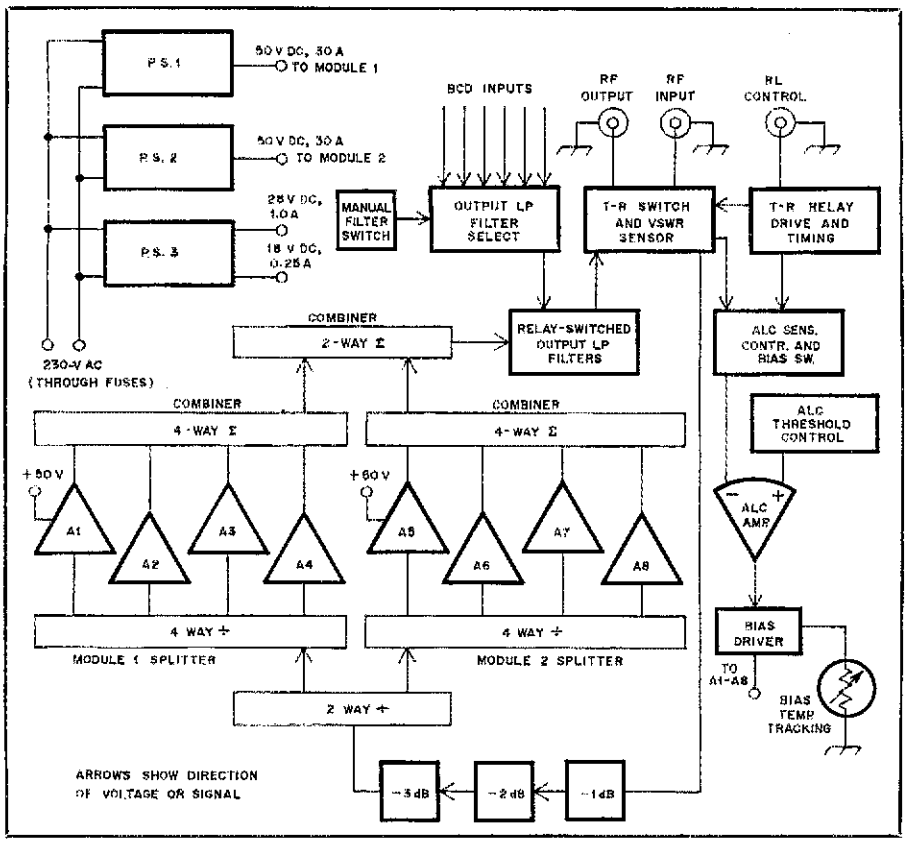


Fig. 1 — Block diagram of the 2-30 MHz power FET linear amplifier. A1-A8, inclusive, are individual FET amplifiers. See text for circuit description.

Bipolar transistors (depending on the type and internal structure) usually produce much more high-order IMD than is the case with FETs or tubes, unless the bipolar devices are biased to Class A and operated at reduced power.[1]

The power gain of a common-source FET amplifier can be varied 20 dB or more by adjusting the bias voltage. All present rf power FETs are enhancement-mode MOS types: If the gate and source are at the same potential, there is no current flow through the drain. The gate of an N-channel device must be positive with respect to the source in order to "turn on" the transistor. The gain-control range depends on the initial gate-threshold voltage (1 to 4 V typical) and the amplitude of the voltage swing at the gate. The transistor will be turned off completely and become an attenuator if reverse bias is applied.

In this amplifier, the bias is lowered only to near ground potential — a gain reduction of 8 to 10 dB. This can be sufficient in the event of a shorted or open load condition. Protective control voltage is obtained from a reflectometer at the amplifier output (Fig. 1). This amplifier also includes a self-contained linear alc system. Alc voltage is not fed back to the exciter as is done normally. The control range is limited to about 2 dB, beyond which it would degrade the IMD excessively. Bipolar-transistor amplifiers usually employ a variable voltage or current attenuator at the input port. PIN diodes are often used, but for linear alc an elaborate circuit is needed to prevent harmonics and distortion.

General Description

A block diagram of the total sytem (exclusive of the digital panel meters) is shown in Fig. 1. One meter reads 0-199.9 V and the other is for 0-199.9 mV. The latter one reads current and has 50-A and 50-mA shunts. The shunts (3) are shown in Fig. 2 as 0.001-ohm resistors. The shunts are used to read the individual currents of the rf modules, and one shunt is utilized to monitor the total current. The voltmeter monitors the nominal voltages of the main supplies, or about one half the voltage difference when switched to both supplies.[2,3] This metering system eliminates the need for heavy-duty wiring and prevents large currents from flowing through the switches.

There are two main rf modules (Fig. 1). Each contains four push-pull amplifiers. Combiners are used to produce a summed output of 1600 to 1800 W. Two pieces of Aavid Engineering heat-sink extrusion (no. 60140) support the amplifier boards, the combiners and other components of each module. Four copper heat spreaders (each 3/16 × 2 × 5-1/2 inches; mm = 25.4 × in.) are mounted individually on the flat surfaces of the heat sinks. The layout permits four MOSFETs (two boards) to be mounted on each of the heat spreaders. Copper is nearly twice as good as aluminum for heat conduction. Hence, it improves the instantaneous heat transfer by spreading the concentrated heat from the transistor flanges more efficiently along the aluminum heat sinks. The two heat sinks are supported by means of aluminum plates on each side. The plates also serve as mounting brackets for the whole structure. This technique provides a channel with the heat-sink fins inside. Two 5-inch fans (actuated by two 75° C thermostats — normally open) force air through the channel. The thermostats are attached to the heat sinks. During cw operation, the fans cycle about two minutes on and five minutes off.

Fig. 3 shows the component layout. Near the top is one of the power modules with four amplifier boards. The output combiner is shown at the center of the module. The lower part of the assembly contains the power supply. At the upper left are the two- and four-port splitters. The two-port main combiner is at the upper right.[4]

The transistor leads are pressed down (not soldered) against the pc boards and related contact areas. Teflon rings, then silicone-rubber rings, followed by aluminum rings, ensure firm contact when pressed in place by means of special standoffs. This method makes field service easier when replacing a transistor, since no soldering is required.

Filtering and T-R Circuit

The main combiner output is fed to a bank of low-pass filters. These are relay-switched for the desired band. The front-panel control switch operates when the BCD inputs to the filter-select circuit are open or high. When one or more of the BCD inputs are grounded, the manual switch is disabled and a light indicates the filter that has been selected by the code. This feature is useful for automatic band changing with transceivers that are designed for computer control.

Output from the filters goes to a T-R switch that consists of two Kilovac HC-1/530 vacuum relays. One is located at the amplifier input and the other is at the amplifier output. The relays are housed in separate shield enclosures (with BNC interconnect) to minimize unwanted crosstalk. T-R relay timing and drive signals must occur in a precise timing sequence to prevent "hot switching" in the amplifier output. Thus, the output relay must be energized first and released later than the input relay. For full QSK, the delays should be minimized. In this circuit the limit is about 8 ms, owing to the speed of the relays. Longer delays would hardly affect the QSK operation, but would shorten the marks for RTTY and cw, which would be apparent at high operating speeds. The control signal from the transceiver requires a key-to-ground

[1]Notes appear on page 16.

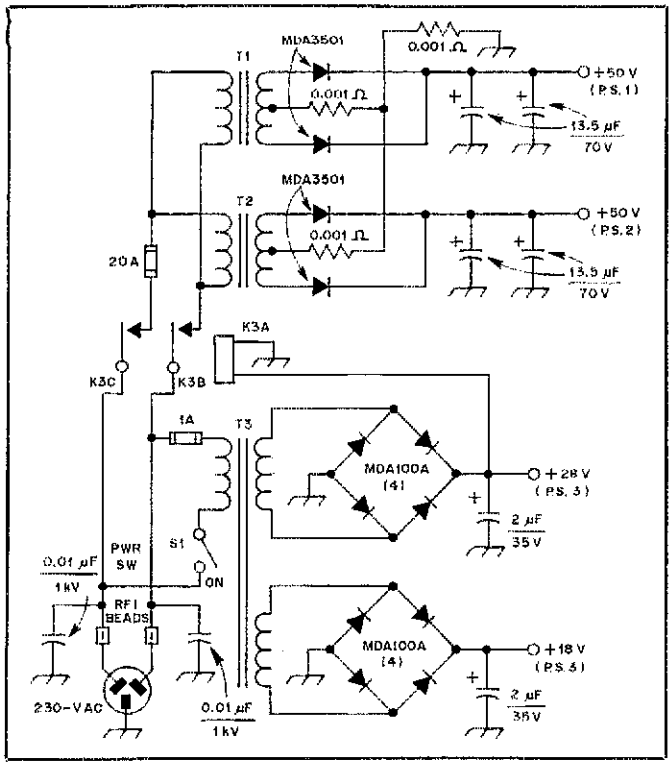


Fig. 2 — Schematic diagram of the FET amplifier power supply. Capacitors are disc ceramic, except those with polarity marked, which are electrolytic. Z1 and Z2 are ferrite beads for RFI suppression (Fair Rite no. 2673021801).

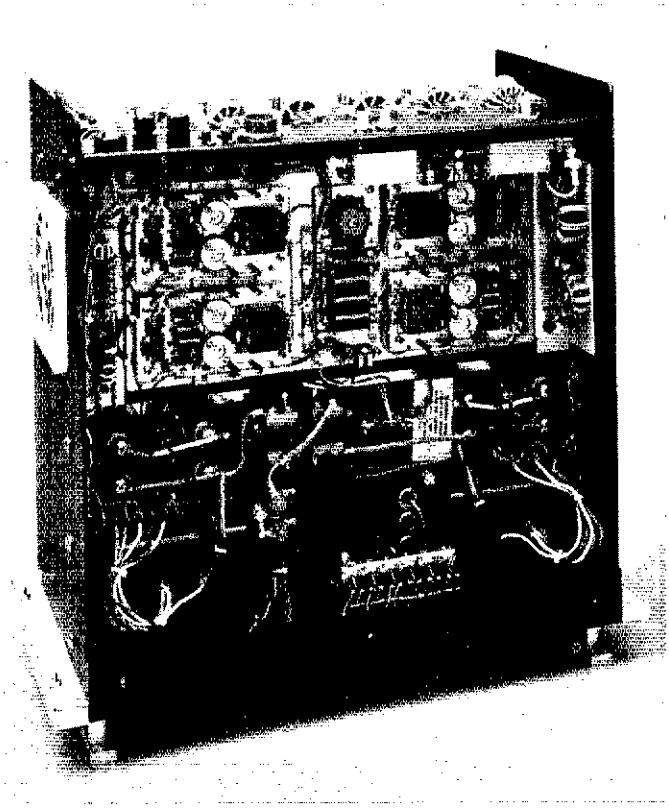


Fig. 3 — The inside of the solid-state amplifier. See text for discussion of module positioning.

polarity. The T-R, timing and drive-circuit module is visible at the upper right in Fig. 3 (just under the rear panel).

A reflectometer type of VSWR sensor is housed in the T-R circuit enclosure. Only the reflected power is measured. Output is routed to the circuit board that contains the alc, bias-temperature tracking and automatic filter-select circuits. Regulators for 12 and 24 V are also located on this board. Ferrite beads are used on the leads that enter this board. This prevents rf from getting into the alc amplifier and CMOS logic circuits.

The T-R output relay control voltage is routed also to the alc circuit. This turns off the transistor bias during standby, thereby preventing the 400-W standby dissipation (500 mA per transistor) of the 16 devices.

The bias-temperature tracking feature keeps the idling current constant with increasing heat-sink temperature. Normally, it would approximately double from 25° C to 75° C. This function is handled by a thermistor that is coupled to one of the heat sinks. Idle-current variation is 20% or less.

Circuit Details

Fig. 4 contains a schematic diagram of one of the push-pull amplifiers. The circuit is much simpler than one with bipolar transistors. The external resistor values

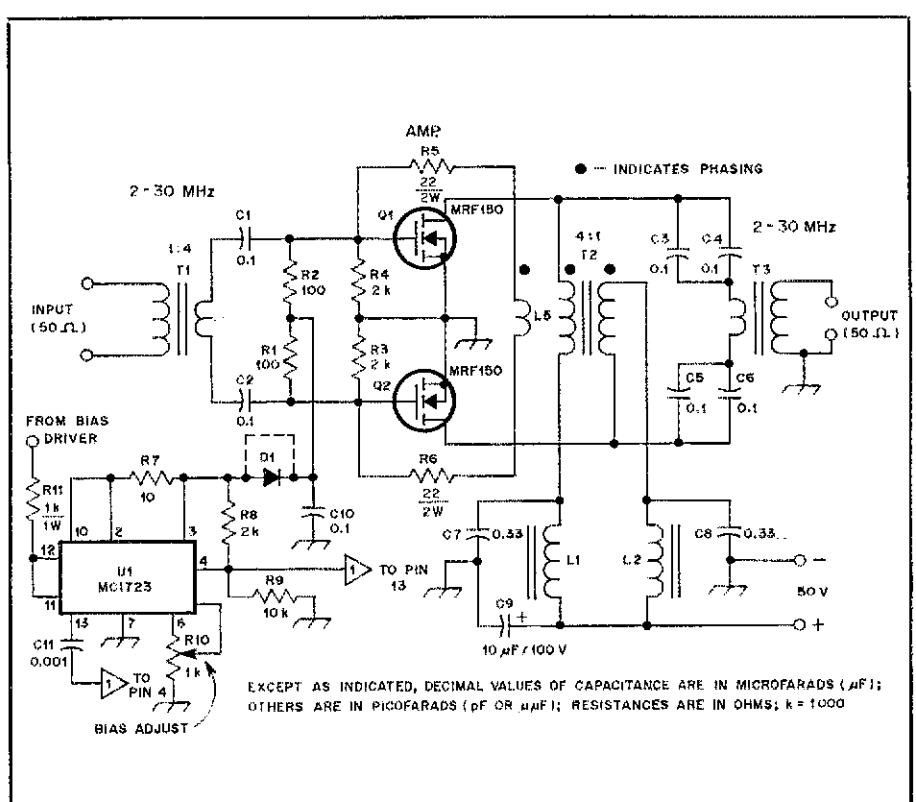


Fig. 4 — Schematic diagram of one of the power modules, inclusive of the bias regulator. C1, C2 and C10 are monolithic capacitors. C3-C8, inclusive, are ceramic chip capacitors. C9 is electrolytic and C11 is disc ceramic. Fixed-value resistors are carbon-composition, 1/2 W, unless noted otherwise. R10 is a Trimpot®. See text for discussion of the remaining components.

for the bias regulator permit regulation of the load but not the input voltage. The regulator serves three purposes: (1) Provides convenient bias adjustment (0.5 to 9 V) with R10; (2) provides a current sink for fast discharge of C10, for alc shutdown; (3) gives isolation between the bias circuits of each amplifer to the common-base driver. Hence, the adjustment of one amplifier does not affect the bias levels of the remaining amplifiers. D1 was used on the initial test board for protection of the regulator. It should be jumpered out for this application to prevent defeating the fast alc action. The regulator of Fig. 4 switches off in about 120 μs when the voltage from R11 drops from 24 to 2 or less. Considering all of the time constants and delays in the loop, the alc can still react in less than 0.5 ms.

The gates of Q1 and Q2 present an almost pure capacitance, respective to the sources, at 2-30 MHz. To ensure stability, the high input Q is lowered by means of R1, R2, C10 and negative feedback from T2. The source impedance and feedback are controlled by R5, R6 and L5. T2 is wound on a TV-antenna-balun style of core with a bifilar winding. L5 consists of one turn on the same core. The ferrite core should have a μ_e of at least 800 and a high Curie temperature for use down to 1.8 MHz. Teflon-insulated wire is recommended because T2 can reach temperatures in excess of 150° C. T1 and T2 are the common ferrite sleeve/metal tube style of transformers described in note 2. The transformation ratios are 4:1 and 1:4, respectively. A low-loss ferrite core (Stackpole C7/DB) is used for T3. It was chosen to prevent core overheating during extended periods of operation. It is available in a rectangular balun format (no. 55-7051) and has a larger cross-sectional area than the more common no. 57-3238 ferrite sleeves.

Most failures during initial testing occurred from overheating in the output blocking capacitors. Since they are ceramic chip capacitors, soldered rigidly to the pc board, cracks appeared in them. These capacitors must handle an average rf current of 4 to 5 A, but at relatively low voltage. Paralleled disc-ceramic capacitors were tried at C3-C6, inclusive. They worked fine, but were bulky for this board layout. They serve to dc-isolate T3 (unnecesary with this style of transformer) and to compensate for the frequency versus output-impedance slope of the transistors. Part 2 of this paper will appear in a subsequent issue of *QST*.

Notes

[1] "Power MOSFETs versus Bipolar Transistors," *AN-860*, Motorola Semiconductor Products, Inc.

[2] *The Radio Amateur's Handbook*, 59th edition (Newington: ARRL, 1982).

[3] *DC Power Supply Handbook* (Application Note 90A), Hewlett-Packard Co.

[4] "Broadband Transformers and Power Combining Techniques for RF," *AN-749*, Motorola Semiconductor Products, Inc.

SEASON'S GREETINGS FROM THE HAMS AT ARRL/IARU HQ.
(Listed in alphabetical order of call sign)

Joel Kleinman	N1BKE
Richard "Bones" Palm	K1CE
Naoki Akiyama	N1CIX/JH1VRQ
Jeannie DeMaw	W1CKK
Laird Campbell	W1CUT
George Grammer	W1DF
Elizabeth H. Karpiej	KA1DTU
Joan Merritt	KA1DTV
Maureen Thompson	KA1DYZ
Stephen C. Place	WB1EYI
Paul K. Pagel	N1FB
Doug DeMaw	W1FB
Hal Steinman	K1FHN
Marian Anderson	WB1FSB
Marge Tenney	WB1FSN
John Nelson	W1GNC
Bill Webb	WB1GOO
Bob Atkins	KA1GT
Ed Tilton	W1HDQ
Steffie Nelson	KA1IFB
Joan Becker	KA1IFO
Jean Peacor	K1IJV
Cheryl Sowers-Clift	KA1IXI
Andrew Tripp	KA1JGG
Brian Downey	WA1KSF
Dennis Lusis	W1LJ
Stan Horzepa	WA1LOU
Phil Accardi	AJ1N
Peter R. O'Dell	KB1N
Sally H. O'Dell	KB1O
Mike Kaczynski	W1OD
Bruce Kampe	WA1POI
George Woodward	W1RN
Richard L. Baldwin	W1RU
Lee Aurick	W1SE
Gerald L. Hall	K1TD
Perry Williams	W1UED
George Collins	KC1V
Arline Bender	WA1VMC
Bill Jennings	K1WJ
Chuck Bender	W1WPR
Bob Halprin	K1XA
John Lindholm	W1XX
Sandy Gerli	AC1Y
Steve Pink	KF1Y
Ellen White	W1YL/4
David Sumner	K1ZZ
Edward C. Raso	WA2FTC
Carol L. Smith	AJ2I
Leo D. Kluger	WB2TRN
Mark J. Wilson	AA2Z
Christopher Imlay	N3AKD
Donald B. Search	W3AZD
W. Dale Clift	WA3NLO
Larry Wolfgang	WA3VIL
William A. Tynan	W3XO
Steve Ewald	WA4CMS
Gerry Hull	AK4L/VE1CER
Paul Rinaldo	W4RI
John Troster	W6ISQ
Wayne Yoshida	KA6KGU
Chuck Chadwick	K8AXL/WB8MOB
Chuck Hutchinson	K8CH
Jim Clary	WB9IHH
Bernard D. Glassmeyer	W9KDR
B. Robert Benson	VE2VW
Harry MacLean	VE3GRO
Maxim Memorial Station	W1AW
ARRL Hq. Station	W1INF

Strays

LISTEN UP

☐ According to Florida law, "No person shall operate a motor vehicle while wearing a headset, headphone, or other listening device, other than a hearing aid. . ." I gather this would include the single earpieces used by some hams to copy above road noise level. Some Florida hams are using this method, and I wonder if they know about the law. [Editor's Note: This law is not unique to Florida. Massachusetts, for example, has a similar law. It's a good idea to check it out with your state's Motor Vehicle Department.] — *Otto Freytag, K4QFM, Riviera Beach, Florida*

I would like to get in touch with . . .

☐ any New York amateurs who are interested in starting a Big Apple Novice net. Tony Sparacio, KA2HJP, 2 Stuyvesant Oval, New York, NY 10009.

☐ hams who would like to form a national net for lovers of cw QRS for the purpose of formal and/or informal traffic and ragchewing at a speed not to exceed 16 wpm. Gerald Smith, KL7FX/4, P.O. Box 7592, Fort Gordon, GA 30905.

Next Month in QST

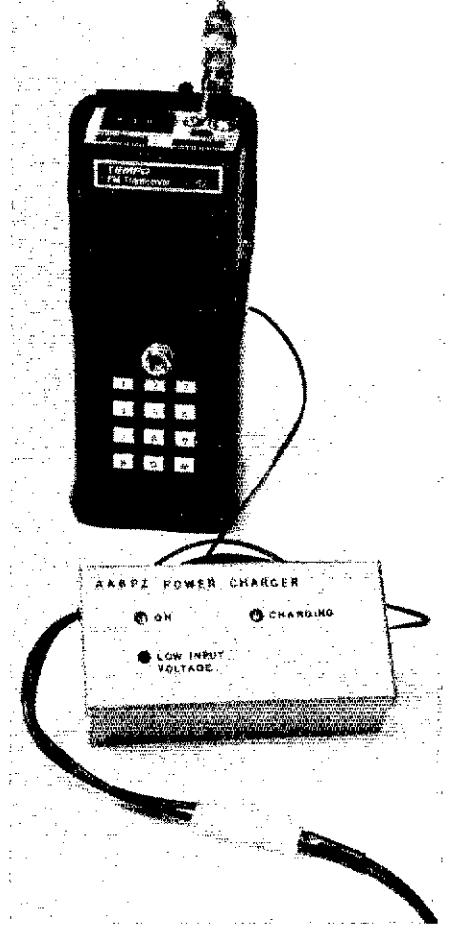
To begin the new year, which promises to be another exciting one for Amateur Radio, we'll bring you something old and something new, in the form of

- two well-respected antenna systems, and why they're just as useful in the 1980s as they were in years gone by.
- a spanking new vhf-uhf awards program based on grid squares. Who'll be first to qualify for VUCC?

Build the AA6PZ Power Charger

How many NiCd packs have you "fried" by leaving them on a fast charger too long? This rapid charger will take the nuisance out of NiCds.

By Paul Zander,* AA6PZ



It was only a few hours after I purchased my TR-2400 transceiver when I discovered that the life of the NiCd batteries was limited. The batteries always seemed to "go dead" in the middle of a QSO. This prompted me to undertake a research program. Here is what I found.

When your batteries go dead, you have three choices. The first is to accept your fate and QRT while the batteries charge. Your second choice is to substitute another charged battery, which requires opening the transceiver and reprogramming the memory after the new battery is in place. The remaining alternative is to connect the transceiver to an external power source. This is the direction I chose in developing a power-charger circuit that can operate the transceiver and charge the batteries at the same time.

Voltage and Current of NiCd Batteries

Let us consider the voltage and current characteristics of NiCd batteries. The battery pack used in a typical hand-held transceiver consists of several cells connected in series to give the desired voltage. Usually there are 8 cells, but some rigs use 7, 9 or even 10. For simplicity, the rest of this article assumes that the battery has 8 cells. If your rig requires a different quantity of cells, remember to scale the voltages to the correct number. Table 1 lists the number of cells in several transceivers.

The battery voltage is determined primarily by the state of charge, and by any current that may be charging or discharging the battery. A battery at rest (neither being charged nor discharged) will produce approximately 9.6 volts (1.2 volts per cell). When the battery is fully charged, the voltage is near 11 volts, and when the battery is discharged, it falls to 8 volts (Fig. 1).

When current is being drawn from the battery the voltage drops slightly, as shown by the bottom line in Fig. 1. When the current stops, the voltage recovers to the resting value over a period of several seconds. This explains why the receiver works well enough to hear, "Negative copy on your last transmission. Better check your batteries."

When the battery is being charged, the voltage is higher than if the battery were just resting, as shown by the top line in Fig. 1. This implies that a battery charger must be capable of supplying a voltage greater than the battery voltage if charging current is to flow.

This fluctuation in voltage (with current) points out a problem with chargers that supply current pulses or unfiltered ac to the battery. Charger-current ripple can cause ripple on the battery voltage. The voltage ripple may, in turn, affect the transmitted signal.

So much for the battery voltage. How much current can the battery deliver and how fast can it be charged? The batteries in most hand-held transceivers are AA cells rated at 450 milliamp-hours (mAh). This figure is the battery capacity; it means that a fully charged battery can delivery 450 mA for one hour before it will be discharged. A transmitter that draws 500 mA will discharge the battery in less than one hour of continuous transmission.

Some manufacturers inflate their ratings slightly by stating that the same cell can deliver 50 mA for 10 hours, thus rating the cell at 500 mAh. The significant point here is not so much the creative specification, but the fact that NiCd batteries can be discharged at high rates of current with only a small sacrifice in total efficiency. This property of NiCds overwhelms all of their disadvantages, making them a popular choice for use in portable transceivers.

A typical transceiver draws 500 mA or more from the battery during transmit. The same battery can also be charged at similar rates, provided it is not overcharged. When a battery is fully charged the incoming electrical energy can no longer be converted to chemical energy. Instead, the energy is converted to internal heat and pressure. Most NiCds are

Table 1
Batteries Used in Popular Transceivers

Model	*Number of Cells*	*Diode*
Kenwood TR-2400	8	No
Tempo S1	8	Yes
Yaesu FT-207R	9	Yes
Santec	8	

*86 Pine La., Los Altos, CA 94022

designed to handle overcharging at rates no greater than one tenth the capacity, or 45 mA. Higher rates of overcharging lead to venting of gases and a permanent reduction in battery capacity.

The problem is to determine when the battery is almost charged, and then reduce the current to a safe level for "topping off" the battery. A low-current topping charge is desirable to allow each cell to be fully charged, despite variations between individual cells.

Constant-Current Charging

Now that we better understand the NiCd battery, how can it be charged? Even more importantly, can it be charged while the transceiver is being used? The simplest device is the trickle charger, which contains a circuit that provides a steady 45-mA current at any battery voltage. This is shown by curve A in Fig. 2. A practical circuit may have some finite voltage limit, but as long as it is at least 1.5 volts per cell, the battery can be fully charged. There are two problems with the trickle charger. First, it takes 12 to 16 hours to deliver a full charge. Second, a transceiver draws between 20 and 100 mA on receive, and much more during transmit. With a trickle charger supplying 45 mA there is no current left to charge the battery. In fact, you are still discharging the battery while you are operating.

Constant-Voltage Charging

A different approach is to use a constant voltage source with adequate current available to power the transmitter. Curve B of Fig. 2 shows the output characteristics of a constant-voltage source. The problem here is determining the correct voltage, as the battery voltage varies slightly with internal construction and temperature. If the charger voltage is too high the battery can be damaged by being overcharged. If the charger voltage is reduced to, say, 10 or 11 V, the battery can only be partially charged. As a result, the constant-voltage circuit is more properly used as a power supply.

The Power Charger

After considering the constant-voltage and the constant-current chargers, we can see that it would be desirable to combine the best features of each. The Power Charger that I have designed does just that. As shown in Fig. 3, when the battery voltage is low, the current available from the charger is high enough to keep the transmitter on the air. As the battery voltage increases, the charging current decreases in order to avoid overcharging the battery. Finally, as the battery approaches full charge the current tapers off more slowly with increasing voltage. This action provides a topping-off charge with some latitude for variations in battery voltage.

Sounds good, but does it work? It sure does! Fig. 4 shows what happens when a discharged battery is connected to the Power Charger. The initial current is high, charging the battery to 25 to 30% of its capacity in the first hour. The current drops off as the battery is charged. After approximately 6 hours the battery is fully charged. Then, as continued charging pushes the battery voltage higher, the current decreases to a few milliamperes. If you forget to disconnect the Power Charger after the battery is charged, the final charge rate is actually less stressful to the battery than if you were using a constant-current trickle charger.

What happens if you operate with the Power Charger connected? When the transmitter draws current from the battery the battery voltage drops, and more current is available from the power charger. When the battery is less than three quarters charged the charger supplies most, if not all, of the transmitter current.

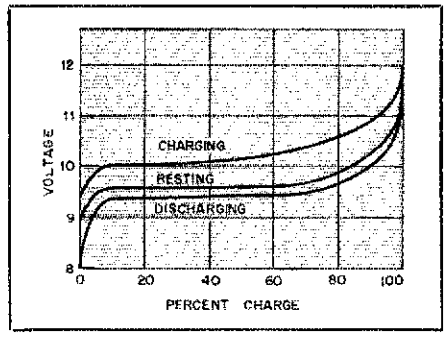


Fig. 1 — Voltage of a NiCd battery as a function of the state of charge.

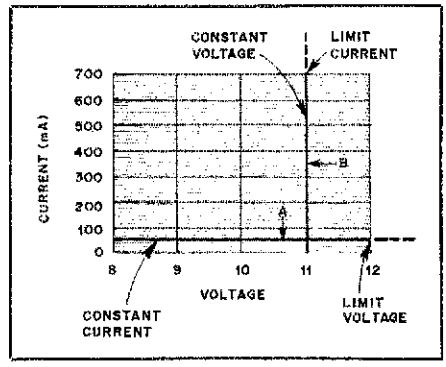


Fig. 2 — Output characteristics of a constant-current (curve A) and a constant-voltage (curve B) charger.

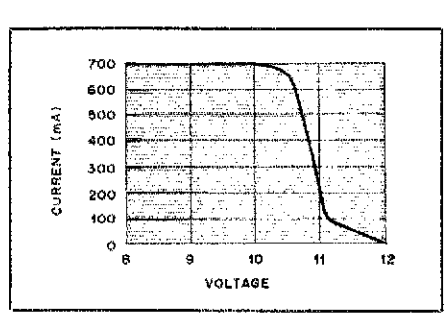


Fig. 3 — Output characteristics of the Power Charger circuit.

Rapid-charging capability, by itself, is of limited utility if the charger must be plugged into a wall outlet. The Power Charger can be operated with a wide variety of sources that supply from 12 to 30 volts. For mobile operation the car battery can supply the power from the cigarette lighter. For extended portable or emergency operation, storage batteries may be useful. For fixed-station use, a simple ac operated supply can be used.

Circuit Description

A simplified schematic of the Power Charger is shown in Fig. 5. A full schematic is shown in Fig. 6. A pnp series-pass transistor, Q1 is used to control the charging current, and a 1-Ω resistor (R1) is used to monitor that current. When Q1 has enough base drive it will have 0.2 V or less between collector and emitter. This, combined with the voltage drop across R1, allows this circuit to have a minimal difference between the input and output voltages. Although it might be possible to use an IC voltage regulator in place of Q1 and some of the other parts, most IC regulators have a minimum of 2 or 3 V between the input and output. This makes them unsuited for mobile and portable operation where there is not much voltage to spare.

Q2 and Q3 control the base drive to Q1. Q3 receives input from Q4 if the charging current is too high — and from Q5 if the output voltage is too high. In response to either of these inputs Q3 reduces the Q2 base current. This, in turn, reduces the base drive to Q1 so that the proper output voltage and current are maintained.

Q4 and the associated components monitor the output current. The base-emitter junction of Q4 is connected across R1. When the current is more than 700 mA, Q4 is turned on. This sends a signal through the other transistors to reduce the base drive to Q1 so the current cannot go higher. In practice, this much current will only be drawn by the transceiver if you are transmitting while the battery is discharged. If the 700-mA current limit is not high enough for your transmitter it can be increased by connecting R5 between the emitter and base of Q4. The formula

$$R5 = \frac{70}{(R1 \times I_{max} - 0.7)} \qquad \text{(Eq. 1)}$$

can be used to determine the correct value. For example, a 680-Ω resistor would increase the current limit to 800 mA.

During most of the charging cycle Q5 and the 4.7-V Zener diode act as a voltage-sensing circuit. The combination of Q1, Q2, Q3 and Q5 regulate the collector voltage of Q1 at 11.2 V. There is, however, a resistor (R1) between that point and the battery. When the output

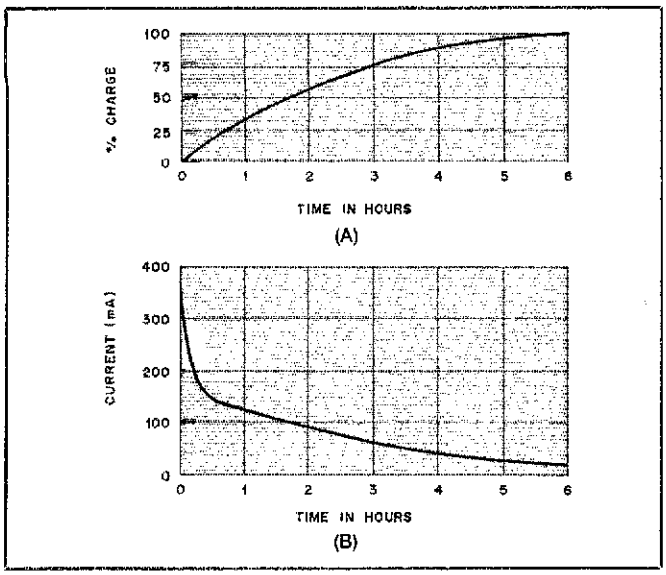


Fig. 4 — Typical charging performance of the Power Charger. Shown at A is the percentage of full charge obtained as a function of charging time. The charging current, as a function of time, is shown at B.

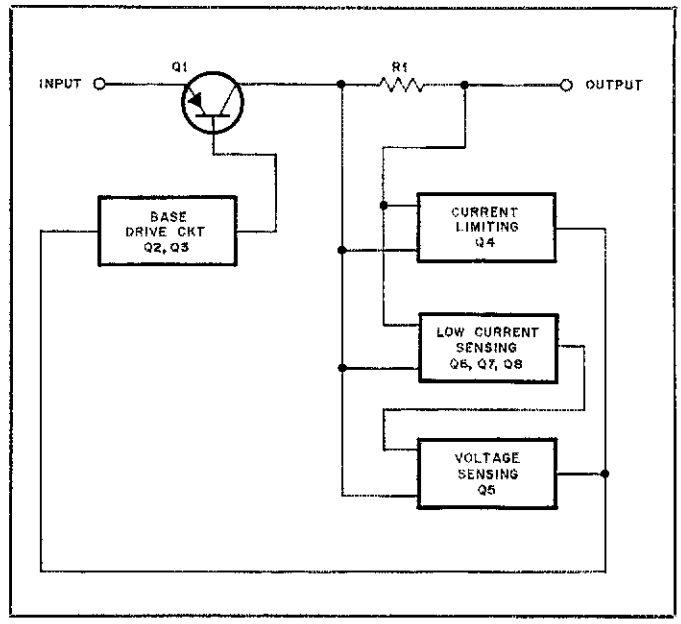


Fig. 5 — Block diagram of the Power Charger.

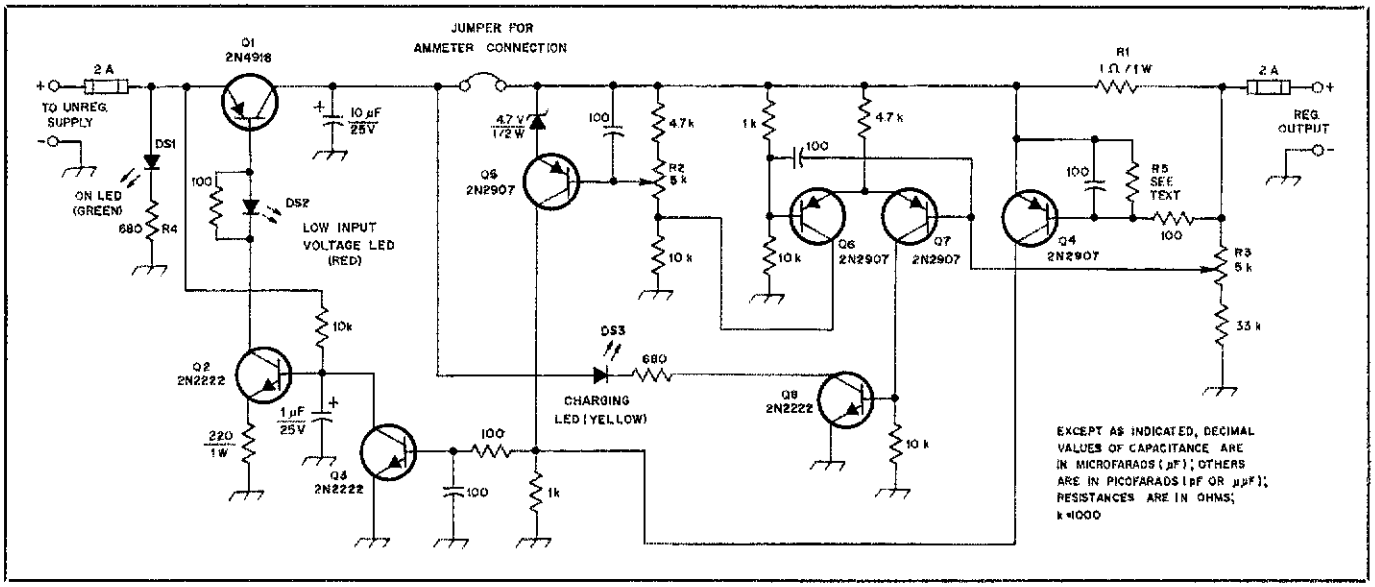


Fig. 6 — Schematic diagram of the Power Charger. Except as indicated all resistors are 1/4-W, 5% carbon types. Capacitors are disc ceramic units rated at 50 V or greater. Polarized capacitors are 25-V electrolytic types.

current is 500 mA there is 0.5 V across R1, so the output is only 10.7 volts. At 200 mA, the drop across R1 is 0.2 volt and the output is 11.0 volts. Viewed from the battery terminals, as the voltage increases the charging current decreases.

As we have just seen, R1 determines the slope of the voltage-current relation shown in Fig. 3. A value of 1 Ω works well with NiCd batteries having a capacity of 450 mAh. For batteries having a smaller capacity, the value of R1 should be increased. For example, when one is charging 250-mAh batteries, R1 should be 1.8 Ω. Using a 330-Ω resistor for R5 would give a maximum current of 500 mA.

The remainder of the circuit is used to provide the topping-off part of the charging cycle. Q6 and Q7 form an amplifier that senses the voltage drop caused by charging current flowing through R1. When the current approaches 100 mA, Q7 starts to turn off and Q6 begins to turn on. The collector output of Q6 is connected to the base circuit of Q5. This causes the charger voltage to rise slightly. The output voltage is allowed to increase more as the current drops further. Eventually, a point of equilibrium is reached at which the current is only a few milliamperes. This current is unable to push the battery voltage higher. With this method, the battery can be fully charged safely and quickly.

As the output voltage increases at the end of the charging cycle, the base drive to Q8 is reduced. This causes the CHARGING LED to dim and eventually go out when charging is complete.

If the input voltage is too low the LOW-VOLTAGE LED turns on to signal that you will be unable to fully charge the battery. This is most likely to occur when using an external storage battery to supply the Power Charger. A similar situation can occur when using the Power Charger with the Kenwood TR-2400 and other rigs that do not have an internal diode in series with the battery. If the power-charger input is accidentally disconnected, Q1 might conduct some current in the reverse direction. The LOW VOLTAGE LED will light as a warning. If, under these circumstances, the input terminals should be accidentally short-circuited, Q2 and Q1 turn off as a safety measure to avoid damaging the radio. The residual current drain on the

NiCd battery will be only a few milliamperes.

The last items in the schematic diagram are the input and output fuses. As we have just seen, the power-charger circuit has current limiting, so perhaps the fuses are not necessary. However, consider that a fully charged NiCd battery can delivery many amperes to a short circuit, and that an automobile battery is designed to deliver peak currents of 200 A or more. In this environment a couple of 20-cent fuses seem like a good idea to prevent unwanted fireworks!

Construction

In designing the Power Charger circuit, consideration was given to using parts that are readily available. The only critical part is Q1, which should be a 2N4918. The fuse clips are Littlefuse no. 102071 or a similar part by another manufacturer. Alternatively, fuses with wire leads can be soldered directly to the board.

All of the components can be mounted on a 1.9- × 3.9-inch etched circuit board.[1] This size fits comfortably inside a 2 × 4 × 1-inch aluminum box. A parts-placement diagram is shown in Fig. 8. Fig. 9 contains front-panel drilling template. Q1 is mounted with an insulating washer between it and the box. The mounting provides heat sinking for Q1 and mechanical support for one end of the circuit board. The other end of the board is supported by a no. 4-40 machine screw and three nuts. The first nut holds the screw securely to the box. The remaining nuts go above and below the board to hold it level in the box. The head of the same screw can be used to mount a rubber foot on the outside of the box.

Probably the only construction difficulty you will encounter is determining the proper charging connector for your transceiver. The Yaesu FT-207R has a subminiature phone plug; the Tempo S-1 contains a miniature phone plug. The Kenwood TR-2400 and the ICOM IC 2A have the same coaxial power plug, but the plus and minus connections are reversed.[3] Then there are several transceivers that are intended for use with a drop-in charger. A mating connector can be made from pieces of plastic and screws for the contacts. The challenge with the drop-in connector is to maintain contact when you transmit. Otherwise, the Power Charger cannot supply power directly to the transmitter, but can only recharge the battery when you set the transceiver back in the charger.

Another concern arises when you try to use one Power Charger with two transceivers. If the transceivers have a different number of cells in their battery packs, then the charging voltage must be different for each transceiver. It might be possible to build the Power Charger for the transceiver with the greater number of cells, and use an adapter containing two series silicon diodes for the other transceiver. The pair of diodes has a drop of approximately 1.4 V, which is similar to that of one charged NiCd cell. A compromise adjustment of the output voltage would then allow use of the Power Charger with either transceiver.

Adjustment

There are two variable resistors to adjust for proper operation of the Power Charger. Make sure that the input voltage is high enough that the LOW INPUT VOLTAGE LED remains off while these adjustments are being performed. The initial adjustment procedure is based on voltage measurements. The final adjustment procedure measures the specific charging current.

For the initial adjustment, turn R2 fully counterclockwise and R3 fully clockwise. Connect the Power Charger input to a convenient dc supply and the output to a dc voltmeter. Both the ON LED and the CHARGING LED should be lit. Adjust R2 for 11.2 volts (1.4 volts per cell). If your transceiver is the FT-207, a Tempo, or other model with an internal diode, increase the voltage by 0.7 volt to compensate for the voltage drop in the diode. If you are unsure about the accuracy of your voltmeter it is advisable to adjust R2 for a voltage reading that is a little on the low side. Next, slowly turn R3 counterclockwise. The CHARGING LED should become dim and go out. Adjust R3 to the point where the CHARGING LED is so dim you can barely see it. Then turn R3 a quarter turn counterclockwise. The output should increase by about 1 volt as R3 is adjusted.

The final adjustment takes care of small errors in setting the voltage, and adjusts the Power Charger to compensate for a diode or other components that may be between the transceiver charging connector and the battery.

Fully charge the battery with a trickle charger, then remove it from the charger for at least a half hour, but for not more than a day. This will allow the battery to recover from being charged.

Next, connect a milliammeter in place of the circuit board jumper between the CHARGING LED and R1. This is the best place to measure the charging current accurately. If, instead, the meter were connected directly to the output of the Power Charger, it is likely that the voltage drop caused by the internal resistance of the meter would adversely affect the adjustment. A meter connected in place of the jumper will measure the current drawn by Q5, Q6, Q7 and the associated parts. This current, which is about 10 mA, can be measured when the Power Charger output is disconnected. When the battery is connected the true charging current can be found by subtracting the transistor cur-

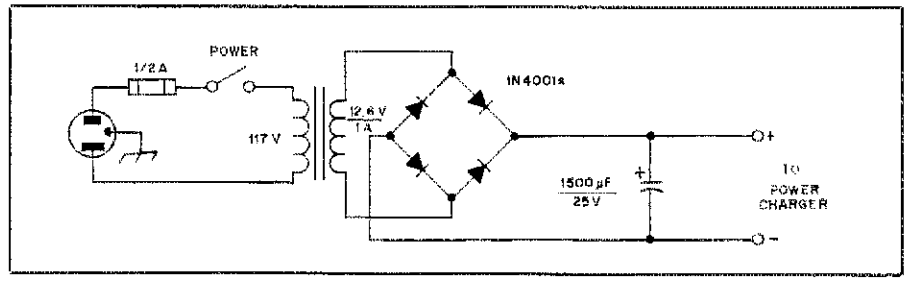


Fig. 7 — A simple ac adapter, such as the one shown here, can be used to power the charger for fixed-station use.

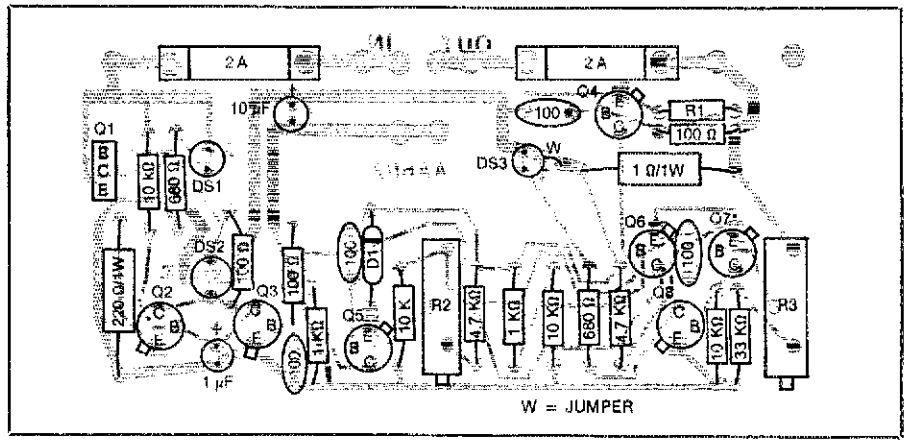
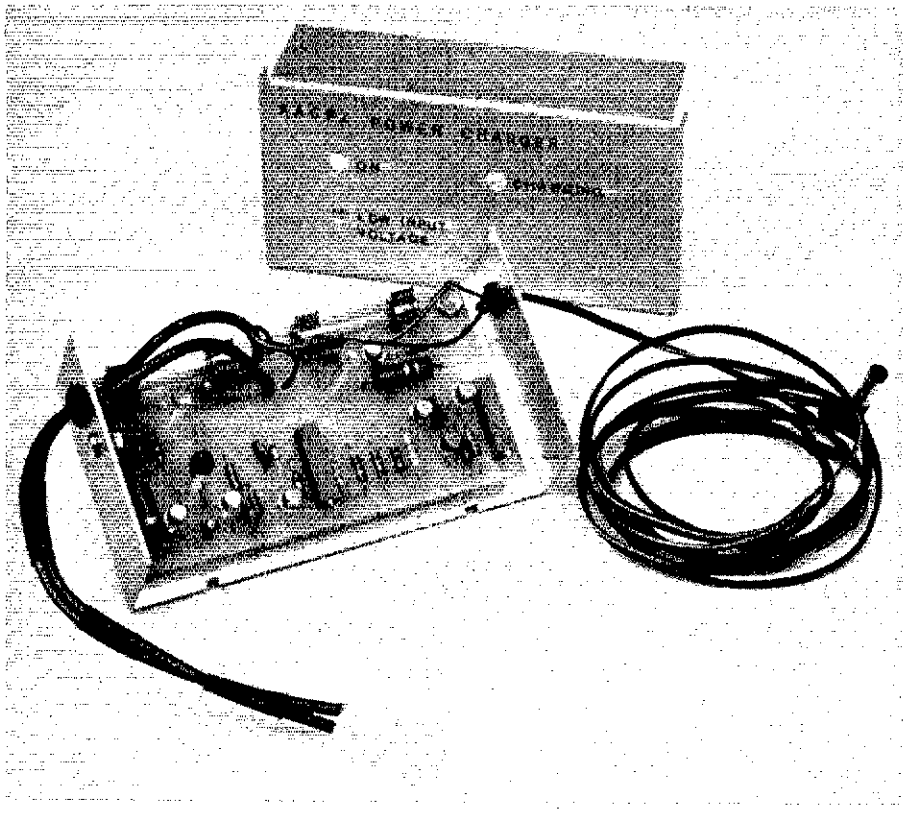


Fig. 8 — Parts-placement guide for the Power Charger. This view is from the component side of the board. Gray areas represent an X-ray view of the unetched foil. The etching pattern appears on p. 51.

[1]Notes appear on page 21.



Interior view of the Power Charger. The three LEDs are mounted on long leads so that they protrude through the top cover.

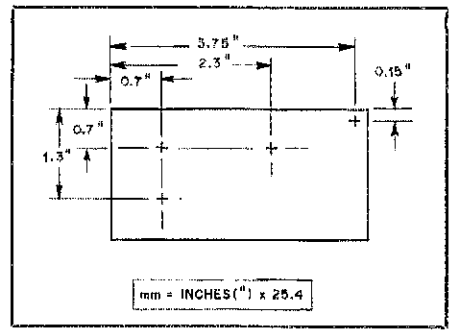


Fig. 9 — If the circuit-board pattern shown in Fig. 8 is followed this drilling template can be used to locate the mounting hole and holes for the LED indicators.

rent from the meter reading.

It may be tempting to measure the Power Charger input current instead, but an ammeter connected at the input would read the current drawn by the ON LED, the CHARGING LED and the base of Q1. This current could be from 20 to 100 mA, thus making an accurate determination of the charging current impossible.

Now, with the ammeter connected and the Power Charger turned on, it is time for the big moment. Connect the transceiver containing the charged NiCd battery to the Power Charger. The initial current surge may be 100 mA or more, but the current should fall quickly to less than 45 mA, which is the trickle-charge rate. Adjust R2 for a charging current between 20 and 30 mA. Adjust R3 until the CHARGING LED is so dim you can barely see it. Some interaction between these adjustments is normal, so you will probably have to repeat them several times until the current and the brightness of the CHARGING LED are correct. Since continued charging will cause the current to decrease slowly with time, the adjustments should be completed within a minute or two of connecting the battery. If this can't be done disconnect the transceiver for a few minutes to allow the battery to recover, then try again. If you plan to use your Power Charger with more than one battery, a compromise adjustment of R2 may be necessary to compensate for construction differences in the batteries.

If you encounter difficulty with this adjustment it is possible that you have a bad component or a wiring error. Power resistors in values from 10 to 200 Ω may be used as loads to verify that your Power Charger has an output similar to that shown in Fig. 3.

If you have an FT-207, it may be desirable to reduce the voltage slightly. It may take a little longer to charge the battery. However, you can avoid the problem of not having the transceiver work properly because of high battery voltage attributable to having left it on the charger too long.

Operation

Operation of the Power Charger is simple. Connect it to a convenient power source between 12- and 30-V dc. If the polarity is correct, the ON LED will light. If the voltage is high enough, the LOW INPUT VOLTAGE LED will be off. Connect the transceiver and the CHARGING LED will come on. When charging is complete the CHARGING LED will go out. Disconnect the Power Charger first from the transceiver and then from the power source. Fig. 7 shows a suggested supply if you don't have a suitable ac power supply. It has some ac ripple, but that is no problem since the charger acts as an electronic voltage regulator.

If a supply of 20 V or more is used to power the charger, an external 10- or 20-Ω power resistor should be used to reduce the power dissipation in Q1. The value of R4 should also be increased to keep the current through the ON LED below 20 mA.

The Power Charger can be used to charge the battery or to maintain the charge in the battery while the transceiver is being used. It is recommended that the latter mode of operation not be used on an exclusive basis, however. If the NiCd batteries are not allowed to cycle occasionally between a fully discharged and fully charged condition, they will suffer a temporary reduction in capacity. Although it is not necessary, a good procedure is to let the battery run down before connecting the Power Charger. This will maintain maximum battery capacity.

The last consideration is temperature. NiCd batteries are not designed for wide temperature extremes. With the exception of some special cells, most NiCds vent if they are allowed to exceed 45° C (113° F). Especially avoid leaving them in a closed car on a sunny day. Also, at low temperatures the chemical activity in the battery slows down. NiCds can be used below freezing, but the capacity is reduced. For these reasons, charging of any type should be minimized when the battery is very warm or very cold.

Conclusions

The Power Charger reduces the low battery indication on the transceiver from a crisis to a minor inconvenience. I have not used the trickle charger with my TR-2400 since getting the prototype of the Power Charger working many months ago. The trickle charger is now resting in the junk box between some Novice crystals and spare vacuum tubes.

Notes

[1]Etched, drilled and soldered-plated circuit boards for this project are available from the author for $12 and an s.a.s.e. with postage for 2 ounces. The ARRL and *QST* in no way warrant this offer.
[2]mm = inches × 25.4.
[3]The standard ICOM battery pack has an internal series resistor that must be removed for fast charging.

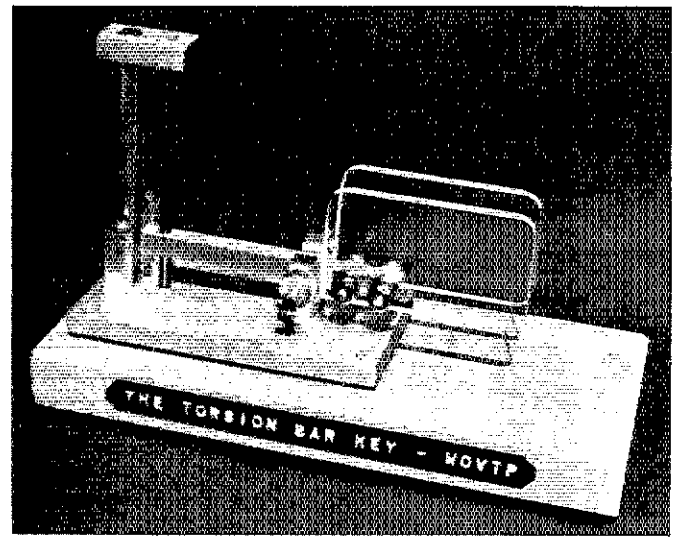
Reference

Nickel Cadmium Battery Application Engineering Handbook, no. GET-3148A, General Electric Co., Gainesville, FL 32602.

The Torsion Bar Key

Build this paddle and add a twist to your cw operating.

By Thomas P. Leary,* WØVTP



A number of articles have appeared in *QST* and elsewhere describing mechanical devices required to operate electronic keyers. After studying these and the many complex schemes employed in commercial paddles, I realized that a simpler recipe for such a key was possible.

To avoid complexity, I decided to construct a paddle that could be fabricated almost entirely with homemade parts. The torsion-bar key described here uses relatively few components, most of which can be built at home in a modestly equipped shop.

The torsion bar concept is a simple one to demonstrate. When a tree branch is twisted and released, it flexes, then returns to its natural position. In this design, the torsion bar functions as the lever-return spring. When the lever arm is moved, the bar twists, offering tension. When the paddle is released, the tension forces the lever back to center (neutral) position.

Construction

Aside from the parts shown in Fig. 1, you will need the following no. 4-40 plated flat-head screws: three 1/4-inch, five 1/2-inch, two 3/4-inch and two 1-inch.[1] In addition, two no. 8-32 1/4-inch and two no. 4-40 1/4-inch steel set screws are needed. You will also need some small wood screws to secure the brass base to the wooden one.

This key can be made with hand tools, but an electric drill or drill press is recommended. If both tools are available, the drill press is the better choice. The brass and steel parts may be found as scrap in some machine shops. Plan on obtaining plenty of extra pieces in case you "goof."

Make sure to mark all pieces carefully and center punch the holes before drilling. Drill the two holes in the top support fixture and the base simultaneously by clamping or gluing them together to ensure proper alignment. The knurled finger nuts, used to tighten the contact screws, may be difficult to locate; mine were found in a box of surplus parts.

Rigid support for the torsion bar is provided by the thicker vertical rod (1/4-inch-diameter steel or brass). This rod is attached to the base and to the rectangular fixture with set screws. The torsion bar (1/8-inch round steel drill rod) is mounted parallel to the support rod and is attached to the rectangular fixture. A simple sleeve bearing (a hole in the brass base) allows the torsion bar to rotate at the bottom, while the rectangular fixture holds the top of the bar firmly.

The lever arm is fabricated from 1/4-inch brass, and is attached to the flat on the torsion bar. This arm is operated by the paddles; pushing it either way "makes" the corresponding contact. The outside surfaces of the paddles should be separated by about 3/4-inch. Thin washers on each side of the lever serve as spacers. The wooden base measures 6-3/8 × 3 × 5/8 inches. The brass base is centered on the wood, and moved 1/4-inch forward. Small wood screws are used to attach the brass base to the wood. Thin rubber feet can be attached to the bottom of the wood to prevent it from sliding on the operating table.

The lever arm is grounded, and is connected to one of the binding posts. The contact points are connected to the other two binding posts by means of thin brass shim strips underneath the base.

I used 10-mil Teflon sheet to insulate the two contact points and their corresponding binding posts from the base. Hold the Teflon sheet over the holes in the base, and punch through it with a sharp pencil; this expands the material into the holes and prevents the 4-40 screws from shorting to the base. If Teflon sheet is not available, any thin insulator (such as a rubber gasket) will do.

Tighten the no. 4-40 set screw in the top fixture last, making sure that the lever is centered between the contact posts. Adjust the contact gap by turning the 3/4-inch no. 4-40 screws and lock them with the knurled finger nuts. The final adjustment is lever tension. With the untreated drill rod, the action is medium. Tension may be increased by lowering the rectangular fixture toward the base. For a lighter touch, the torsion bar can be made of a piece of 1/8-inch brass or brazing rod.

Garnet (not sand) paper will give the brass parts a "brushed" finish. In the old days, hams made almost everything they used in their shacks. Be an old-time ham and become a keymaker!

[1]mm = inches × 25.4.

*218 South 95th St., Omaha, NE 68114.

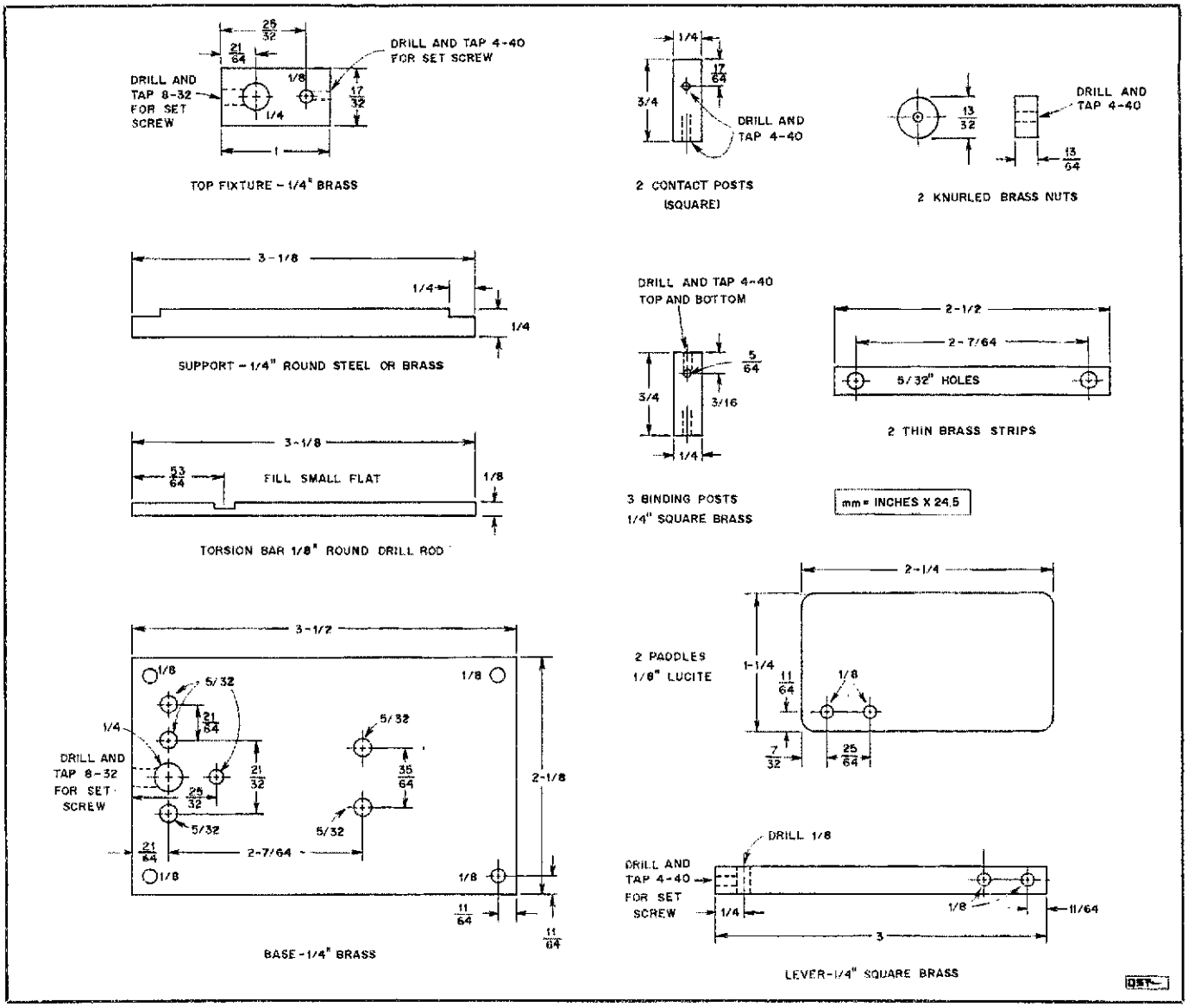


Fig. 1 — Parts for the Torsion Bar Key. Dimensions given are in inches (mm = inches × 25.4).

Strays

TIS DO'S AND DON'TS

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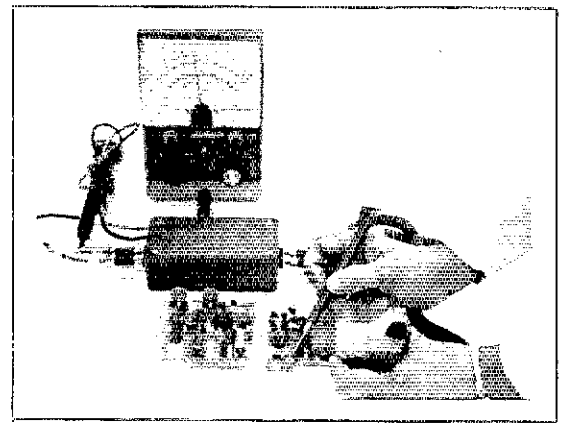
Semiconductor Testing — in or out of the Circuit



Take a tip from the manufacturers of digital multimeters that offer in-circuit semiconductor testing, and build a pn junction tester. A battery, a resistor and your trusty old VTVM are all you need!

By Clifford J. Appel,* WB6AWM/7

Can a semiconductor be tested easily with an analog ohmmeter? Yes! The technique has been pointed out in *QST* many times. A fine discussion of the method appears in the December 1981 issue.[1] I have used it for years and it works, for sure.

Measuring the resistance in the forward direction and the reverse direction through a semiconductor certainly makes sense, doesn't it? In the forward direction we would expect to see a low resistance. Simple, no?

Yes, if the semiconductor is all by itself. If the semiconductor is on a printed-circuit board, with the components connected to the semiconductor in the intended circuitry, the resistance-measuring technique may be confusing. The reason for the confusion is that the ohmmeter is not only reading across the semiconductor, but also across all circuit components in parallel with the semiconductor. These parallel components can make the "low" resistance in the forward direction look like a short, or at least lower than the resistance we expected. Likewise, the very high resistance in the reverse direction might not be what we thought it should be, although it still may not look low or look like a short. When confronted with this confusing circumstance, there's only one way to put one's mind at rest. Break out the soldering iron, pull the semiconductor off the circuit board, and check it again!

That would be fine if we had only one semiconductor to test. But what if we had to test every semiconductor on the circuit board? Now we are facing a real chore, and what at first seemed like fun has quickly turned into a nightmare. There must be a better way.

There is — or I should say, there are! Two alternative techniques are available. The first is the less satisfactory of the two, in my opinion, but I will describe it briefly since being aware of it increases one's electronic troubleshooting knowledge. The second technique is the best method I have seen to date for semiconductor testing. It is used commercially with some digital multimeters, but there is no reason we can't use it with our less-sophisticated analog voltmeter.

The Low-Voltage AC Tester

The first technique incorporates a clever gadget that has been named printed-circuit board tester, dynamic transistor checker and octopus. Basically, it puts low-voltage 60-Hz ac (about 3 V peak-to-peak) across the semiconductor. The voltage across the semiconductor is viewed with an oscilloscope. Because alternating current is used, the semiconductor is tested in the forward direction during part of the ac cycle, and in the reverse direction during the rest of the cycle. A printed-circuit-board tester I built several years ago is shown in Figs. 1 and 2. References listed at the end of this article provide slightly different schematics and offer a more detailed description of the tester, but the idea is the same.[2,3]

Be aware that one connection from the tester goes to the horizontal input of the oscilloscope. Therefore, the scope must not sweep as it would during normal operation. Disable the sweep, place the "horizontal" control in the "external" mode, and use the horizontal amplifier in the scope just as the vertical amplifier is used to view a signal. I make this point because I have seen people struggle unsuccessfully to make the tester provide patterns, and they soon give up in frustration, thinking this little gadget was a hoax. They merely had the scope adjusted improperly.

The printed-circuit-board tester will display patterns on the scope in accordance with the impedance it sees. If the probes in Figs. 1 and 2 are not touching anything, they see an open circuit and thus show a horizontal line on the scope (Fig. 3A). If the probes touch each other, they see a short circuit and thus show a vertical line on the scope (Fig. 3B). Since ac is used in the tester, it is possible to check inductors and capacitors, within reason, for shorts or opens, in addition to testing semiconductors. Figs. 4 and 5 show the oscilloscope presentation when the tester probes are placed across a diode and a 5-μF capacitor, respectively. Note that in Fig. 4 we see a combination of a horizontal line and a vertical line. This is an open and a short. Isn't this what we would expect to see across a diode? In one part of the ac cycle we see a short through the diode. In the remaining part of the ac cycle we seen an open across the diode. Fig. 5 is not quite so obvious, but if the capacitor value is much higher than 5 μF, the circle will be more of a vertical line (a short, right?). If the capacitor value is lower than 5 μF, the circle will flatten out to a horizontal line (an open, since the low capacitance at 60 Hz yields a high reac-

[1]Notes appear on page 26.

*P.O. Box 251, Electric City, WA 99123

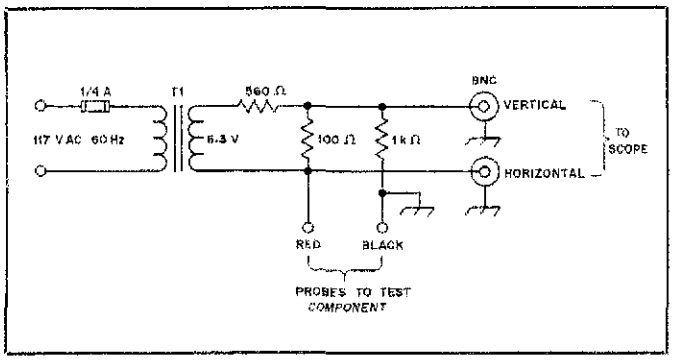


Fig. 1 — Schematic diagram of the printed-circuit-board tester used in conjunction with an oscilloscope for testing semiconductors "in circuit." T1 can be a filament transformer.

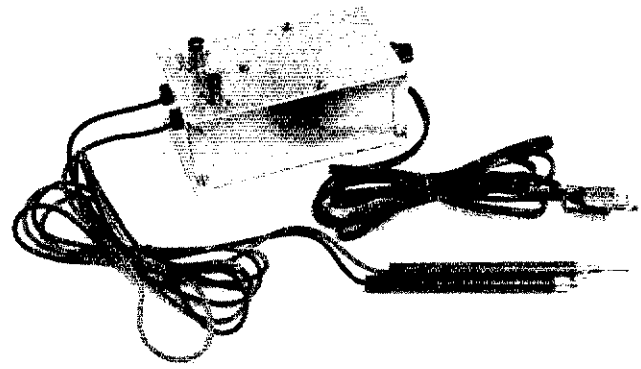


Fig. 2 — The printed-circuit-board tester constructed by the author. The BNC connectors permit coupling to an oscilloscope with RG-58/U cable.

tance). We could apply similar logic to testing inductors. And, of course, we test transistors just as if the base-emitter combination and base-collector combination were the same as the anode-cathode combination of a diode. The collector-emitter combination is tested to ensure there is no short or low resistance.

The Drawbacks

"Tell me no more," you say. "This device is just what I've been waiting for." Well, let me break the bubble, or at least deflate it a bit. Most of the time when checking semiconductors in a circuit with the tester, we get the pattern shown in Fig. 4. Sometimes, though, we get strange patterns because of the components that may be in parallel with the semiconductor. With experience (and maybe intuition), we can decipher these strange patterns. At other times, the only thing to do is pull the device off the printed-circuit board and test it out of circuit. On occasion, the pattern can be downright deceiving. A clear example is Fig. 5. True, the pattern comes from a 5-μF capacitor, but I also had a diode across the capacitor. The diode characteristic did not show up at all on the scope presentation.

Of course, the other drawback to the printed-circuit-board tester is that it is inconveniently pseudo-portable. You have to drag it around and set up the scope; 117-V ac has to be available for the tester and probably for the scope, too. For the reasons stated above and in the previous paragraph, I do not consider the printed-circuit-board tester the better of the two techniques for checking semiconductors in circuit.

The PN Junction Tester

The second technique — the only way to "fly," in my opinion — is the pn junction tester. This method is used by Beckman, Fluke and a few other manufacturers of digital multimeters.

When a direct current passes through a pn junction (that is, an anode-cathode junction of a diode, a base-emitter junction or a base-collector junction of a transistor), there is a voltage drop in the forward direction. For a silicon semiconductor this voltage drop is 0.6 to 0.7 V. For a germanium semiconductor, the voltage drop is 0.25 to 0.35 V. In the reverse direction, current will not pass through the junction; therefore, the junction is an open circuit. So, if we push current through the junction (the diode or transistor) and measure the voltage drop across the junction with a voltmeter, we have the pn junction tester.

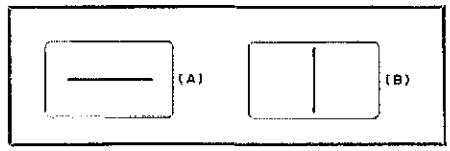


Fig. 3 — At A the tester presents a horizontal line on the scope when looking across an open circuit. At B, it presents a vertical line when looking across a short circuit.

As mentioned earlier, pn-junction testing is the technique used by Beckman and Fluke in their digital multimeters. Fig. 6 shows a typical pn-junction test on a silicon diode using the Beckman multimeter. On the left, the junction is being tested in the forward direction. Note the drop is 0.625 V, above what we expected. On the right, the leads from the multimeter are reversed across the diode and the result is a reading of OL on the multimeter. Loosely translated, this means the multimeter sees an open circuit across its leads. Thus, these tests show the diode is good. An open in both directions (an OL on the meter) would tell us the diode is defective. Similarly, a shorted diode would present no voltage drop and the meter would read zero.

When the Beckman meter displays OL, it is telling you that the voltage it sees across the leads is more than 1.999. When used as a pn junction tester the 2.0-V scale on the voltmeter is switched in automatically. The voltage inside the Beckman meter that is placed across the meter leads

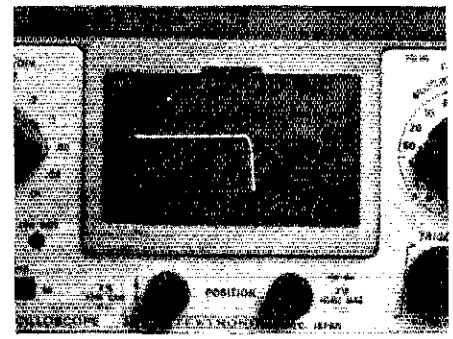


Fig. 4 — The tester shows an open and a short when placed across a diode.

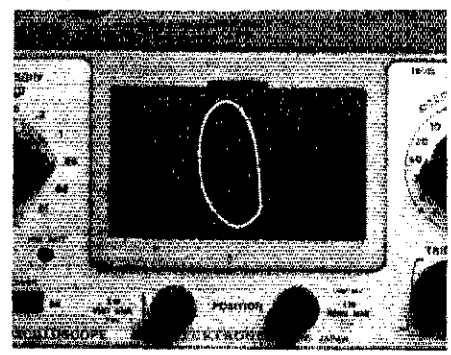


Fig. 5 — The tester shows a circle when connected across a 5-μF capacitor.

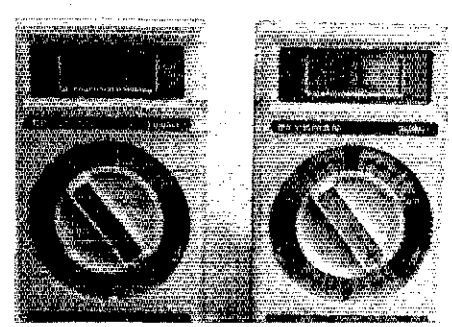


Fig. 6 — Beckman multimeter reading forward voltage drop (left) and reverse voltage drop (right) across a diode.

is about 5 V. Thus, OL means overload or overrange, because you are trying to read 5 V on the 2-V scale. It doesn't harm the meter, and the OL feature is a nice touch to let you know what's going on. Also, the current being pushed through the pn junction comes from a constant-current source of about 5 mA. The Fluke multimeter pn-junction tester operates about the same way, except that it does not use a constant-current source and has no OL feature. In addition, the current pushed through the pn junction is about 1 mA.

A Circuit for Home Construction

So now you're probably thinking that you already have a digital meter, a VOM and a VTVM, and now someone is suggesting that you spend another $180 or so on a new instrument just so you can check semiconductors in circuit. Not so. We can build our own pn junction tester and use our existing voltmeter.

I don't want the electrical engineers in our Amateur Radio ranks to laugh too loudly at me, but the sophisticated circuit shown in Fig. 7 is what I use as a pn-junction tester with my ancient Heath VTVM. Let's look at how this thing works so you can "design" your own to suit your particular meter. I am going to assume the meter used is an analog meter, but the idea is the same for a digital meter.

Let's assume your low-range voltage scale is zero to 1.5, as it is on my Heath VTVM. If you use the 1.5-V scale, then the battery used in the pn junction tester should be 1.5 V. If your meter has a zero-to 3-V scale, use two batteries in series to get 3 V. If your meter has a scale that is not convenient for use with carbon-zinc dry cells, you may choose to use some inexpensive NiCd batteries. Example: Full scale is 2.5 V, so use two NiCd batteries in series to get 2.4 V. Whatever you do, the battery voltage should not exceed the maximum voltage on the range scale you select if you are using an analog meter. Why? Because during the time the probes in Fig. 7 are open-circuited you are reading the battery voltage, and you'll slam the meter needle into the stops if you use a battery voltage higher than the maximum value of that range.

If we take a lesson from the Fluke and Beckman pn junction testers, the current we push through the pn junction needs to be between 1 and 5 mA. Let's assume that our nominal silicon pn junction will drop 0.65 V. If we use a 1.5-V battery, the resistor will drop the difference, or 0.85 V. Resistor values between 850 and 170 Ω will yield currents from 1 to 5 mA. I used a 330-Ω resistor in my pn junction tester. If you use a 3-V battery, any resistor between 2.2 kΩ and 470 Ω would be suitable. If you use 2.4 V from NiCd cells, any resistor between 1.8 kΩ and 390 Ω will be suitable.

Fig. 8 shows the exotic packaging and construction technique I used for my pn junction tester. Three drops of super glue fix the battery holder to the plastic enclosure. All parts are obtained from Radio Shack. The photo at the beginning of this article shows the pn junction tester and the Heath VTVM being used to test a transistor on a printed-circuit board.

Testing Procedure

The approach used to test semiconductors in or out of a circuit is the same as if we were using the Beckman or Fluke. If the drop in the forward direction reads somewhat close to the 0.6 V or 0.7 V we expect to see, and the drop in the reverse direction is the full battery voltage (1.5, 3 or 2.4, depending on the battery you selected), the pn junction is good. Remember when testing transistors to check the base-emitter junction, the base-collector junction, and the collector-to-emitter, in forward and reverse directions (six checks). The collector-to-emitter test should always show an open (full battery voltage, both directions). And if you ever test a pn junction that yields zero potential across it, you have a shorted junction. You need test no further — the semiconductor is dead.

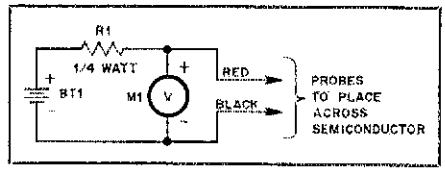


Fig. 7 — Schematic diagram of the pn junction tester. See text regarding BT1 and R1. M1, as used by the author, is an old Heath VTVM, but could be any VTVM or FETVOM, or high-impedance digital voltmeter.

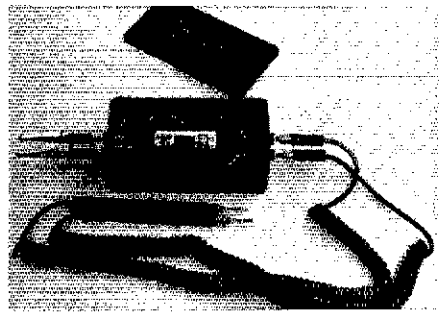


Fig. 8 — The layout of the pn junction tester. The meter is connected to the jacks on the left; the probes on the right are placed across the semiconductor. The enclosure is Radio Shack part no. 270-222. The battery is a size C dry cell.

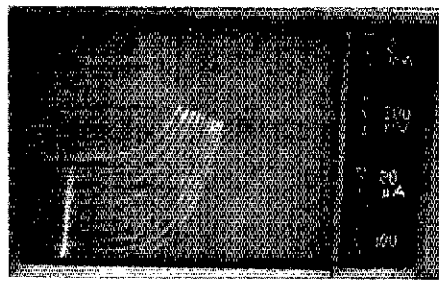


Fig. 9 — The Tektronix curve tracer shows a transistor to be defective even though the pn junction tester showed that it was good. The lines should remain essentially horizontal in sweeping from left to right, rather than curving upward significantly. The vertical traces at the right indicate that the transistor breaks down at a potential from collector to emitter of approximately 3.5 V.

More Drawbacks?

I have described the pn junction tester and have shown how you can make one for use with your meter. Now you think that the ultimate, perfect, foolproof semiconductor tester will solve all problems, for certain. You will never have to remove a semiconductor from the circuit to test it. Well, not quite. There will be times when a good semiconductor will appear defective (such as Darlington configurations), and it will have to be removed to conduct an accurate test. No tester is foolproof in those situations, but they are few and far between.

And one final caveat: If we test a semiconductor with the pn junction tester and it checks okay, are we *certain* it is good? Nothing is certain except, as the saying goes, death and taxes. The pn-junction test is reliable 99% of the time, but one of my colleagues has found that rare occasion when the pn-junction test showed a transistor to be good when the Tektronix curve tracer showed it to be defective. See Fig. 9. But the printed-circuit-board tester described earlier also showed the transistor to be good, as did the resistance checks with an analog ohmmeter that were outlined in the article referenced in note 1. Fortunately, events such as that are statistical rarities.

If you noticed something strange about the Heath VTVM in the photograph at the beginning of this article, you are observant. There is a toggle switch on the front, and the 117-V ac umbilical cord is missing. A 1974 article by Mike Kaufman outlines a modification to the Heath VTVM that can be applied to any VTVM.[4] The change removes the two vacuum tubes and replaces them with an LM310 voltage-follower op amp. It is a modification that is well worth the time to perform, as it makes your electronic meter truly portable.

Any question a reader has will be answered to the best of my ability. Please enclose an s.a.s.e. with the correspondence. Thank you! QST

Notes

[1] D. DeMaw, "Some Basics for Equipment Servicing," *QST*, Dec. 1981.
[2] V. Epp, "Dynamic Transistor Tester," *Ham Radio*, Oct. 1971.
[3] D. Ludlow, "The Octopus," *QST*, Jan. 1975.
[4] M. Kaufman, "How to Convert Your VTVM to an IC Voltmeter," *Ham Radio*, Dec. 1974.

Clifford J. Appel was first licensed as KN4NKF in October 1960, graduating to WA4EBX a year later. An Extra Class amateur since May 1978, he is a Communications and Instrumentation Mechanic at Grand Coulee Dam, the nation's largest hydroelectric power-generating facility.

Antenna Gain Measurements

Part 2: Instrumentation — simple, easily constructed instruments permit a precise determination of antenna gain.†

By Fred Brown,* W6HPH

Part 1 of this article dealt with the techniques of measuring antenna gain accurately. This concluding part is devoted to the equipment needed for such measurements. Comparison of two antennas obviously requires (1) a signal source and (2) some kind of receiver capable of giving a quantitative indication of received signal strength.

Station receivers and transmitters are often pressed into service as antenna-range instruments, but such make-shift arrangements usually leave much to be desired. The equipment described here is designed specifically for accurate gain measurements on the two amateur bands most likely to be used for antenna experiments: 432 and 1296 MHz. Antenna size and height-above-ground requirements make gain measurements awkward on bands below 420 MHz, and antennas become especially unwieldy below 144 MHz. Bands above 1300 MHz, on the other hand, require microwave sources that are not easy for the average amateur to construct. And antennas for these higher bands, rather than being too large, shrink to a size that is sometimes too diminuitive to work with conveniently.

A Signal Source

On-the-air signals are used sometimes for antenna measurements, but they are generally not satisfactory, for a number of reasons. They are often intermittent in nature, and frequently they are in a wrong direction or not close enough to the desired frequency. On-the-air signals will nearly always meet the distance requirement, but sometimes they are so far away that fading becomes a problem.

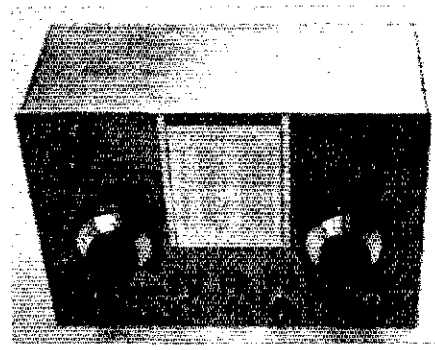
For these and other reasons, it is preferable to have a completely portable source that can be taken into the field. Fortunately, since only a very low power level is needed (in the milliwatt region), battery requirements are minimal.

For antenna work, a crystal-controlled source is not really necessary. A frequency stability on the order of ± 1/2% is usually adequate, and this degree of stability can be attained easily with an ordinary L-C oscillator. A self-excited oscillator is considerably simpler to construct than a crystal-controlled source, and has the further advantage of being adjustable in frequency — a feature often useful to the experimenter.

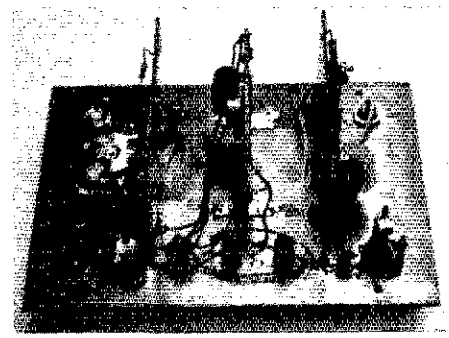
Most measurements at microwave frequencies are done with 1000-Hz, amplitude-modulated sources. This is because laboratory-type microwave detectors are usually either bolometers or point-contact silicon diodes. These detectors feed an amplifier-meter combination; if the source were unmodulated, it would be necessary to use a high-gain dc amplifier with attendant drift problems. High-gain audio amplifiers are easy to construct and do not suffer the notorious drift problems of dc amplifiers. The audio amplifier is usually tuned sharply to 1000 Hz to improve the signal-to-noise ratio, and to help reject stray signals modulated by other frequencies.

In keeping with this tradition, the source described here is 1000-Hz modulated, and is therefore compatible with most laboratory-type microwave instruments. Square-wave modulation is used because it simplifies the modulator (only a switching transistor is needed) and also because it avoids fm problems.

In Fig. 9, Q1 is the 432-MHz oscillator and Q2 is the 1296-MHz oscillator. If only one band is of interest, the unneeded oscillator could be omitted, of course.



A frequency-calibration chart is fixed to the front panel of the 432- and 1296-MHz signal source. The vernier dials are Archer catalog no. 274-605, sold by Radio Shack.



Inside view of the signal source shows the 1000-Hz modulator board between the 432-MHz oscillator (left), and the 1296-MHz oscillator.

Both Q1 and Q2 are inexpensive and readily available 2N5179 transistors. Q3 and Q4 form a 1000-Hz multivibrator, and Q5 acts as a switch to modulate either oscillator. The modulation frequency can be set to exactly 1000 Hz by means of R1.

Dielectric tuning (C3) is used on the 1296-MHz oscillator because ordinary variable capacitors are almost unusable at

†Part 1 of this article appeared in November 1982 *QST*.

*1169 Los Corderos, Lake San Marcos, CA 92089

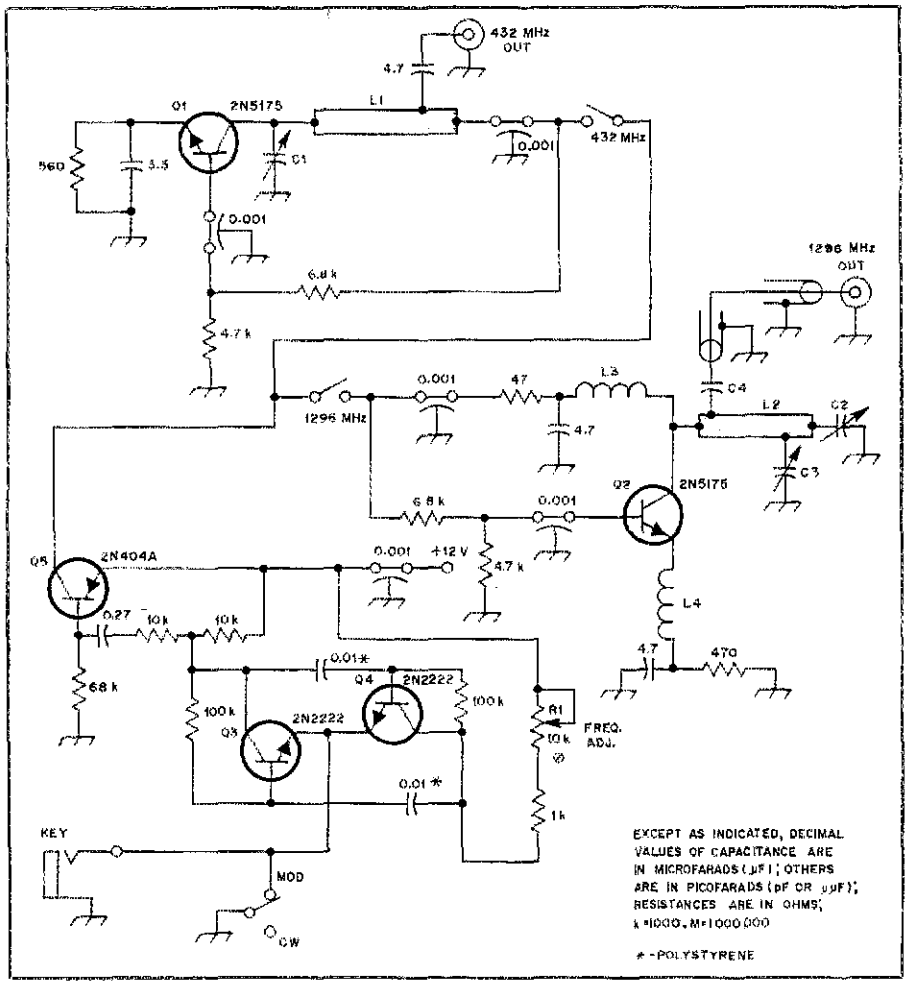


Fig. 9 — This battery-powered combination 432- and 1296-MHz signal source permits antenna measurements at sites remote from ac power. Construction details of the 432-MHz oscillator, Q1, and the 1296-MHz oscillator, Q2, are given in Figs. 10 and 11, respectively. Adjust the modulation frequency to 1000 Hz by means of R1.

C1 — Two-plate APC-type variable, 4-pF maximum capacity.
C2 — 0.5-3 pF ceramic piston trimmer, Triko 201-01M suitable (Alaska Microwave part no. 55100, Alaska Microwave Lab, Box 2049, Palmer, AK 99645.
C3 — See Fig. 11 and text.
C4 — Rectangular tab of 24-gauge copper, 5/8 inch long, 0.22 inch wide, spaced 0.065 inch above L2. See Fig. 11.
L1 — 1.75-inch length of no. 12 solid copper wire, spaced 0.3 inch from circuit board. See Fig. 10.
L2 — Rectangle of sheet copper, 1.33 inches long, 0.43 inch wide, spaced 0.24 inch from circuit board. See Fig. 11.
L3 — 9 turns no. 22 bare wire, 0.13-inch ID, 0.35 inch long.
L4 — 4 turns no. 22 bare wire, 0.13-inch ID, 0.23 inch long.

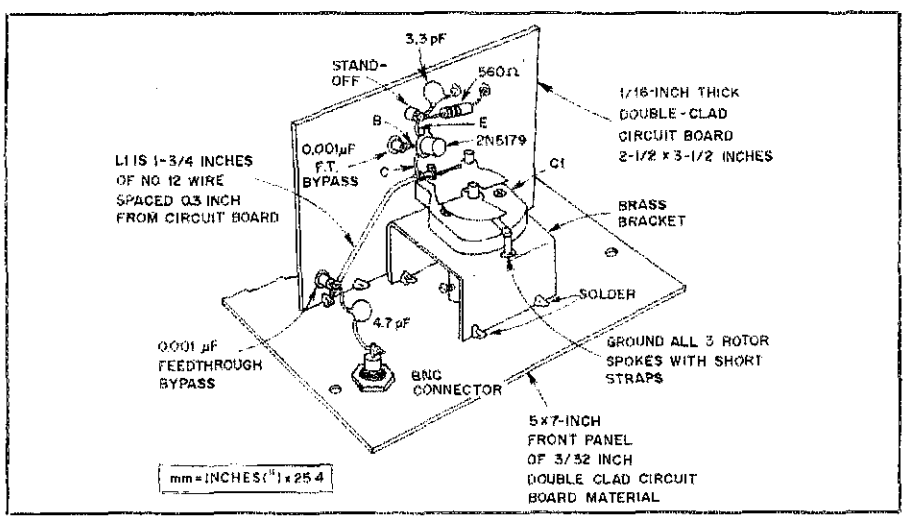


Fig. 10 — The 432-MHz oscillator is tuned by a two-plate APC-type capacitor, C1, which has a maximum capacity of 4 pF. Tuning range is roughly 390 to 450 MHz.

this frequency. The tuning range turned out to be only 6 MHz — barely enough to compensate for frequency shift caused by ambient temperature changes. The range could have been made greater if the plastic tuning vane had been made of metal sandwiched between two layers of plastic.

The signal source is built on a 5 × 7-inch panel of 3/32-inch double-clad circuit board. A standard 5 × 7 × 3-inch aluminum chassis serves as the cabinet. Complete shielding is mandatory, of course; stray radiation from the source would be detrimental in antenna work. Most of the construction details should be evident from the photographs and Figs. 10 and 11. Each oscillator is built on a separate 2-1/2 by 3-1/2 inch rectangle of 1/16-inch double-clad circuit-board material. The modulator is built on a piece of perf board of the same dimensions.

The usual caveat with respect to shortest possible uhf lead lengths apply to these oscillators, especially Q2. Ordinary TO-18 transistors seldom are used at a frequency as high as 1300 MHz, but they can be made to work if care is taken. To minimize inductance, the feedthrough bypass capacitor on the base of Q2 should be of a type that has a low profile; it should protrude no more than 1/16 inch above the circuit board.

The source is powered by an external 12-V battery, and current drain is about 6 mA. Power enters the box through a feedthrough bypass capacitor to avoid radiation from the power lead.

The Detectors

There are a number of reasons to justify choice of a detector and amplifier combination in preference to a superheterodyne receiver. In addition to being much simpler, direct detection avoids the frequency-drift problems common to self-excited oscillators and tunable "superhets." Furthermore, a superhet normally would terminate in a linear detector, which would have a mathematically predictable response over less dynamic range than the square-law detector used here.[9]

The term *square law* means that the detector output voltage is proportional to the *square* of the rf input voltage. If the output is amplified and indicated on a linear meter, the meter reading will be proportional to received *power*, rather than voltage. Any diode detector with output of less than 10 mV will have a nearly perfect square-law response over a wide dynamic range — in fact, from 10 mV all the way down to the noise level.

Another reason the square-law detector is preferable is that it improves resolution. Small changes in signal level are doubled over what they would be with a linear

[9]Notes appear on page 31.

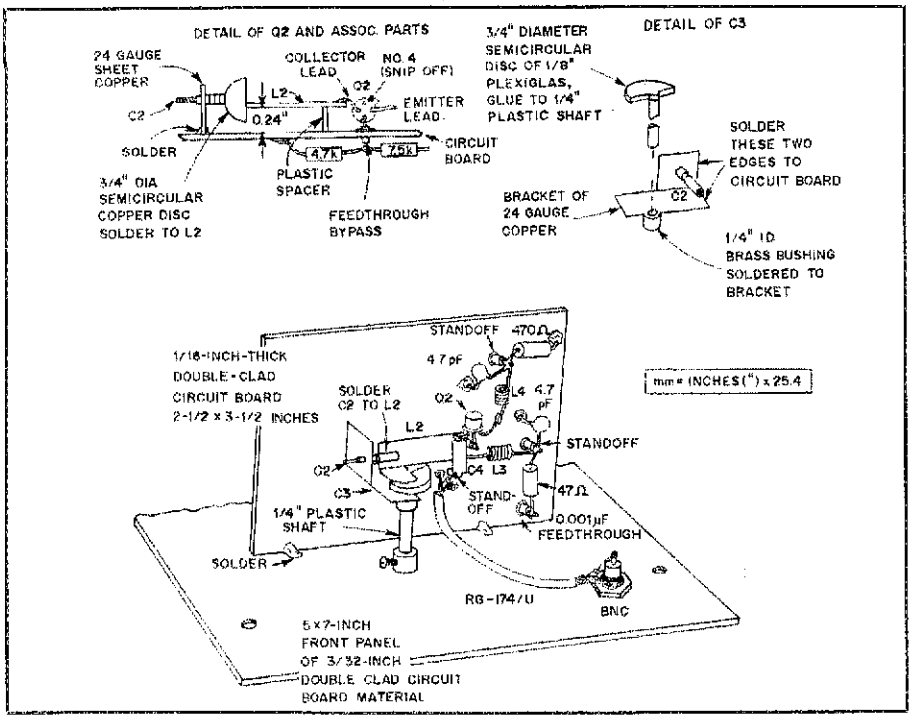


Fig. 11 — The 1296-MHz oscillator uses C3, a semi-circular plastic vane, for fine tuning. L2 is supported at one end by the piston trimmer, C2, and at the other end by a plastic spacer, which is glued in place with epoxy cement. With C3 at half capacitance, the frequency is set to 1296 MHz by means of the coarse frequency adjustment, C2. Very short base and collector leads on Q2 are mandatory if the oscillator is to reach 1296 MHz.

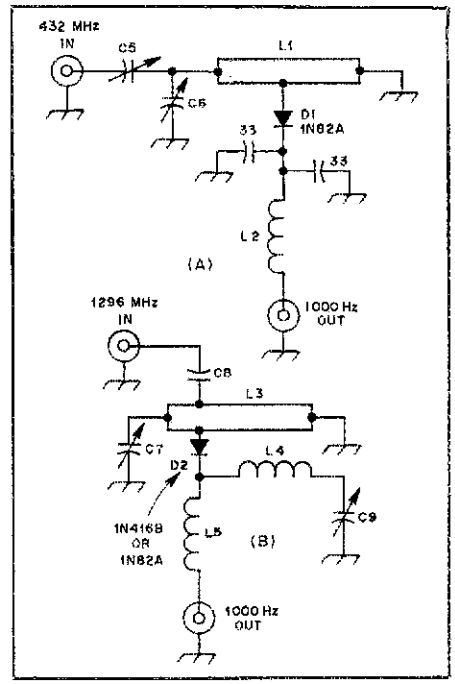


Fig. 12 — The 432-MHz detector (at A) and the 1296-MHz detector (at B) both use point-contact silicon diodes to rectify the uhf signal. Construction details are given in Fig. 13.

C5, C6, C7, C9 — 0.5-3 pF ceramic piston trimmer, Triko 201-01M suitable. (Same as C2 in Fig. 9; see that caption.)

C8 — 0.31-inch-wide strip of 22-gauge copper, 0.78 inch long, spaced 0.12 inch from L3. See Fig. 13.

L1 — 2.75 inches no. 12 solid bare wire bent to L shape, spaced 0.38 inch above circuit board, tapped 3/4 inch from C6. See Fig. 13.

L2 — 19 turns no. 22 bare wire, 0.15-inch ID, 1.5 inches long, air wound.

L3 — 0.38-inch-wide strip of 22-gauge copper, 1.5 inches long. Bend as shown in Fig. 13.

L4 — 3/4 inch of no. 22 wire connecting D2 to C9.

L5 — 12 turns no. 22 bare wire, 0.15-inch ID, 0.45 inch long.

detector: A 1-dB rf-level change results in a 2-dB change in output, and so on. In contrast with an S meter, in which a 3-dB change is barely noticeable, a square-law detector spreads 3 dB out over the entire upper half of the meter scale, from mid- to full-scale. As a result, changes as small as 0.05 dB are quite discernible.

Untuned detectors often are used for antenna work, but a tuned detector has the advantage of providing at least some rejection of RFI, and the further advantage of better sensitivity. Separate tuned detectors were made for 432 and 1296 MHz (Fig. 12), although both are housed in the same box. As with the source, complete shielding is mandatory. The detectors are built on a 4 × 8-inch rectangle of 3/32-inch-thick double-clad circuit board. This forms the cover plate for a standard 4 × 8 × 2-inch aluminum chassis. Construction details are shown in Fig. 13.

As can be seen from Fig. 12, a commonplace 1N82 diode is used as the 432-MHz detector. At 1296 MHz, the 1N416B proved slightly superior, although a 1N82 could have been used for this band with only a small sacrifice in sensitivity. Input coupling of both detectors should be adjusted for maximum output when driven from a 50-ohm weak-signal source. The coupling and tuning adjustments interact to some degree, and so will need repeaking several times. The combination of L4 and C9 on the 1296-MHz detector is a series-tuned bypass network, and should be tuned for maximum response.

The Indicator Unit

Ultimately, the gain measurement will depend on a meter reading of some sort, and it is important that the meter indication truly reflect the gain difference between the antenna under test and the reference antenna. Since the detectors are operating in their square-law region, the indicator unit must sometimes work with

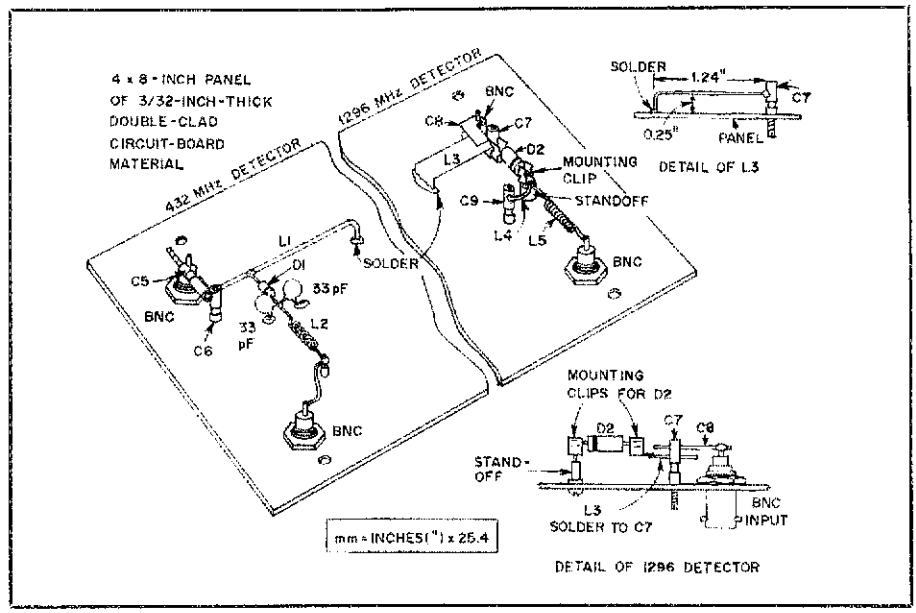


Fig. 13 — Both detectors are built on a single 4 × 8-inch panel of copper-clad circuit-board material. The 432-MHz input coupling capacitor, C5, is soldered directly to the BNC connector center pin and capacitor C6. Similarly, C8 is soldered directly to the 1296-MHz-input BNC. The panel fits on an inverted 4 × 8 × 2-inch aluminum chassis. Complete shielding is important.

inputs of only a few microvolts, and in no case more than 10 millivolts. A high order of amplification is therefore needed to boost the 1000-Hz signal to a level at which it can drive the meter. Also essential is a large dynamic range, which calls for a low noise figure and narrow bandwidth.

The circuit shown in Fig. 14 was designed to meet these requirements. Starting at the input, the 1000-Hz audio signal is amplified by FET Q6 and filtered by the two-pole filter, L6-C10 and L7-C11. A one-pole filter would have been adequate from a strictly signal-to-noise-ratio standpoint, but a two-pole filter was used for reasons that will be apparent later. Output of the filter is adjusted in level by the attenuator switch, S1, and delivered to the source follower, Q7.

You may notice that the resistance values in the attenuator will result in steps of 10 dB, whereas the front panel is calibrated in 5-dB steps. This is because the front-panel calibration refers to the rf level at the *input* of the detector. Since the detector is square-law, its output will be double the number of decibels change at its input.

After passing through the gain control, R2, the 1000-Hz signal is further amplified by Q8 and Q9. The meter is driven by a rectifier circuit consisting of op-amp U1 and diodes D3 and D4. An exceptionally linear response results from placing the rectifier in the op-amp negative-feedback loop.[10] The 2200-μF capacitor and the 47-ohm resistor across the meter are for nothing more than meter damping. These components will not be needed if a well-damped meter is used.

The output of U1 is also amplified by U2 and the two transistors, Q10 and Q11. These transistors drive a 2-inch speaker mounted on the sidewall of the cabinet. If used strictly for antenna measurements, the speaker and its driver could be omitted, but its inclusion makes it easier to identify interfering signals, such as radar; it is also sometimes helpful for making adjustments by ear when the meter is not in view. The main reasons for including the speaker, however, will be made clear later.

Since only audio frequencies are involved, construction of the indicator unit is not especially critical. Precautions must be taken to prevent feedback around the extremely high-gain amplifier, however. The preamplifier components (inside the

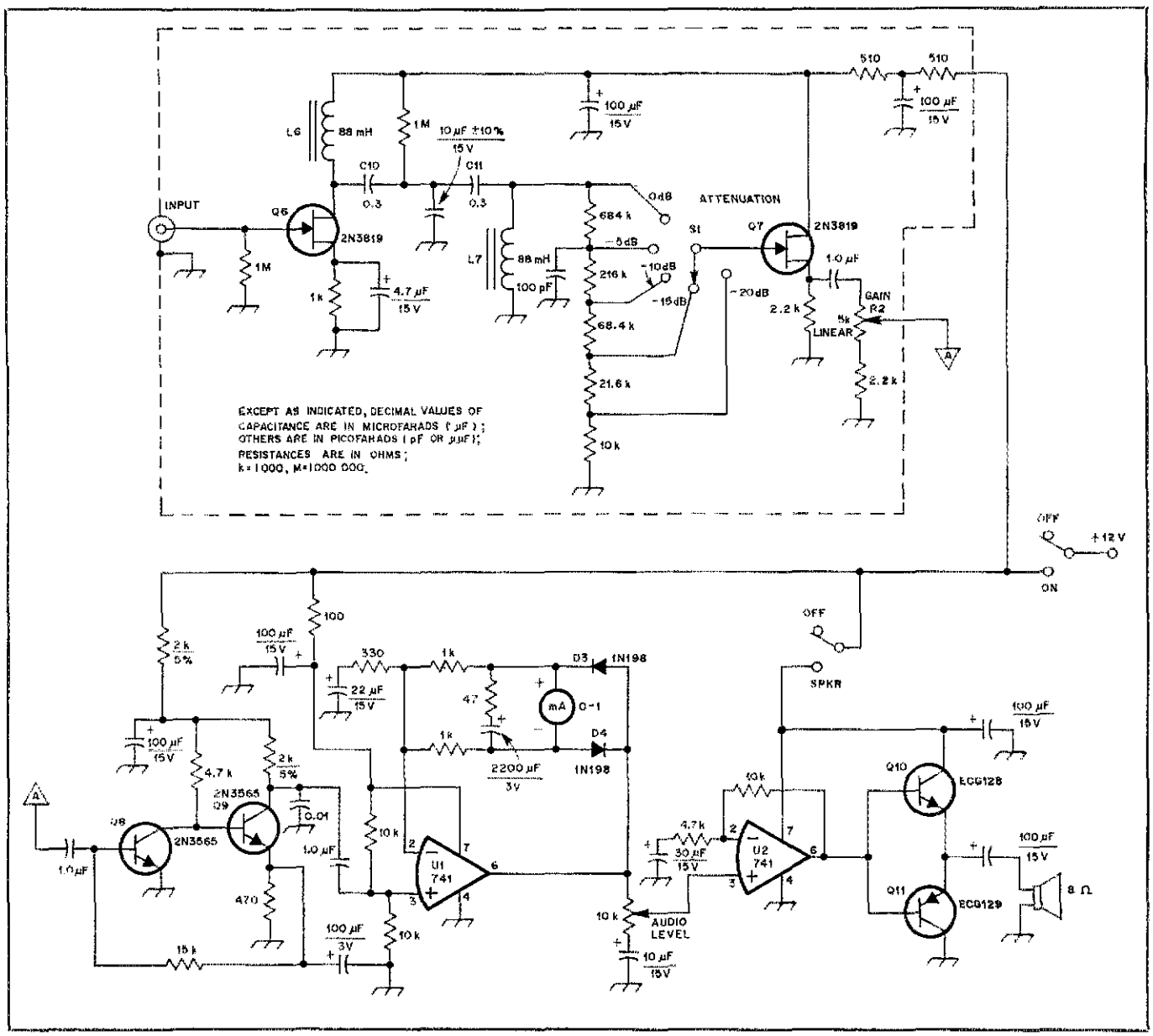
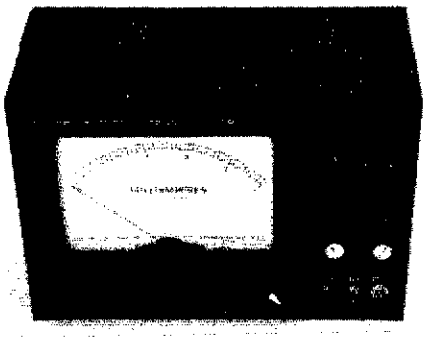


Fig. 14 — The indicator unit constitutes a narrow-bandwidth 1000-Hz microvoltmeter. The FET preamplifier, inside the dashed line, should be enclosed by a metallic shield. Capacitors with polarity indicated are electrolytic.



The indicator unit incorporates a rechargeable 12-V NiCd battery. A 2-inch speaker is mounted on the left side panel. Front-panel dimensions are 8-1/2 × 12 inches, and the cabinet is 5-1/2 inches deep. The base is made of 1/2-inch plywood; top and sides are 1/4-inch Masonite.

dashed line in Fig. 14) should be shielded from the rest of the circuitry. The 1-MΩ input resistor at the gate of Q6 should be a film type — composition resistors are too noisy. Film resistors also should be used for the switchable attenuator, and these latter resistors should all be 1% values. Since the values are not standard, it may be necessary to use series or parallel combinations of available resistors to make up the correct values.

The 1000-Hz band-pass filter is made from ordinary 88-mH toroids (advertised frequently in *QST*) and 0.3-μF resonating capacitors. These components should be adjusted for resonance at exactly 1000 Hz. Fine tuning can be accomplished by substituting slightly different values, by paralleling capacitors, or by removing a few turns from the toroids.

Although an average-size meter could have been used, the large 7-inch meter was chosen because it is easy to read from a distance. When converting into decibels, remember that the meter reading is proportional to received *power*, not voltage. Second-hand microwave instruments called *standing wave indicators* sometimes can be purchased very reasonably at flea markets; these instruments have a meter with a decibel scale calibrated for a square-law detector. If one of these meters is used for the indicator unit, the instrument will be direct-reading in decibels. Another possibility is a meter from an old ac VTVM, but it will always be necessary to divide the decibel readings by a factor of two.

In any event, for best accuracy, all measurements should be done in the upper 7/10 of the meter scale. If the meter reading is below 0.3, the attenuator switch should be turned to a higher gain position.

As mentioned earlier, the diode detectors can be expected to maintain their square-law response up to an output level of about 10 mV. Above that level, their response increasingly becomes less square law and more linear until, above 100 mV, they are almost perfectly linear. For this reason, it is advisable to make note of the gain-control setting at which full-scale deflection occurs at 10-mV input (on the lowest attenuator-switch position). Remember to stay below that signal level when making quantitative measurements. The full-deflection sensitivity of the indicator unit is 25 μV at maximum gain, so there is ample dynamic range below 10 mV.

Other Uses

CW Processor: Usually when we go to the trouble of building something, we want the end result to be as versatile as possible. This is especially true if extra functions can be included by adding only a few more parts.

As mentioned before, the speaker and its driver circuit are not absolutely necessary for antenna measurements. But their addition allows the indicator unit to be used in the shack as an audio processor for cw reception. The audio bandwidth of the unit is 59 Hz at 6 dB down, and 148 Hz at 20 dB down. When the audio output from an ordinary 3-kHz-bandwidth receiver is run through the indicator unit, improvement in cw reception is phenomenal.

It will be noticed that there is no forward bias on Q10 and Q11. This causes the audio output stage to function as a threshold gate — another feature intended for cw reception.[11] If linear operation is preferred, it can be made so by disconnecting the 10-kΩ resistor from the base of Q10 and Q11, and connecting it to their emitters instead.[12]

MCW Communications Set: Note that a key jack was included in the source unit. This permits the antenna instrumentation to be used as a short-range mcw communications set. As such, it will clearly not meet the needs of a serious uhf operator. But it is plenty good enough for something like sending code practice to the kid across the street, or for indoor transmitter hunts.[13] Keying capability is needed, in any event, to comply with FCC requirements of call sign identification every 10 minutes.

With a total of 18-dB antenna gain (receiving plus transmitting), the maximum range of this instrumentation was measured as about 1/2 mile on 1296 MHz. The range is so short mainly because of the receiver insensitivity; about 50 μV of rf is needed to produce an audible output. A superhet a-m receiver would extend the line-of-sight range to more than 50 miles.

Notes

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

[10]National Semiconductor Corp., *Linear Applications*, 1973, p. LB-8.

[11]J. J. Duda, "Noise Reduction for CW Reception," *Ham Radio*, Sept. 1973, p. 52.

[12]A. G. Evans, "The Two-Hour Audio Amp," *73*, Sept. 1980, p. 118.

[13]A. E. Hudson, "Hidden-Transmitter Hunts for Everyone," *QST*, Sept. 1948, p. 40.

Strays

TA PROFILES

We had the pleasure recently of welcoming Richard M. Jansson, WD4FAB, into our official TA family. His professional expertise in thermal design (especially in the area of solid-state rf amplifiers) will be of value to all radio amateurs. He is a Life Member of the ARRL, and holds appointments in the VHF/UHF Advisory Committee and as an Official Emergency Station.

First licensed in 1972 as WA1QLI, Dick currently holds an Advanced class license. He has received amateur awards for WAC, DXCC, 600 Club, Satellite DX Achievement, WAS, WAS-6 meter and WAS-satellite. He is a Life Member of SMIRK, SWOT and AMSAT, and holds a membership in the Academy of Model Aeronautics (AMA). He is also a member and past president of the University of Maryland Amateur Radio Club.

Dick resides in Maitland, Florida, and is the senior staff engineer for Martin Marietta Aerospace. There he is engaged in cryogenic thermal design and thermodynamics of closed-cyle cryogenic refrigerators. He is also avocationally employed as a member of the AMSAT Phase III spacecraft engineering team, providing thermal-design engineering needed for the complex craft. (An excellent report on WD4FAB's achievements for the AMSAT team appears in *AMSAT Satellite Report*, No. 28, March 8, 1982.) Dick was previously a member of the AMA Frequency Committee (advising the AMA on frequency usage for radio-controlled [R/C] modeling). The most recent AMA activities involved action with FCC on 80 new R/C frequencies in the 4-meter band, and a new 6-meter band plan for amateur modelers.

Dick is a registered professional engineer with the Commonwealth of Massachusetts. He earned his BS degree in mechanical engineering from the University of Maryland. When his busy schedule allows, Dick enjoys R/C sailplane modeling and flying, R/C model yacht racing and photography. — *Marian Anderson, WB1FSB*

TA Dick Jansson, WD4FAB, busy at work in his office.

The Effect of Supporting Structures on Simple Wire Antennas

Your tower does more than just support your antennas. You may be surprised at the results!

By John S. Belrose,* VE2CV

Wire antennas, such as dipoles, inverted Vs and Delta Loops, are the most commonly used antennas for Amateur Radio communications on the lower hf bands (160, 80, and 40 m). Theoretical vertical-plane patterns for dipoles and inverted Vs at various heights above ground have been well documented.[1,2] Mayhead[3] has measured the vertical-plane patterns of dipoles, quads and Delta Loops on an improvised antenna pattern range. While his results are not in perfect accord with my measurements performed on a commercial antenna test range, the patterns he provided gave me the stimulus to begin my study.

Amateur wire antennas are typically supported by grounded metal towers between 50 and 60 feet high.[4] The supporting towers are therefore about the right height to be resonant ($h \sim \lambda/4$) at 80 m, and could affect the antenna radiation pattern markedly. Yet this fact has been ignored by the radio amateur; he usually takes no account of the fact that dipoles and Delta Loops radiate vertically polarized fields off their ends. The amateur normally is concerned only with the field that lies broadside to the antenna. Since this field is horizontally polarized and the towers are vertical, this may be the reason the influence of metal towers has been overlooked.

This article describes experimental measurements and theoretical model calculations for various wire antennas over a perfectly conducting ground plane, with and without the influence of metal support towers. The experimental testing was done at 200 MHz, employing a ground-level antenna-pattern range that has been described in *QST*.[5] Reradiation effects from the supporting towers are at a maximum, since the towers were approximately $\lambda/4$ high at the model frequency. A summary of the results given here has been published previously.[6]

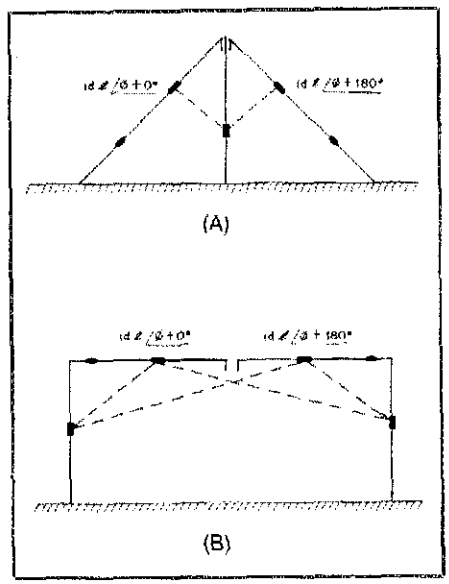


Fig. 1 — Drawings illustrating how antenna-current elements ($id\ell$) induce currents on conducting support tower(s). An inverted V (A) and a horizontal dipole (B) are shown.

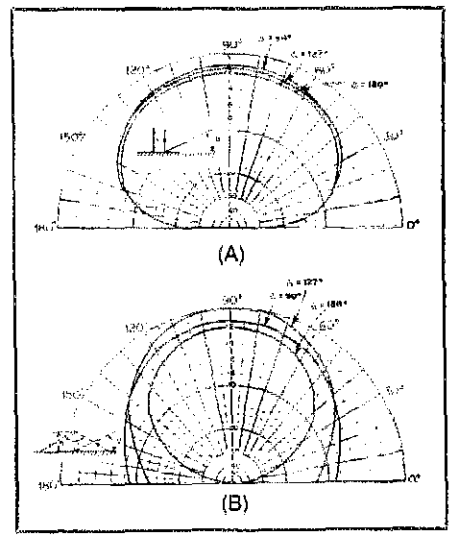


Fig. 2 — Vertical-plane, polar diagrams of an inverted-V antenna for two orthogonal planes and polarizations. A is for horizontal polarization in the plane broadside to the antenna, and B is for vertical polarization in the plane of the antenna.

The 1/2-λ Inverted V

The 1/2-λ inverted V is a resonant dipole with drooping ends. It is a very practical antenna, requiring only one support. Provided that the feed is balanced, the effect of a metal supporting tower on the radiation pattern is minimal. This can be seen in Fig. 1A. The current elements ($id\ell$) on each arm of the dipole will be in opposite phase, so currents that each induces on the tower will cancel. The vertically polarized pattern of the antenna is very sensitive to any imbalance, and a balun should be employed to provide balanced feed if a true bidirectional pattern is desired.

Vertical-plane patterns for various configurations of 1/2-λ inverted-V dipoles are shown in Fig. 2. The azimuthal patterns (not shown) are typical figure eights with maxima in the respective orthogonal directions for each polarization. When the included angle Δ between the two arms of a dipole is equal to 180°, this is the configuration of a horizontal dipole. For this pattern measurement, the antenna was supported by nonconducting towers.

The height (h) in Fig. 2, and others to

Notes appear on page 35.

*3 Tadoussac Dr., Aylmer, PQ J9J 1G1, Canada

follow, is λ/4. While no attempt was made to measure absolute gain, all patterns were taken at a constant power level employing a 50-Ω signal generator. With reference to the 1/2-λ dipole (Fig. 3), 0 dB corresponds to an overhead power gain ($\theta = 90°$) of 6 dBd. The gain differences measured for $\Delta = 127°$ and 90° are opposite to those that would be expected; this is because an inverted V with $\Delta = 90°$ is a better match to the 50-Ω feeder cable. The input impedance of a horizontal dipole is approximately 72 Ω.

For radio amateurs, the configuration $\Delta = 90°$ is optimum. This antenna provides high-angle radiation for short- to medium-distance communications, but the polarization is dependent on the azimuth; low-angle vertical polarization, for communication to distant stations, is maximum in the plane containing the antenna.

The 1/2-λ Dipole

The vertical plane radiation patterns for the 1/2-λ dipole are shown in Fig. 3. These are tracings of the observed patterns, with no smoothing. The "wiggles" on the curves are a range imperfection. Note that the conducting towers have little effect on the horizontally polarized field in the plane broadside to the dipole (Fig. 3A); the conducting towers have a significant effect on the low-angle ($\theta<20°$) vertically polarized field in the plane of the dipole (Fig. 3B). In fact, the tower effect results in a significant field directed toward the horizon. The azimuthal patterns, not shown, were again typical figure eights, orthogonally directed for each polarization.

A qualitative explanation for these differences can be inferred from the sketch in Fig. 1B. The current elements ($id\ell$), which are located the same distance each side of the feed point, are of equal but opposite phase. Each element will induce a current on each supporting tower, and the resulting currents on the towers will not cancel. Therefore, a marked effect would be expected — particularly in the plane of the antenna and in the direction of the horizon, since this is the direction of maximum field strength from a vertical radiator.

The 1-λ, Apex-Down, Apex-Feed Delta Loop

A 1-λ, apex-down, apex-feed Delta Loop radiates essentially like a horizontal 1/2-λ dipole, and the resulting patterns, with and without metal supporting towers, should be similar to those found in Fig. 3. This expectation was confirmed by measurement (Fig. 4).

The measured patterns for the apex-down, apex-feed Delta Loop are replotted in Figs. 5 and 6 on a rectilinear format, and for comparison with theoretical calculations. A geometrical representation is shown in Fig. 7A. The theoretical gains (in dBi) G_ϕ and G_θ are the horizontally

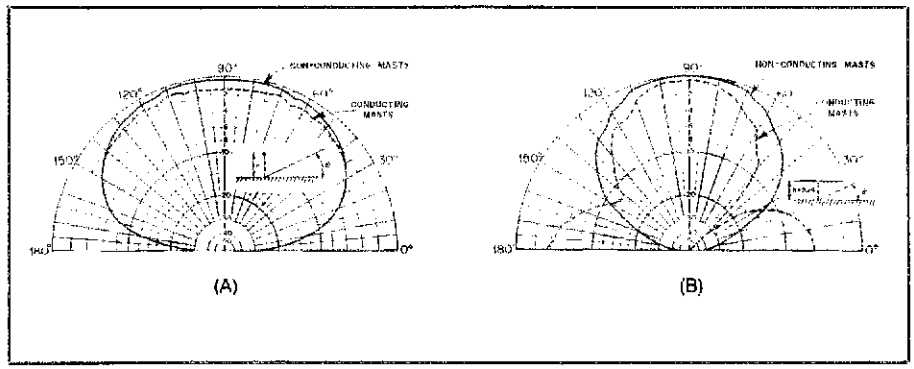


Fig. 3 — Vertical-plane polar diagram of a horizontal dipole antenna for two orthogonal planes and polarizations. A is for horizontal polarization in the plane broadside to the antenna, and B is for vertical polarization in the plane of the antenna. The continuous and broken curves are for nonconducting and conducting support towers, respectively.

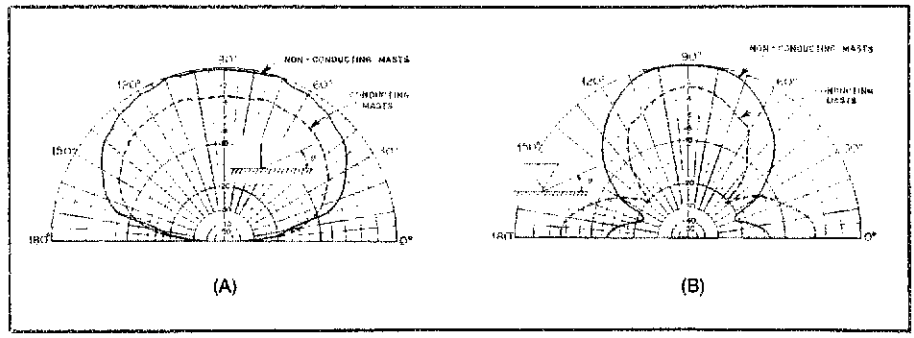


Fig. 4 — Vertical-plane polar diagrams of a 1-λ, apex-down, apex-feed Delta Loop for two orthogonal planes and polarizations. A is for horizontal polarization in the plane broadside to the antenna, and B is for vertical polarization in the plane of the antenna.

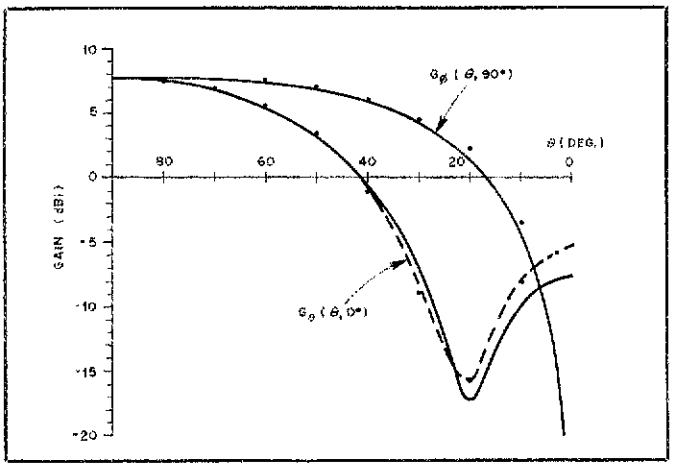


Fig. 5 — Calculated gain curves for the apex-down, Delta-Loop antenna shown in Fig. 7A, where the support towers are nonconducting. The dots and broken line represent measured values.

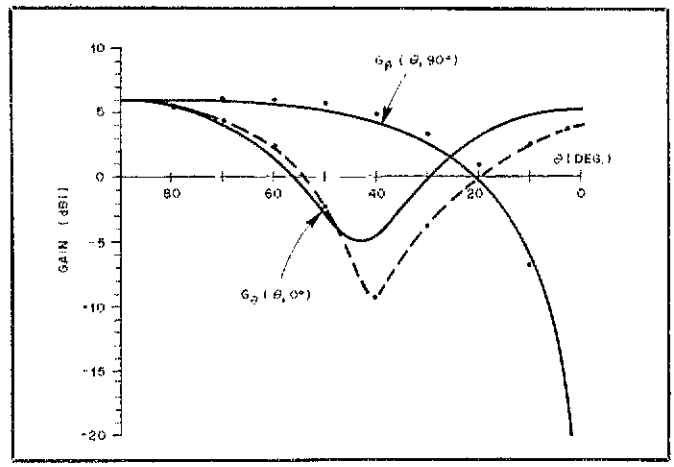


Fig. 6 — Calculated gain curves for the apex-down, Delta-Loop antenna shown in Fig. 7A, where the support towers are conducting. The dots and broken line represent measured values.

and vertically polarized power gains, respectively. The theoretical results (shown by the solid lines) were calculated by a modern numerical electromagnetic code (NEC) developed by Burke and others.[7] The broken lines have been plotted from data obtained through measurement. While an exact agreement between prediction and measurement does not exist, it is clear that the effect of the conducting tower is well predicted by the NEC. While no attempt was made to ensure that the numerically modeled 1-λ Delta Loop was exactly resonant, it is interesting to note that a marked change in input impedance was predicted when metal towers are employed. With nonconducting towers, the input impedance of a 1-λ loop (in free space) was calculated to be 157 Ω $\angle -35°$, which changed to 293 Ω $\angle -49°$ when conducting towers were modeled.

The 1-λ, Apex Down, Top-Corner-Feed Delta Loop

Figs. 8 and 9 are patterns for the 1-λ, apex-down, top-corner-feed Delta Loop. With nonconducting towers, the radiation is predominantly vertically polarized (see Fig. 8), with maximum field strength in the plane broadside to the antenna (Fig. 9). Gain in this broadside direction is about 1 dBd. With conducting towers, the bidirectional nature of the vertical polarization pattern (in the plane of the antenna) is modified (Fig. 8B). The ellipsoidal azimuth pattern is distorted into a weak cordiodal pattern (Fig. 9), with a slight field-strength maximum in the direction of the feed point.

The 1-λ, Apex Up, Lower Corner-Feed Delta Loop

This antenna is a practical one, since only a single supporting tower is needed. The arrangement is shown in Fig. 7B. Theoretically derived gain patterns are shown in Figs. 10 and 11. While a conducting tower noticeably modifies the pattern, the effect is minimal and, from a practical standpoint, can be ignored. The gain pattern in Fig. 11 (where a conducting tower is present) shows that the radiation is predominantly vertically polarized, with maximum field strength toward the

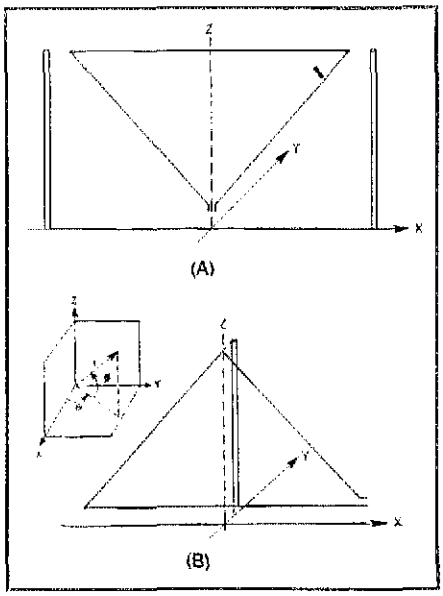


Fig. 7 — Geometry for (A) an apex-down, Delta-Loop antenna and (B) an apex-up, Delta-Loop antenna. Insert provides text coordinate reference.

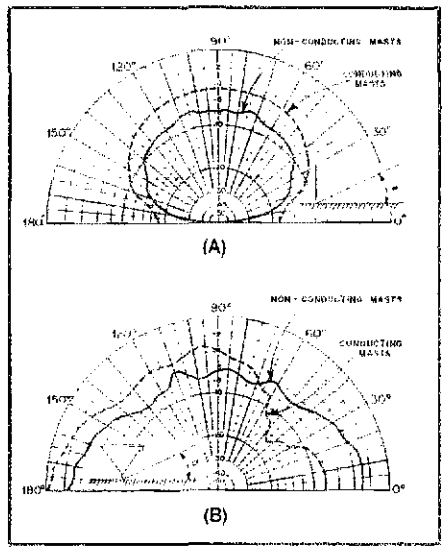


Fig. 8 — Vertical-plane, polar diagrams for a 1-λ, apex-down, top-corner-feed Delta Loop for two orthogonal planes and polarizations, measured (A) for horizontal polarization in the plane broadside to the antenna and (B) for vertical polarization in the plane of the antenna.

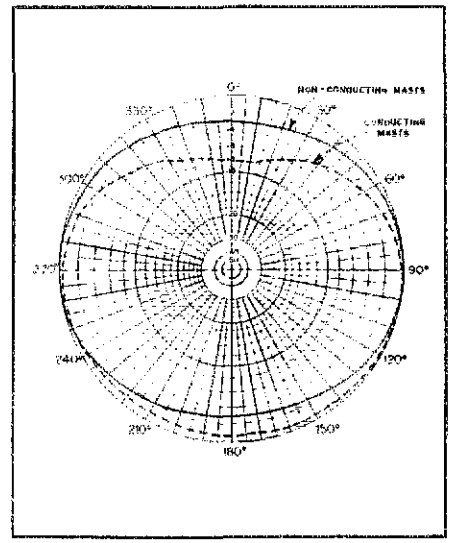


Fig. 9 — Azimuth polar diagram for vertically polarized radiation of a 1-λ, apex-down, top-corner-feed Delta Loop, measured at an elevation angle θ = 10°. The antenna was in the 0° - 180° plane, with the feed point on the 0° side.

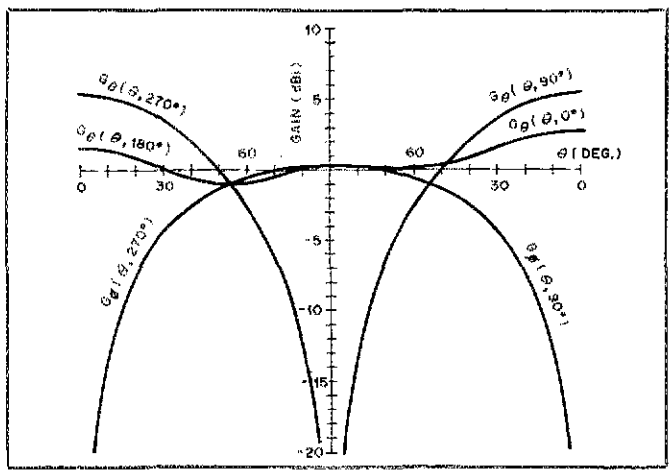


Fig. 10 — Calculated gain curves for the apex-up, Delta-Loop antenna shown in Fig. 7B, where the support tower is nonconducting.

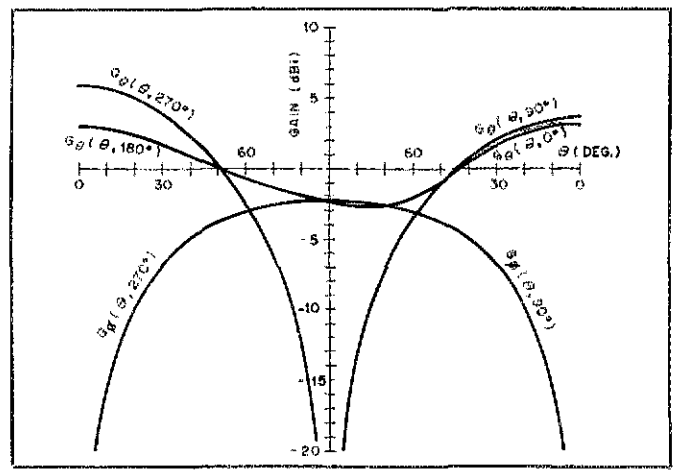


Fig. 11 — Calculated gain curves for the apex-up, Delta-Loop antenna shown in Fig. 7B, where the support tower is conducting.

horizon. Gain is greater than 3 dBi at all azimuths. It should be noted that the gain of a 1/4-λ monopole over a perfectly conducting earth is 5.16 dBi (3 dBd); therefore, the 1-λ Delta Loop has not provided increased "gain." However, it provides a means to obtain, with a single supporting tower, an efficient antenna without the need for a radial ground system. Like all 1-λ loops, it also can be used on its harmonic frequencies. Dipoles and monopoles are resonant on odd harmonic frequencies, whereas the 1-λ loop is resonant on all its harmonic frequencies.

Effect of Varying Tower Height

A grounded, conducting tower reradiates strongly when it is either 1/4- or 3/4 long, and less when it is of any other height. Fig. 12 illustrates how the relative scattering effect for grounded metal towers of various thickness varies with tower height.[8] While this parameter cannot be used to simply predict the radiation patterns for wire antennas suspended on towers of different heights, it does provide some insight into the magnitude of the effect. For example: If towers that were approximately λ/4 long at 80 m were used to support a 160-m antenna (h~λ/8), the magnitude of the reradiated fields on 160 m would be 22 dB less than on 80 m; at 40 m (h~λ/2), the effects would be 5-9 dB less (dependent on the thickness of the tower).

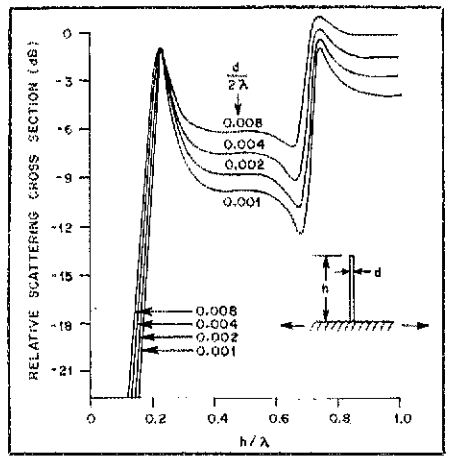


Fig. 12 — Normalized scattering cross section (along the ground plane) for a grounded, conducting tower. The scattering cross section is a quantitative measure of the reradiated signal power density, with respect to the plane wave incident on the scatterer.

Acknowledgments

The author wishes to express his thanks to L. R. Bode, who built the model antennas, and to Max Royer, of the Communications Research Center, who carried out the numerical modeling. Thanks also to J. G. Dunn, of the National Research Council, who measured the antenna patterns on their test range. QST

Notes

[1] *The ARRL Antenna Book*, 13th ed. (Newington: ARRL, 1974), pp. 55-56.
[2] D. Covington, "Radiation Patterns of Dipoles Over Perfect Ground, *QST*, April 1970, pp. 46-50.
[3] L. Mayhead, "Loop Aerials Close to Ground," *Radio Communication*, May 1974, pp. 298-301.
[4] m = feet × 0.3048.
[5] J. Belrose, "The Half Sloper — Successful Deployment is an Enigma," *QST*, May 1980, pp. 31-33.
[6] J. Belrose, "The Effects of Metal Supporting Towers on the Radiation Pattern of Simple Wire Antennas," *1981 IEEE Second International Conference on Antennas and Propagation*, Conf. Proc. No. 195, Vol. 1, April 1981, pp. 84-87.
[7] J. Burke, A. Poggion, J. Logan and J. W. Rockway, "NEC — Numerical Electromagnetic Code for Antennas and Scattering," *1979 IEEE International Symposium on Antennas and Propagation*, Seattle, WA, Vol. 1, June 1979, pp. 147-150.
[8] G. Royer, "The Effects of Re-radiation from High-rise Buildings and Towers Upon the Antenna Patterns for AM Broadcast Arrays," *1981 IEEE International Symposium on EMC*, Boulder, CO, August 1981.

New Books

☐ *The Complete Handbook of Amplifiers, Oscillators, and Multivibrators,* by Joseph J. Carr. Published by Tab Books, Inc., Blue Ridge Summit, PA 17214. Softcover, 364 pages, Tab book no. 1230. First edition 1981, 5-1/2 × 8 inches, $8.95.

From the opening pages of this book dealing with basic semiconductor theory, until the closing chapter on microwave devices, the ham and nonham alike will find a wealth of information dealing with electronic fundamentals and basic solid-state devices, along with devices such as oscillators and multivibrators.

Filling the book with practical working examples, author Carr has managed to cover quite a broad area of electronics in a comprehensive manner. In fact, he discusses some topics in this book that are not treated in very many other books. For example, entire chapters are devoted to designing FET circuits, utilizing isolation amplifiers, tackling operational amplifier problems, explaining the CDA (current difference amplifier) and OTA (operational transconductance amplifier), voltage-to-current converters, choppers, carrier and lock-in amplifiers. The chapter on microwave devices (Gunn devices, IMPATT devices and TRAPATT diodes) is especially valuable for the above 1-GHz experimenter.

Math is used where needed but is not overdone. The only problem with the book is an occasional erroneous reference in the text, mostly to figure and graph numbers, but this problem is not overtaxing. All in all, the book serves as interesting reading for any ham as well as a useful addition to the reference shelf. — *Al Gordon, WD6HAK*

☐ *Practical RF Design Manual,* by Doug DeMaw. Published by Prentice-Hall, Inc., Englewood Cliffs, NJ 07632. First edition, 1982. Hard-bound, 6 × 9 inches, 246 pp., including index, $24.95.

The title of this textbook says it all! It is a practical, down-to-earth manual for those of us in the ham fraternity who like to "roll their own." Even if you are not interested in building your own equipment, the vast amount of information presented in this book will give you a better understanding of how and why circuits behave as they do. The text is very readable, so even if your electronic knowledge is not "extra class," you should be able to gain a wealth of information. The professional electronics engineer should also find this book valuable.

Chapter 1 leads you through transmitter and receiver fundamentals, delving into frequency stability, spectral purity, SWR protection circuits, etc. The section on receiver dynamic range and how to measure it is very worthwhile. If your understanding of this much-talked-about subject is fuzzy, it may be worth the price of the book for this information alone. Sensitivity, selectivity and noise limiting are also covered.

Chapter 2 is all about frequency control. Crystal oscillators, L-C rf oscillators and heterodyne frequency generators are covered, and many practical circuits are given.

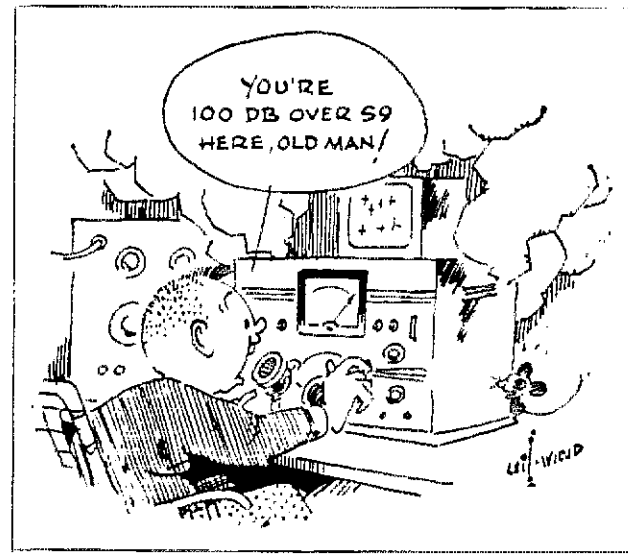
Chapters 3 and 4 deal with small and large rf amplifiers, including design criteria and many explanatory circuits. Particular emphasis is placed on amplifier stability, biasing, broadbanding techniques. In addition, there is a lot of material on VMOS power FETs.

The final chapters will fill you in on frequency multipliers, mixers, balanced modulators, detectors, i-f amplifiers, filters and agc systems.

One worthwhile and handy feature of this book is that the formulas, and results, are entered on the diagram so you do not have to go searching through the text for them. I found some errors in the diagrams that I can only assume crept in when the draftsperson copied the originals to the Prentice-Hall format. The proofreaders also missed them!

I have been building ham gear for over 30 years, and I found many new and useful ideas in the pages of this book that may be applied to almost any project. It is a worthwhile addition to any technical library. — *Norm Bradshaw, W8EEF* QST

MINIMUF: A Simplified MUF-Prediction Program for Microcomputers



On which band and at what time should you expect propagation to Pakistan or Pennsylvania? Use this computer model of muf and prepare your own up-to-the-minute predictions.

By Robert B. Rose,* K6GKU

In the mid 1970s, Navy engineers were working to utilize the explosion in microprocessor computing technology to improve the timeliness and accuracy of hf-propagation predictions. The primary emphasis was directed toward allowing hf users in the field to assess current propagation conditions. Up to that time, hf-prediction codes were long, complex programs requiring large computers. The user in the field depended on long-term predictions based on years of historical observations. This method often lacked the ability to reflect current solar activity and any changes in the operating scenario. The Navy work was directed toward developing a simplified hf-prediction system that was adaptable to almost any micro or minicomputer using the BASIC language. Further, it was desired that the user be able to enter current solar/geophysical parameters, such as solar flux. This provided more accurate predictions.

The hf sky-wave channel, shown in Fig. 1, is generally described as being bounded by the maximum usable frequency (muf) and by the lowest usable frequency (luf). The luf is an absorptive function, and is controlled by power, signal-to-noise requirements and other such system gain functions. It is a fuzzy boundary, and, as far as amateur operation is concerned, frequencies near the luf are the least efficient part of the spectrum. Most hf users know that the closer to the muf one operates, the more efficient the communications channel becomes. DXers are particularly interested in the muf characteristics of certain paths. The muf is a physical boundary that is controlled by the level of solar activity and solar illumination on the path. It is a concise constraint that the hf user cannot overcome with power, antenna or other mechanical means. Because it does vary on a day-to-day basis, and because sometimes it is vastly different than long-term predictions would show, it seemed that a simplified muf-prediction algorithm would be a very useful tool. In the mid 1970s, scientists at the Naval Ocean System Center predicted that the peak of solar cycle 21, 1978 to 1982, would be higher than initially expected, further motivating the project.[1]

Traditionally, the prediction of muf was done by a large, complex computer model, nominally consisting of 150,000 to 200,000 bytes of computer code. In 1977, a simple model was developed to show the dynamics of the muf and how its sensitivity to solar activity varies.[2] "Simple" is an understatement; the new model consisted of 80 BASIC program steps! Many military, industrial and commercial hf users have implemented and tested MINIMUF.

The initial verification was done by comparing the predictions with oblique-incidence-sounder data, which is the only way to observe the actual muf boundary. The original sounder data base encompassed 196 path months (4704 test points) of observed maximum usable frequencies measured over 23 different hf-sounder paths. MINIMUF was found to have an rms error of ±3.8 MHz. Current users find it useful from 2 to 50 MHz for muf predictions out to 6000 miles.[3] However, accuracy degrades for ranges of less than 250 miles.

As one can imagine, anything as simple as MINIMUF invites "tinkering." Over the past three years, numerous experimenters have made attempts to improve the model with such features as adding an E and F_1 region (MINIMUF is a single-layer F-region model), changing constants to reflect local conditions and giving it more diurnal variation. All of these revisions, when compared against oblique-sounder data, degraded the accuracy and made the program more complicated. These exercises only served to prove the old adage, "If it works, don't fix it." The ver-

*Head, Ionospheric Assessment Systems Branch, Naval Ocean Systems Center, San Diego, CA 92152

[1]Notes appear on page 38.

sion of MINIMUF described in this article was first published in 1978,[4] and is still the principal version in use.

Application Tips

With increasing solar activity, user interest in updating MINIMUF to reflect current conditions also increased. The updating method found to be most effective was to vary the sunspot-number input parameter as a function of the 10.7-cm solar flux. Because of the lag in F-region response to a rapid increase in solar activity, it is best to use either a 5-day, 15-day or 90-day running average of the 10.7-cm flux. The type of application will determine which is best. The 5-day mean is a short-term, more dynamic input, while the 90-day mean is more applicable for long-term planning. These flux values can be acquired from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Research Laboratories, Boulder, CO 80303 or from WWV transmissions at 18 minutes after each hour. The conversion from 10.7-cm flux to sunspot number is accomplished by the graph shown in Fig. 2.

Two other points are borne out by field testing. First, MINIMUF is an F-region approximation. Any intervention by E-region modes of propagation, either as multiple E or EF complex modes, is not predictable by MINIMUF. Such operational situations, however, are proving to represent only a small percentage of the total. Second, MINIMUF has the greatest accuracy within the one- and three-hop ranges, between about 250 and 6000 miles. Predictions for transmission paths longer than this should be used with some caution. Fig. 3 is a sample output listing that users may find helpful in getting their version of MINIMUF working.

Conclusion

MINIMUF is simple, and it works. It is expected to be particularly useful during the next solar-minimum period, in the mid 1980s, for operation in the new WARC bands.

It is emphasized that MINIMUF is not designed to replace the current large-scale numerical codes such as IONCAP, ITS-78, SKYWAVE, and the like. If you have ready access to a large computer, use the large codes. If you are limited to a Texas Instruments TI-59® calculator, Radio Shack TRS-80® microcomputer, or similar micro-based systems, MINIMUF was designed for you. It is conceivable that in the future MINIMUF will be resident in a read-only memory (ROM) in a microprocessor controlled transceiver. If the operator enters the desired end points, date, time and solar flux, he or she could quickly determine whether a frequency band was open in the desired direction. Technically, it is feasible now.

The author wishes to acknowledge the contributions of Dr. Paul Levine of Megatek Corporation, who produced the original MINIMUF concept, and Messrs. J. N. Martin and D. B. Sailors of the

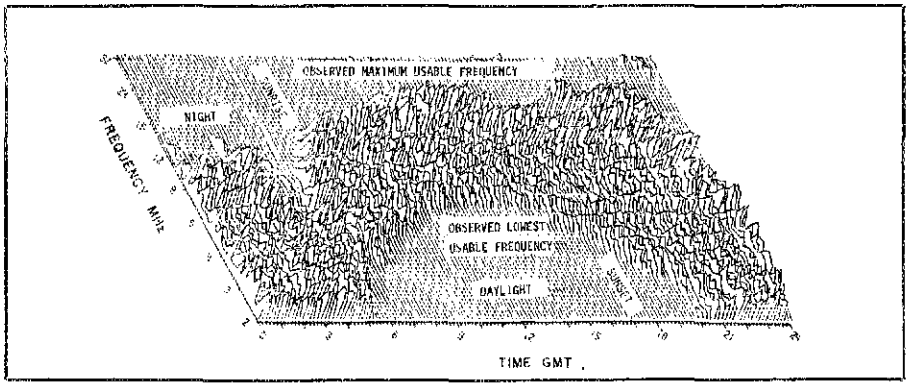


Fig. 1 — A typical 24-hour plot of the hf sky wave channel.

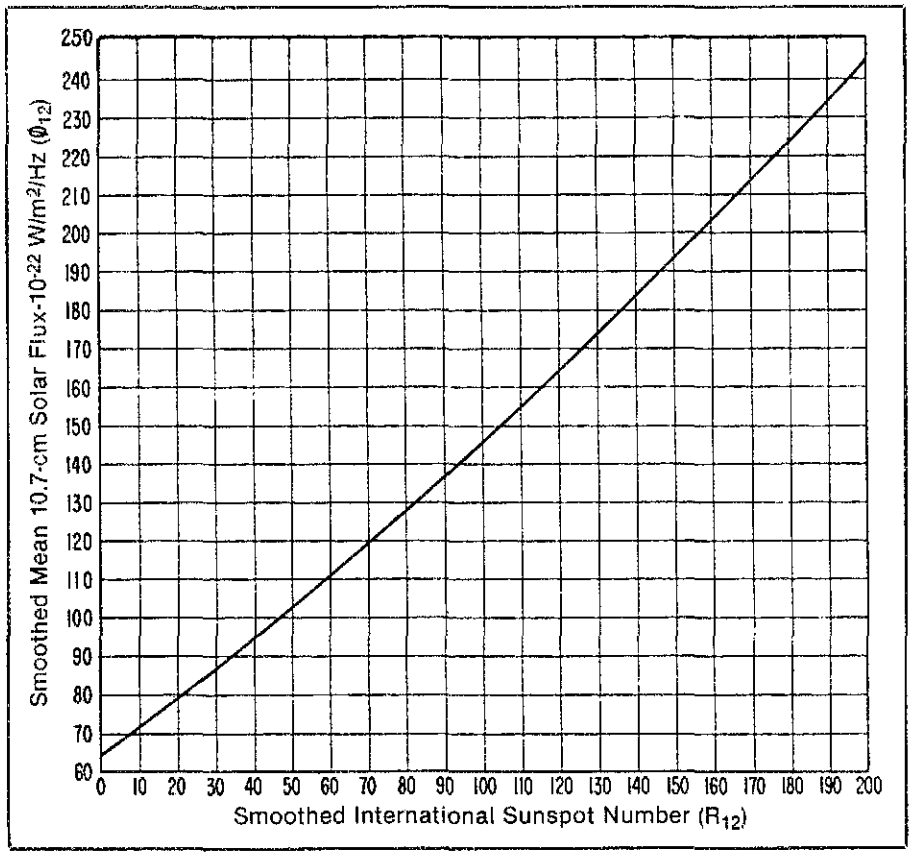


Fig. 2 — Relationship between the smoothed International Sunspot Number and the smoothed mean 10.7-cm Solar Flux.

```
DATE: 17 OCT
TRANSMITTER LOCATION:
  LATITUDE 21.00,  LONGITUDE 156.00
RECEIVER LOCATION:
  LATITUDE 38.00,  LONGITUDE 122.00
SUNSPOT NUMBER = 110

   HOUR        MUF (MHZ)
  ------      ----------
     0           36.3
     1           35.0
     2           33.0
     3           29.9
     4           25.0
     5           22.8
     6           20.9
     7           19.3
     8           18.0
     9           16.9
    10           16.0
    11           15.2
    12           14.6
    13           14.1
    14           13.7
    15           21.0
    16           27.6
    17           31.5
    18           34.0
    19           35.6
    20           36.7
    21           37.3
    22           37.5
    23           37.1

PRESS RETURN TO PERFORM NEXT CASE.
```

Fig. 3 — Example of a 24-hour muf listing from MINIMUF-3.5. Times given are in UTC.

Naval Ocean Systems Center, San Diego, California, for their work in the mathematical and software development of MINIMUF, and also for the extensive accuracy verifications they performed.

APPENDIX — MINIMUF BASIC PROGRAM

A listing of the MINIMUF-3.5 program is included. Lines 100 through 720 contain a small driver, which allows the model to be exercised. The actual MINIMUF program starts at line 1000.

The input variables for the MINIMUF program are as follows:

L1 — Transmitter latitude ($-90° \leq L1 \leq 90°$)
W1 — Transmitter west longitude ($-360° \leq W1 \leq 360°$)
L2 — Receiver latitude ($-90° \leq L2 \leq 90°$)
W2 — Receiver west longitude ($-360° \leq W2 \leq 360°$)
MØ — Month ($1 \leq M\emptyset \leq 12$)
D6 — Day ($1 \leq D6 \leq 31$)
T5 — Time (UT), hours ($\emptyset.\emptyset \leq T5 \leq 24.0$)
J9 — Output muf, MHz
S9 — Sunspot number
PI — 3.141593
PØ — 1.570796

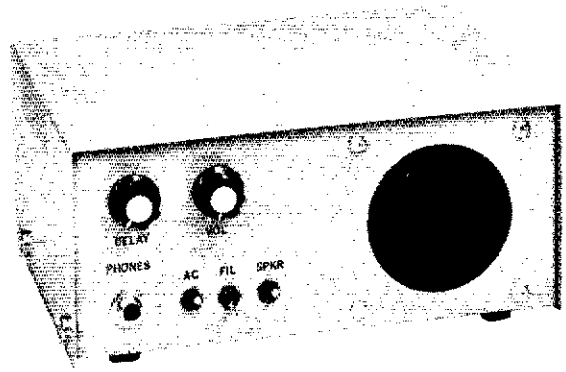
[Editor's Note: This program listing is from a Tektronix computer. You may have to change some statements for the version of BASIC used by your computer. For example, this computer has a function, PI, which returns the value for π. Some versions of BASIC do not have the ACS (arc cosine) function, and it must be derived. The statement – ATN(X/SQR (– X * X + 1)) + 1.5708 will work in place of ACS(X).]

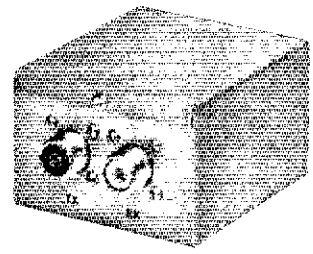
Notes

[1]P. E. Argo, J. R. Hill, R. B. Rose and M. P. Gannis, "Radio Propagation and Solar Activity," *QST*, Feb. 1977, pp. 24-27.
[2]R. B. Rose, J. N. Martin and P. H. Levine, "MINIMUF-3: A Simplified HF MUF Prediction Algorithm," Naval Ocean Systems Center Technical Report TR-186, Feb. 1, 1978.
[3]km = miles × 1.6093.
[4]R. B. Rose and J. N. Martin, "MINIMUF-3.5: An Improved Version of MINIMUF-3," Naval Ocean Systems Center Technical Document TD-201, Oct. 26, 1978.


```
1 REM - SAMPLE DRIVER FOR MINIMUF 3.5
100 INIT
110 DIM M$(37),A$(4),M(12)
120 DATA 31,28,31,30,31,30,31,31,30,31,30,31
130 READ M
140 M$="JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDEC"
150 R0=PI/180
155 P1=2*PI
160 R1=180/PI
170 P0=PI/2
180 PAGE
190 PRINT "TRANSMITTER LAT, LON = ";
200 INPUT L1,W1
210 IF L1=>-90 AND L1<=90 THEN 240
220 PRINT "INVALID LATITUDE.  MUST BE IN RANGE (-90,+90)."
230 GO TO 190
240 IF -360<=W1 AND W1<=360 THEN 270
250 PRINT "INVALID LONGITUDE.  MUST BE IN RANGE (-360,+360)."
260 GO TO 190
270 PRINT "RECEIVER LAT, LON = ";
280 INPUT L2,W2
290 IF -90<=L2 AND L2<=90 THEN 320
300 PRINT "INVALID LATITUDE.  MUST BE IN RANGE (-90,+90)."
310 GO TO 270
320 IF -360<=W2 AND W2<=360 THEN 350
330 PRINT "INVALID LONGITUDE.  MUST BE IN RANGE (-360,+360)."
340 GO TO 270
350 PRINT "DATE (DAY,MONTH) = ";
360 INPUT D6,M0
370 IF 1<=M0 AND M0<=12 THEN 400
380 PRINT "INVALID MONTH.  MUST BE IN RANGE (1,12)."
390 GO TO 350
400 IF 1<=D6 AND D6<=M(M0) THEN 430
410 PRINT USING 420;M(M0)
420 IMAGE "INVALID DAY.  MUST BE IN RANGE (1,",FD,")."
425 GO TO 350
430 PRINT "SUNSPOT NUMBER = ";
440 INPUT S9
450 IF S9>0 THEN 480
460 PRINT "INVALID SUNSPOT NUMBER.  MUST BE NON-NEGATIVE."
470 GO TO 430
480 PAGE
490 A$=SEG(M$,3*M0-2,3)
500 PRINT USING """DATE: "",FD,1X,FA",D6,A$
510 PRINT "TRANSMITTER LOCATION:  ";
520 PRINT USING 530;L1,W1
530 IMAGE"LATITUDE ",FD.2D,", LONGITUDE ",FD.2D
540 PRINT "RECEIVER LOCATION:     ";
550 PRINT USING 530;L2,W2
560 PRINT USING """SUNSPOT NUMBER = "",FD";S9
570 PRINT
580 PRINT "   HOUR      MUF(MHZ)"
590 PRINT
600 L1=L1*R0
610 W1=W1*R0
620 L2=L2*R0
630 W2=W2*R0
640 FOR T5=0 TO 23
650 GOSUB 1000
660 PRINT USING 670;T5,J9
670 IMAGE 5X,2D,7X,2D.D
680 NEXT T5
690 PRINT
700 PRINT "PRESS RETURN TO PERFORM NEXT CASE.";
710 INPUT A$
720 GO TO 180
1000 REM - MINIMUF 3.5
1010 K7=SIN(L1)*SIN(L2)+COS(L1)*COS(L2)*COS(W2-W1)
1020 IF K7=>-1 THEN 1050
1030 K7=-1
1040 GO TO 1070
1050 IF K7<=1 THEN 1070
1060 K7=1
1070 G1=ACS(K7)
1080 K6=1.59*G1
1090 IF K6>=1 THEN 1110
1100 K6=1
1110 K5=1/K6
1120 J9=100
1130 FOR K1=1/(2*K6) TO 1-1/(2*K6) STEP 0.9999-1/K6
1140 IF K5=1 THEN 1160
1150 K5=0.5
1160 P=SIN(L2)
1170 Q=COS(L2)
1180 A=(SIN(L1)-P*COS(G1))/(Q*SIN(G1))
1190 B=G1*K1
1200 C=P*COS(B)+Q*SIN(B)*A
1210 D=(COS(B)-C*P)/(Q*SQR(1-C↑2))
1220 IF D=>-1 THEN 1250
1230 D=-1
1240 GO TO 1270
1250 IF D<=1 THEN 1270
1260 D=1
1270 D=ACS(D)
1280 W0=W2+SGN(SIN(W1-W2))*D
1290 IF W0=>0 THEN 1310
1300 W0=W0+P1
1310 IF W0<P1 THEN 1330
1320 W0=W0-P1
1330 IF C=>-1 THEN 1360
1340 C=-1
1350 GO TO 1380
1360 IF C<=1 THEN 1380
1370 C=1
1380 L0=P0-ACS(C)
1390 Y1=0.0172*(10+(M0-1)*30.4+D6)
1400 Y2=0.409*COS(Y1)
1410 K8=3.82*W0+12+0.13*(SIN(Y1)+1.2*SIN(2*Y1))
1420 K8=K8-12*(1+SGN(K8-24))*SGN(ABS(K8-24))
1430 IF COS(L0+Y2)>-0.26 THEN 1520
1440 K9=0
1450 G0=0
1460 M9=2.5*G1*K5
1470 IF M9<=P0 THEN 1490
1480 M9=P0
1490 M9=SIN(M9)
1500 M9=1+2.5*M9*SQR(M9)
1510 GO TO 1770
1520 K9=(-0.26+SIN(Y2)*SIN(L0))/(COS(Y2)*COS(L0)+1.0E-3)
1530 K9=12-ATN(K9/SQR(ABS(1-K9*K9)))*7.639437
1540 T=K8-K9/2+12*(1-SGN(K8-K9/2))*SGN(ABS(K8-K9/2))
1550 T4=K8+K9/2-12*(1+SGN(K8+K9/2-24))*SGN(ABS(K8+K9/2-24))
1560 C0=ABS(COS(L0+Y2))
1570 T9=9.7*C0↑9.6
1580 IF T9>0.1 THEN 1600
1590 T9=0.1
1600 M9=2.5*G1*K5
1610 IF M9<=P0 THEN 1630
1620 M9=P0
1630 M9=SIN(M9)
1640 M9=1+2.5*M9*SQR(M9)
1650 IF T4<T THEN 1680
1660 IF (T5-T)*(T4-T5)>0 THEN 1690
1670 GO TO 1820
1680 IF (T5-T4)*(T-T5)>0 THEN 1820
1690 T6=T5+12*(1+SGN(T-T5))*SGN(ABS(T-T5))
1700 G9=PI*(T6-T)/K9
1710 G8=PI*T9/K9
1720 U=(T-T6)/T9
1730 G0=C0*(SIN(G9)+G8*(EXP(U)-COS(G9)))/(1+G8*G8)
1740 G7=C0*(G8*(EXP(-K9/T9)+1)*EXP((K9-24)/2)/(1+G8*G8)
1750 IF G0=>G7 THEN 1770
1760 G0=G7
1770 G2=(1+S9/250)*M9*SQR(6+58*SQR(G0))
1780 G2=G2*(1-0.1*EXP((K9-24)/3))
1790 G2=G2*(1+(1-SGN(L1)*SGN(L2))*0.1)
1800 G2=G2*(1-0.1*(1+SGN(ABS(SIN(L0))-COS(L0))))
1810 GO TO 1880
1820 T6=T5+12*(1+SGN(T4-T5))*SGN(ABS(T4-T5))
1830 G8=PI*T9/K9
1840 U=(T4-T6)/2
1850 U1=-K9/T9
1860 G0=C0*(G8*(EXP(U1)+1)*EXP(U)/(1+G8*G8)
1870 GO TO 1770
1880 IF G2>J9 THEN 1900
1890 J9=G2
1900 NEXT K1
1910 RETURN
```

BEGINNER'S BENCH





Build a Universal T-R Controller

Are you missing out on semi-break-in cw? Do you have to change control circuits to try out a new rig? If so, this easy-to-build T-R controller is for you.

By George Collins,* KC1V

A feature of modern ssb transceivers that many cw operators enjoy is key-activated T-R (transmit-receive) switching, or semi-break-in cw, as it is often called. With semi-break-in cw, the station equipment is switched automatically from receive to transmit when the operator closes the cw key. After the key has been open for a preset time period, the station is switched back to receive.

If you are using an older transmitter and receiver, or a homemade QRP (low power) rig, chances are semi-break-in cw is a feature you have been without. Another problem with this type of gear is that the required control circuits (transmitter keying, receiver muting, etc.) differ from one piece of equipment to another. Generally, it's not too difficult to find suitable control circuits for a given transmitter and receiver, but if you have more than one rig, or you enjoy trying out different equipment, the problem becomes more complex. To add to the difficulty, many transmitters require an external antenna relay.

How can we solve these problems? By building the Universal T-R Controller! This workshop project should eliminate most (if not all) of the problems you may encounter when interconnecting your equipment. As a "plus feature," you get semi-break-in cw, a good sidetone and an audio filter — all in the same package.

Features

Before we discuss the construction and operation of the T-R controller, let's see exactly what it will do. First, it provides semi-break-in operation. The time period from key opening until the station is switched to receive (the hold-in delay) has been made adjustable. This allows you to set the delay according to your sending speed and personal preference. Normally, the delay time is set so that the station remains in the transmit mode between words, but switches to the receive status when there is a pause in the sending.

An important function of the T-R controller is the keying delay. When the key is closed, the antenna relay is actuated immediately. Typically, it takes 15 to 25 ms for the relay to move from one position to the other. If the transmitter were keyed at the same time the relay coil was energized, the output would very likely reach full power before the relay had closed. This undesirable opening or closing of the relay with voltage applied to the contacts is called "hot switching." It can result in a "clicky," interference-producing signal and burned relay contacts. A keying delay built into the T-R controller eliminates this problem by preventing the transmitter from being keyed until the key has been closed for approximately 25 ms. This delay occurs only during the first key closure. Once the relay is closed, the delay is unnecessary and the transmitter keying follows the opening and closing of the key, exactly.

In order to provide for keying of a variety of transmitters, two transistor keying switches are used. One switch will key negative voltages (grid-block keying), while the second switch is used to key positive voltages (found in many solid-state rigs).

Transistor switches also are used for receiver muting. Three switches are provided for this purpose: one for negative muting lines, and two for positive lines. One of the positive switches is closed during transmit, while the other is open. These switching circuits enable you to use the T-R controller with just about any transmitter and receiver combination.

A requirement for good cw operating is a sidetone monitor. Unfortunately, many older commercial transmitters and some homemade rigs don't contain a sidetone circuit. For this reason, I included a sidetone oscillator in the T-R controller. The tone generated by the controller is a clean, pleasant-sounding sine wave. An audio amplifier and a speaker are provided for direct monitoring, or the sidetone signal can be fed to the audio amplifier in your receiver. If the receiver is not capable of driving a speaker, the low-level audio from the receiver can be fed to the amplifier in the T-R controller for speaker operation. An active audio filter is used as part of the sidetone generator. It can also be used during cw reception to improve the overall selectivity. It can be switched out of the receiver audio line if it is not needed or if you are copying a voice signal. A built-in power supply allows the unit to be operated from the 117-V ac line. You can also operate it from a 12-V dc supply if one is available.

The antenna relay is mounted remotely. This avoids having to run coaxial cables to the front of your operating position. It also helps in keeping rf energy out of the logic and audio circuits! The relay specified can be used at power levels up to 150 W.

Construction

To make construction of the T-R controller as simple as possible, etched circuit boards have been used.[1] One board contains the semi-break-in logic and switching

*Basic Radio Editor

[1]Notes appear on page 43.

circuits (Fig. 1). A second board is used for the sidetone oscillator, the active filter and the audio-amplifier circuits (Fig. 2). Most of the ac power-supply components (Fig. 3A) are mounted on the sidetone board. If you wish to power the circuit from only a 12-V dc supply, these components can be omitted. Alternative wiring for 12-V dc operation is shown in Fig. 3B. Parts-placement diagrams for the circuit boards are shown in Fig. 4. While etched circuit boards make for rapid assembly, they are not a necessity. You can use almost any construction method you like for this project, with good results.

As is the case with most construction projects, the T-R controller should be assembled one section at a time. Test each section before assembling the next. This makes testing and troubleshooting much

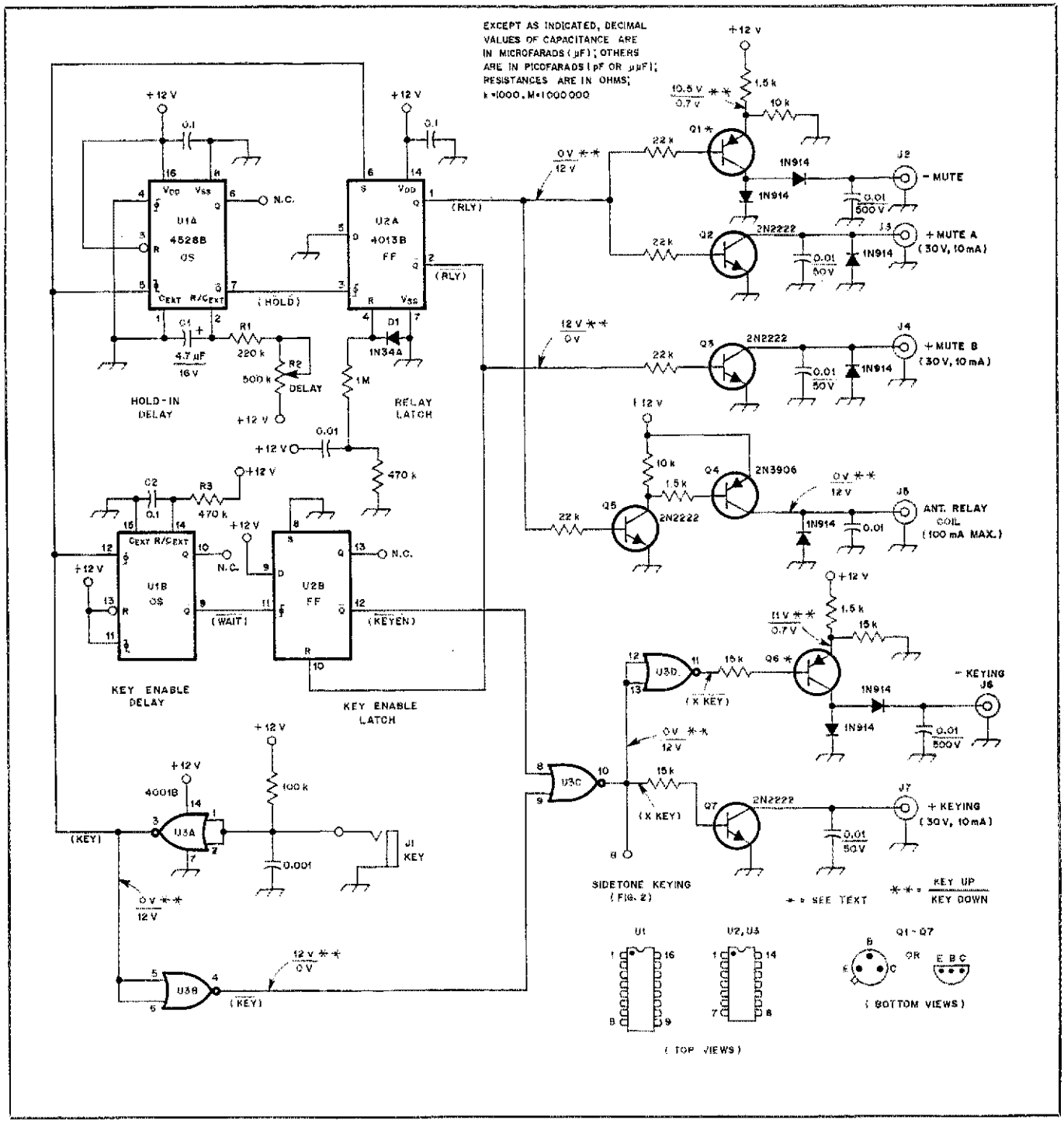


Fig. 1 — T-R controller-logic and switching-section schematic diagram. Unless otherwise specified, resistors are 1/4-W, 5% carbon types, and capacitors are 16-V disc ceramics. Polarized capacitors are electrolytic. Numbered components not listed below are for text reference only. Radio Shack part numbers are shown in parentheses.

C2 — 0.1-µF, 25-V Mylar.
D1 — 1N34A germanium diode (276-1123); type 1N270 also suitable.
J1 — 1/4-inch phone jack (274-252).
J2-7, incl. — RCA type of phone jack (274-346).
Q1, Q6 — High-voltage pnp switching transistor, ECG 288 or equiv.
Q2, Q3, Q5, Q7 — Npn switching transistors, 2N2222 (276-1617) or equiv.
Q4 — Pnp switching transistor, 2N3906 (276-1004) or equiv.
R2 — 500-kΩ, linear-taper, panel-mount control (271-210).
U1 — 4528B CMOS dual monostable (276-2496).
U2 — 4013B CMOS dual D-type flip-flop (276-2413).
U3 — 4001B CMOS quad two-input NOR gate (276-2401).

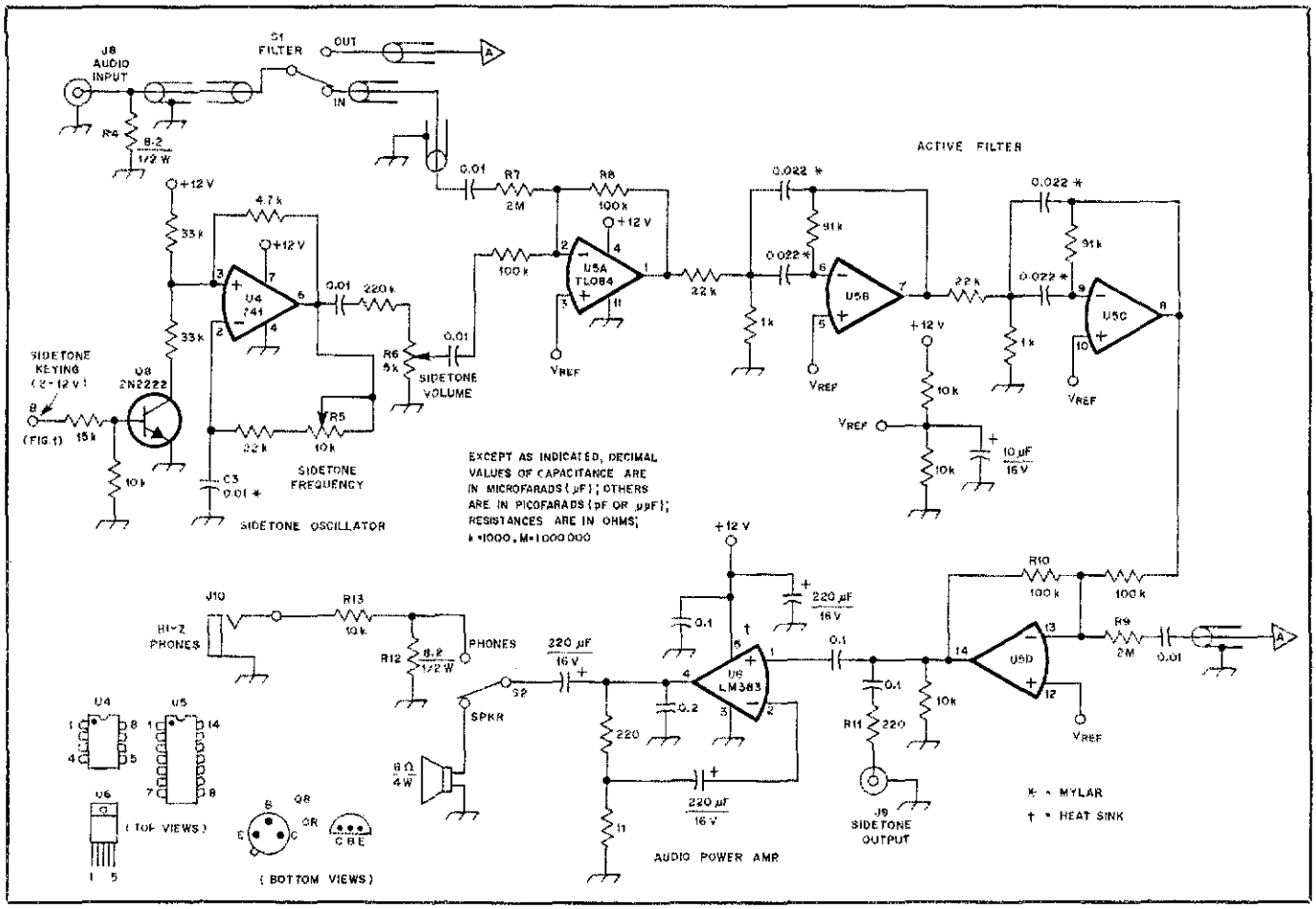


Fig. 2 — T-R controller-sidetone and audio-section schematic diagram. Unless otherwise specified, resistors are 1/4-W, 5% carbon types, and capacitors are 16-V disc ceramics. Polarized capacitors are electrolytic. Numbered components not listed below are for text reference only. Radio Shack part numbers are shown in parentheses.

C3 — 0.01-µF, 25-V Mylar.
J8, J9 — RCA type of phono jack (274-346).
J10 — 1/4-inch phone jack (274-252).
R5 — 10-kΩ, 1/4-W, pc-mount control (271-1720).
R6 — 5-kΩ, audio-taper, panel-mount control (271-1720).
S1, S2 — Miniature spdt toggle switch (275-613).
U4 — 741 op amp, 8-pin DIP (276-007).
U5 — TL084 quad op amp (276-1714).
U6 — LM383 audio amp (276-703).

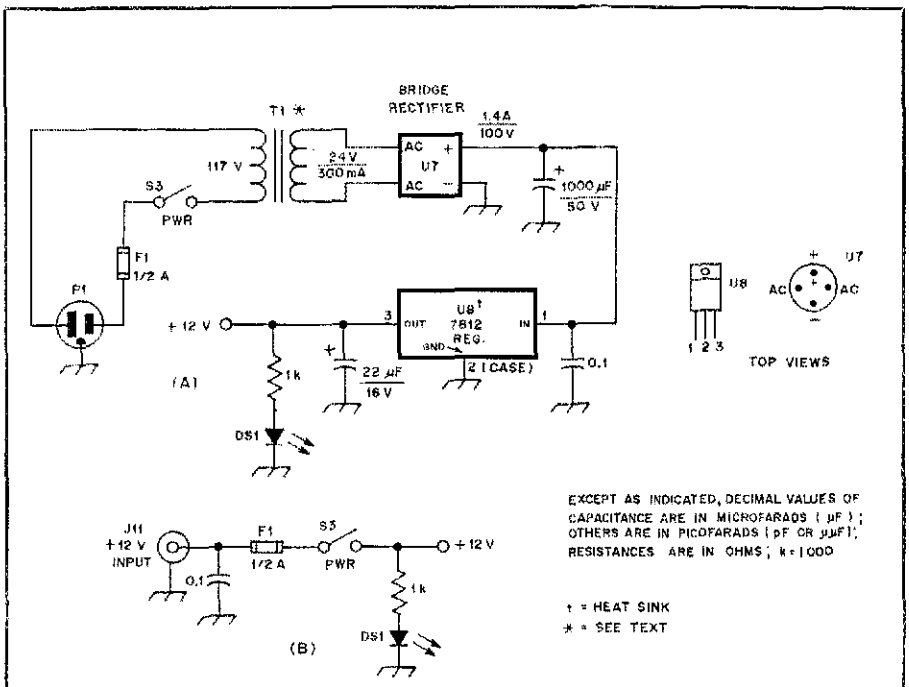


Fig. 3 — T-R controller ac power-supply schematic diagram (A). Alternative wiring for operation from an external 12-V dc supply is shown at B. Unless otherwise specified, resistors are 1/4-W, 5% carbon types, and capacitors are 50-V disc ceramics. Polarized capacitors are electrolytic. Numbered components not listed below are for text reference only. Radio Shack part numbers are shown in parentheses.

DS1 — Red LED (276-041).
P1 — Three-wire line cord with plug.
T1 — 24-V, 300-mA transformer (273-1386). See text.
U7 — 1.4-A, 100-V bridge rectifier (276-1152).
U8 — 12-V, 1-A, three-terminal voltage regulator (276-1771).
J11 — RCA type of phono jack (274-346).

easier. Start by mounting the power-supply components on the sidetone board. For safety, mount the circuit board, the power switch (S3) and the fuse (F1) in the cabinet before testing. Plug in the unit and close S3. DS1 should light, and the voltage at the output of U8 (pin 3) should be between 11 and 13 V. The input voltage to U8 (pin 1) will be approximately 35. This is higher than necessary and results from the use of a readily available 24-V transformer. If you can obtain an 18-V

transformer, it can be used in place of the specified unit. I modified a 24-V transformer by removing turns from the secondary winding until the ac voltage measured approximately 18. This is relatively easy to do, and the lower voltage reduces the amount of heat generated by the regulator IC (integrated circuit).

After testing the power supply, you can assemble the remainder of the sidetone board. Be sure to use sockets for mounting U4 and U5. U6 is soldered directly to the circuit board (as are U7 and U8). You may need to bend the leads of U6 slightly to match the circuit-board pads. Before applying power to the circuit, check the orientation of Q8 and that of each IC. Make sure the wiring is correct, and check the value of each resistor and capacitor. Place S1 in the OUT position, set R6 at midrange and switch S2 to SPKR. Now apply power and connect the sidetone keying input (point B, Fig. 2) to the 12-V supply. You should hear a tone in the speaker. If you don't, turn off the power (unplug the line cord!), then recheck the wiring and the placement of each component. With R6 set for a moderate audio level, adjust R5 for maximum volume. Adjusting R5 in this way sets the sidetone signal to the center frequency of the active filter. This is necessary if we are to obtain a pure tone and good keying characteristics.

The next step is to assemble the logic board. Sockets should be used for all the ICs on this board. These ICs are CMOS (complementary-symmetry metal-oxide semiconductor) devices and can be damaged by static discharges. CMOS ICs should always be stored with the pins inserted in conductive foam or wrapped in aluminum foil. Touch a grounded conductor before handling the ICs, and don't place them in the sockets until all the wiring has been completed and the board is ready for testing. Never insert or remove a CMOS device while power is applied to the circuit! If you follow these rules, you shouldn't have difficulty working with CMOS ICs.

To test the logic board, connect the remote antenna relay (Fig. 5) to J5, and a key to J1. When power is applied, key closure will cause the relay to switch to the transmit position. When the key is opened, the relay should remain closed for a short time (the hold-in delay period). The length of time the relay remains closed depends on the setting of R2. The maximum hold-in delay is approximately 2 seconds.

The keying delay is so short that you won't be able to observe it without using a dc oscilloscope. If a scope is available, connect it to pin 9 of U1. Attach an electronic keyer (set the speed for 20 to 30 wpm) to J1 and close the dot lever. The scope should display a square wave that switches from 12 V to ground. The signal should remain at ground for approximately 25 ms. As a final check, measure the key-up and key-down voltages shown in Fig. 1. Be sure to wait until the hold-in delay has "timed out" before measuring the key-up voltages.

The controller and the antenna relay should be housed in metal enclosures for shielding. I used commercially available boxes for both enclosures, but homemade units constructed of circuit-board material will serve as well. Don't mount the sidetone board too close to T1. Also, keep the audio leads away from the ac wiring. Shielded wire should be used for all the audio wiring, and the shields should be grounded as shown in Fig. 2. I like to use shielded wire for the external leads to the relay, the transmitter and the receiver, as well. This avoids problems

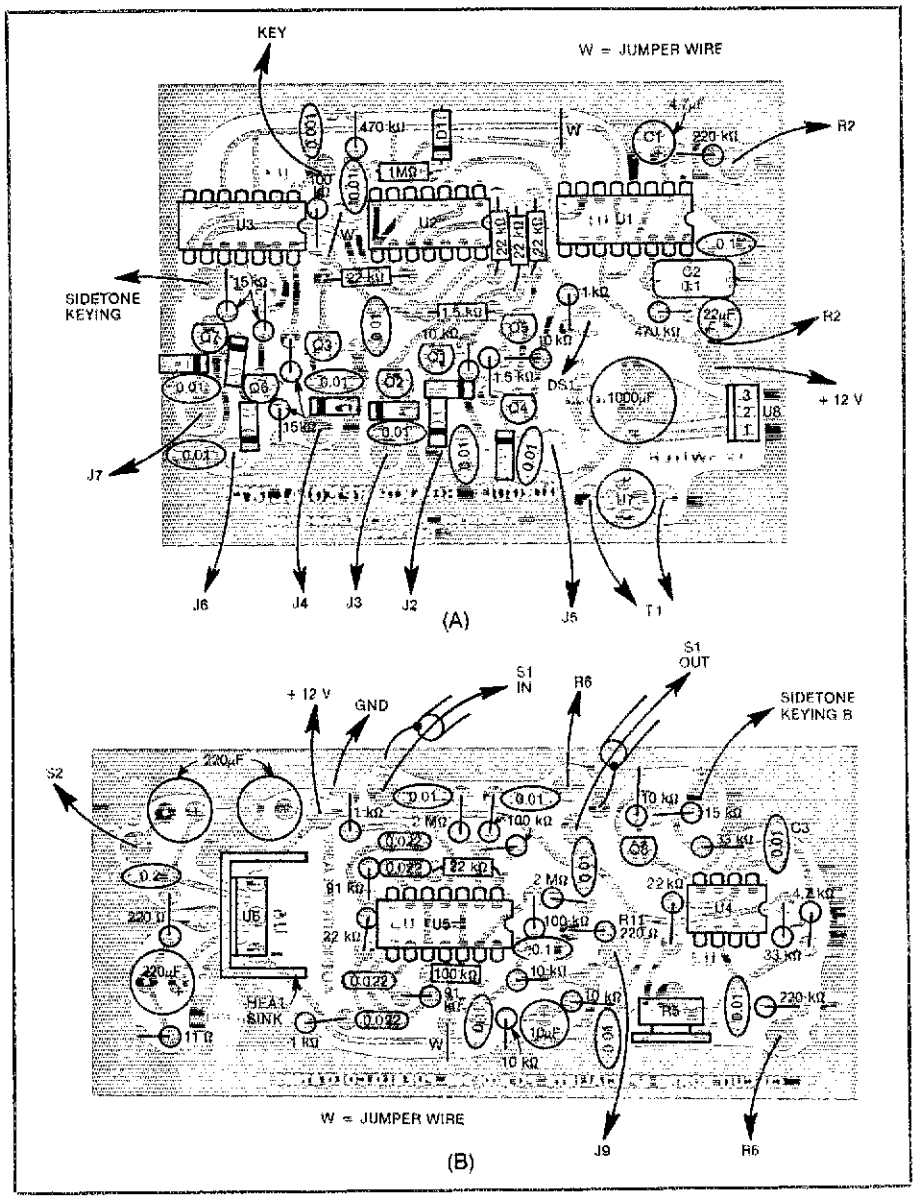


Fig. 4 — Parts-placement diagrams for the T-R controller logic and switching board (A), and the sidetone and audio board (B). The boards are shown from the component side. Gray areas represent an x-ray view of the unetched copper. Etching patterns for these boards appear in the Hints and Kinks section of this issue.

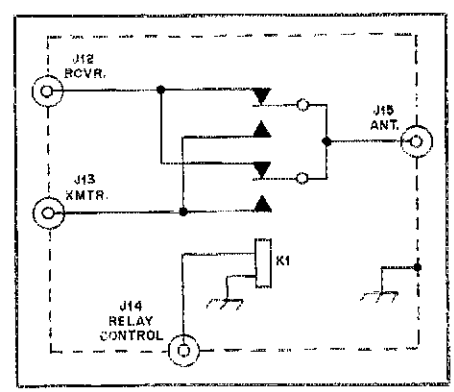
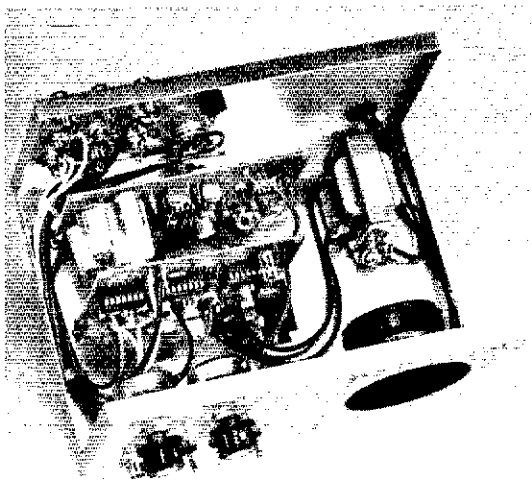
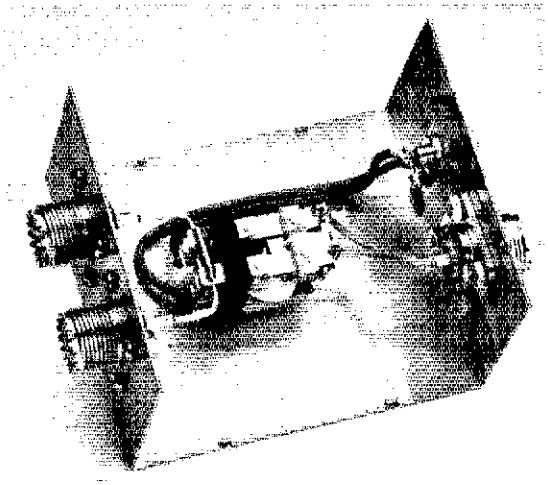


Fig. 5 — Remote antenna relay schematic diagram.

J12, J13, J15 — SO-239 coaxial-cable connector (278-201).
J14 — RCA type of phono jack (276-346).
K1 — Dpdt relay, 10-A, 125-V ac contacts, 12-V, 160-Ω coil (275-218).



This version of the controller was constructed in a metal cabinet available from Radio Shack (270-269). A larger-than-necessary cabinet was used to allow other station accessories to be added later.



The remote antenna relay is housed in a 3 × 2-1/2 × 2-inch aluminum box.[2] Leads to the moving contacts are removed from the relay terminals and connected directly to the ANT connector. The relay is held in place by silicon adhesive applied to the relay frame and the box.

that might be caused by rf being picked up on the leads.

A few of the components in the controller must be selected with care. In particular, the capacitors used in the keying-delay circuit (C2) and the active filter should be low-leakage types (such as Mylar). They should have a tolerance of 10% or better. Q1 and Q6 are high-voltage pnp switching transistors. The critical parameter of these transistors is the collector-to-emitter breakdown voltage (V_{ceo}). Almost any pnp device rated at 150 V or more can be used. The other transistors are not critical.

Using the T-R Controller

Connecting the controller to your gear doesn't require much more than plugging the receiver muting line and the transmiter keying line into the correct switching-circuit jack. After that, all that remains is to connect the sidetone and audio amplifier/filter section. This can be done in a number of ways, depending on your particular needs. To use the amplifier in the controller, you connect the receiver audio output to J8. If the receiver output has a high impedance characteristic, you'll need to change the value of R4 to 47 kΩ. You can adjust the gain of the amplifier to suit the output level of the receiver by changing the value of R7 and R9. Increasing the resistance will lower the gain.

If you do not wish to use the amplifier in the controller, J9 can be used to feed the sidetone signal to your receiver audio section. With some receiver sidetone inputs, it may be necessary to increase the value of R11 to between 10 kΩ and 47 kΩ. Use the value that provides the best signal level with your receiver. The values shown for R12 and R13 were selected for use with high-impedance (2-kΩ) headphones. If you are using low-impedance phones, R12 should be omitted and R13 changed to 10 Ω.

How It Works

There are two parts to the T-R controller logic section. One part (U1B and U2B) produces the keying delay, and the other (U1A and U2A) generates the hold-in delay. U1 is a dual monostable multivibrator, or one-shot device. This device produces an output pulse each time a trigger signal is applied to the input. The length of the pulse is determined by the R-C network connected to the timing inputs C_{ext} and R/C_{ext}.

U2 is a dual flip-flop; it acts as a memory device. When a transition from a logic ∅ (0 V) to a logic 1 (12 V) occurs at the clock input (pin 3 or 11), the logic level at the data, or D, input is transferred to the output (Q). After the clock transition has occurred, the logic level at the D input can change, but the Q output state will remain the same — the flip-flop will "remember" what level the input was at when the last clock transition occurred. This flip-flop is clocked only by a ∅-to-1 transition; the reverse transition will not affect the output state. Flip-flops of this type are referred to as being positive-edge triggered.

When the key is closed, the output of U3A (which is connected as a simple inverter) changes from a logic ∅ to a logic 1. This ∅-to-1 transition triggers one-shot U1B. As soon as U1B is triggered, the $\overline{Q}$ output goes to logic ∅. $\overline{Q}$ will remain a ∅ for the keying delay period. When U1B times out, $\overline{Q}$ changes from a ∅ to a 1. This positive transition triggers flip-flop U2B. Because the D input of U2B is at + 12 V, the triggering causes the Q output to go high (a logic 1). The $\overline{Q}$ output is always in the state opposite that of the Q output, so it goes low. The logic ∅ from $\overline{Q}$ is used to control the gating of the key signal, through U3C, to the transmitter keying switches (Q6 and Q7). This prevents the transmitter from being keyed until the keying delay one-shot function has completed the timing cycle (25 ms). The keying will remain enabled until flip-flop U2B is reset.

U2A, the relay-latch flip-flop, also is actuated when the key is closed and the Q output immediately goes to a 1. This turns on the antenna relay circuit. It remains on until U2A is reset by U1A (the hold-in delay one-shot). This one-shot is triggered by a *negative* (1-to-∅) transition; thus, it does not begin timing until the key is opened. When U1A times out, the $\overline{Q}$ output goes from a ∅ to a 1. This clocks the relay-latch flip-flop, turning off the antenna relay circuit. Resetting the relay-latch flip-flop ($\overline{Q}$ = 1) causes the keying-enable flip-flop to be reset, making it ready for the next cycle of events.

Because the one-shots are retriggerable, the timing cycle starts over at every active transition. Thus, the hold-in delay is timed from the *last* key opening. The R-C network connected to the U2A reset input causes the flip-flop to be reset when power is applied. This ensures that the logic circuit will "come up" in the correct state when turned on.

Most of the signal lines in the logic section have been named. The names were chosen to indicate the function of the line. A bar over the name indicates that the function is active when the line is at a logic ∅. For example, the line labeled $\overline{\text{KEYEN}}$ is the keying-enable line. When it is at a logic ∅, the transmitter keying is enabled. The RLY line controls the antenna relay switch. It does not have a bar over it, so the relay is turned on when RLY is a logic 1. $\overline{\text{KEYEN}}$ is referred to as an active low signal, while RLY would be called an active high signal.

Conclusion

Versatility was a major consideration in the planning of the T-R controller. The logic and switching section will control just about any receiver and transmitter combination. By simply adjusting a few resistor values, the sidetone and audio section is tailored easily to a wide variety of receivers. I think you'll find that the Universal T-R Controller will simplify your station setup and increase your operating enjoyment. QST

Notes

[1]Etched circuit boards, parts and parts kits for the Universal T-R Controller are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002.

[2]mm = in. × 25.4.

Product Review

Conducted By Paul K. Pagel,* N1FB

ICOM IC-730 HF Transceiver

☐ My excitement ran high as I took the IC-730 home just in time for the November Sweepstakes phone weekend. I found the instruction manual easy to read, and logically organized. Noticeably missing was much of the literally translated Japanese that seems to plague some imported equipment manuals. A few minutes of reading the manual and checking the controls was all I needed to feel ready for a contact. Front-panel controls are clearly labeled and positioned for ease of operation.

The '730 comes with most of the features now considered standard on an hf transceiver. It covers the ham bands from 80 through 10 meters, including the three WARC bands. Modes of operation are a-m, lsb, usb and cw, with PTT, VOX or semi-break-in operation possible. Controls are provided for mike gain, rf power, af and rf gain, and band selection. An age circuit with two selectable time constants is provided, but there is no way to turn it off completely. The noise blanker can be turned on or off using a push-button switch on the front panel. (Blanking pulse width is selected as wide or narrow with a control hidden under a removable panel on the case top.) Other features include an rf speech processor, receiver incremental tuning and a digital readout for the two VFOs. There is a built-in receiver preamplifier that is helpful for pulling in weak stations. A band-pass shift control (i-f shift) helps reduce interference from strong stations on nearby frequencies. This control also changes the tone of a received signal, which results in a decrease in the intelligibility of an ssb station.

The review unit was equipped with an optional crystal calibrator and the IC-EX203 150-Hz cw audio filter. An IC-PS15 ac-operated power supply provided the necessary 13.8-V dc at 20 A. This supply is controlled by the power switch on the '730. Other matching accessories available from ICOM include an external speaker, headphones, a mounting bracket for mobile operation, a desk microphone and a hand-held scanning microphone. Additional filters are the FL-45 (500-Hz) cw crystal filter and the FL-44 ssb crystal filter. The FL-30 crystal filter will also convert the i-f shift control to a true pass-band tuning system.

Special Features

Several features of the '730 deserve special attention. A four-bit microcomputer is used to control the phase-locked-loop local oscillator. This allows selection of three tuning rates, determined by push-button switches. You can change the VFO frequency in steps of 1 kHz, 100 Hz or 10 Hz. The faster rate is ideal for tuning from one end of the band to another, and the slower rate is convenient for "fine tuning" a station. The 100-Hz rate is about right for normal tuning, but you will hear the distinct incremental frequency changes as you tune through a signal. Don't be confused, as was one mystified '730 owner that I talked to. The tuning rate refers to the digital tuning jumps, not kilohertz per turn of the knob. A LOCK button prevents changing the operating frequency — a good idea for those of us who are prone to bumping the tuning knob!

Push buttons are used to select VFO A or B, and NORMAL/SPLIT operation. Either VFO can be used independently for transceive, or they can be used in tandem for split-frequency (same band) operation. The frequency of either VFO can be written instantly into the other by using the WRITE button, but be careful. To write the frequency of VFO B into VFO A, you first select VFO A, then push the WRITE button. More than once I tried to do it the other way and found myself with two VFOs at the opposite end of the band! The frequency of VFO A can be written into memory (one frequency per band) and, if the MEMO button is engaged later, it is like having three VFOs. On "power up," both VFOs and the memory will be 100 kHz up from the bottom of the selected band. A rear-panel jack is provided for the connection of +9- to +12-V dc source, such as the optional BC-10A ac-operated supply or the car battery in a mobile installation. This will retain the operating frequency of both VFOs and the memory on each band while the rig is switched off.

The RIT function is activated with a push button; an LED near the control indicates when it is in operation. I expected the digital frequency display to change as I turned the RIT control knob, but found that, as with my analog-readout rig, the displayed frequency remains the same.

A multifunction front-panel meter serves as an S meter on receive, but can indicate a variety of information on transmit. This will depend on the setting of the front-panel meter control and the SWR/SET switch under the top-cover access panel. The front-panel button can be set to indicate ALC or RF output. With this control set for RF output, the top switch can be used to indicate relative output power or SWR.

Also found under the top cover access panel are the VOX GAIN, VOX DELAY, and ANTI-VOX controls. The cw monitor level can be adjusted here, the noise blanker pulse width selected, and the speech processor switched on or off. The crystal calibrator is turned on and the 25- or 100-kHz marker frequency is selected by means of small slide switches. Operating any of these controls will require you to study the underside of the access panel for identification of the tiny controls. You will have to peek through the opening to see which switch you are pushing.

Rear-panel jacks are provided for connection of an antenna, a power cable, a key, an external speaker, a memory back-up supply and an accessory plug. The alc voltage from an external amplifier can be input through a jack provided for that purpose. There is a spring-type ground connector that aids fast connect and disconnect of the ground wire.

Receiver

An incoming signal is routed through a low-pass filter selected by the BAND switch. A preamplifier can be activated to provide about 10 dB of gain, if needed. Next, the signal proceeds to the band-pass filter as selected by the BAND switch. A high-level doubly balanced mixer combines the received signal with the first LO signal to provide the 39.7315-MHz first i-f. A signal from the second LO is combined with the first i-f signal in another high-level doubly balanced mixer to produce a second i-f at 9.0115 MHz. The MODE switch selects an a-m crystal filter only, or the additional ssb or cw crystal filters. With the FL-45 (500-Hz) cw filter installed, the CW-N position selects this filter, while the CW position selects the ssb filter. The signal now is converted to 455 kHz and is fed to either a ceramic filter in the a-m mode or a mechanical filter in the ssb or cw modes. The optional FL-44 ssb crystal

*Assistant Technical Editor

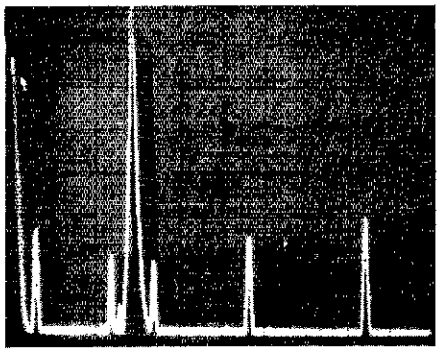


Fig. 1 — Worst-case spectral display of the IC-730. Vertical divisions are each 10 dB and horizontal divisons are each 5 MHz. Output power is approximately 90 W on 20 meters. All spurious emissions are at least 50 dB below peak fundamental output. The IC-730 complies with current FCC specifications for spectral purity.

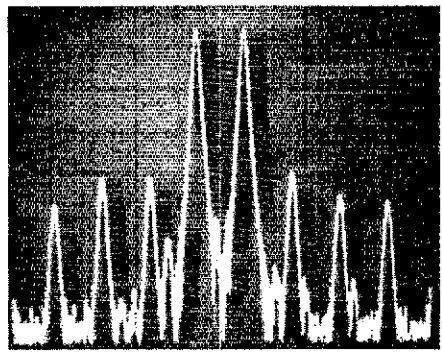


Fig. 2 — Spectral display of the IC-730 during the transmitter two-tone IMD test. Third- and fifth-order products are down 40 dB, and the seventh-order products are down 46 dB. Vertical divisions are each 10 dB, and horizontal divisions are each 10 kHz. The rig was being operated at 80-W PEP output on 20 meters.

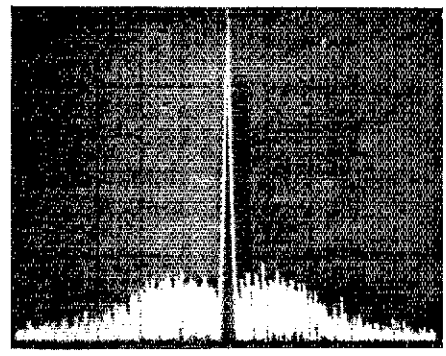


Fig. 3 — Synthesizer noise is shown in this photo. The IC-730 was producing 80 W of output power on 20 meters. Vertical divisions are each 10 dB, and horizontal divisions are each 10 kHz.

ICOM IC-730 HF Transceiver, Serial No. 01519

Manufacturer's Claim Specifications	*Measured In ARRL Lab*
Frequency coverage: 80 through 10 meters; WARC bands included.	As specified, plus 100 kHz above and below each band edge.
Modes of operation: lsb, usb, cw, a-m.	As specified.
Frequency readout: 6-digit blue luminescent display.	3/8-in.-high digits. Also analog marks on tuning knob, every 2 Hz in 10-Hz tuning position.
kHz/turn of knob: Not specified.	100 kHz/10 kHz/1 kHz for 1 kHz/100 Hz/10 Hz tuning.
Backlash: Not specified.	Nil.
RIT range: ±800 Hz.	As specified.
S-meter sensitivity (μV/S 9): Not specified.	80 m, 150; 40 m, 150; 30 m, 140; 20 m, 160; 17 m, 160; 15 m, 180; 12 m, 190; 10 m, 180.
Receiver sensitivity: ssb/cw 0.3 μV for 10 dB S + N/N	Receiver dynamics measured with optional IC-EX203 150-Hz audio filter installed. The first number is with the internal preamp on.

	80 m	*20 m*
Noise floor (MDS) dBm:	−140	−140
	−134	−133
Blocking DR (dB):	N.L.†	
Two-tone 3rd order IMD DR (dB):	N.L.	96
	95	95
Third-order intercept:	N.L.	+4.0
	+6.5	+9.5

Audio power output (8-ohm load): 2 W.	As specified.
Power requirements: 13.8-V dc ±15%, negative ground. Current drain 20 A max. (at 200-W input).	Not measured.
Transmitter rf output power: ssb, 200-W PEP input; cw, 200-W input; a-m, 40-W output maximum.	80- to 100-W output on all bands in cw mode.
Harmonic suppression: Better than 50 dB.	Second harmonic, −54 dB; third harmonic, −50 dB (Fig. 1).
Spurious suppression: Better than 50 dB.	−60 dB (Fig. 1).
Third-order IMD: Not specified.	−40 dB (Fig. 2).
Color: Black.	As specified.
Size (HWD): 3.7 × 9.5 × 10.8 in.††	As specified.
Weight: 14.1 lb.	

†N.L. means noise limited
††mm = in. × 25.4; m = ft X 0.3048; kg = lb × 0.454.

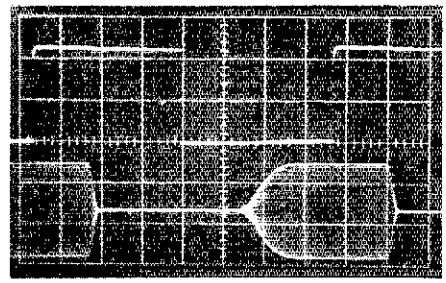


Fig. 4 — The keyed cw waveform of the IC-730 is shown. The upper trace shows actual key closure, while the lower trace shows the rf output envelope. Horizontal divisions are each 10 ms.

filter can be used to replace this mechanical filter if you desire greater ultimate rejection at the −60 dB points and a better i-f shape factor. A 9.4665-MHz LO can be shifted ±1.5 kHz by sliding the IF SHIFT control. This oscillator provides the fourth conversion in the receiver circuit, back to the second i-f of 9.0115 MHz before sending the signal on to the detector and af amplifier.

The review unit also had the 150-Hz audio filter installed. This filter is activated in either CW position, providing a very narrow passband. If you like tuning the band with a wider filter, you will have to switch to the USB mode. But this causes the operating frequency to shift 1.5 kHz. When you find a station you want to copy, and switch to the CW mode, you will have to retune the rig. I found this somewhat annoying.

The receiver proved to be quite sensitive, and displayed good dynamic range. The front end was not "crunched" by most strong, locally generated signals.

Transmitter

The '730 has a solid-state, broad-band transmitter that provides between 80 and 100 W of maximum output power into a 50-ohm load. There is no tune-up required, and the final-amplifier transistors are SWR-protected. I found that the output started to be cut back as the SWR approached 2:1. Most of the time I used a random-length wire antenna (a no. 30 wire out the window and attached to the rain gutter) and a Transmatch in a "no outside antennas" apartment. The Transmatch provided a 50-ohm load on all bands to keep the final transistors "happy."

The MIC GAIN control adjusts the level of modulation, and should be adjusted until the alc meter is moving within the bottom half of the scale. An RF POWER control adjusts the output from about 10 to 100 W. With the speech processor switched on, the MIC GAIN sets the clipping limits while the RF POWER control sets the rf drive level.

There is only one VOX DELAY circuit, so if you like to use VOX on phone and work semi-break-in cw, you will have to readjust the delay each time you change modes. This is not difficult, but can be a nuisance.

The final-amplifier transistors are cooled by

a fan that runs only during transmit. A temperature-sensing circuit will switch the fan to a faster speed and keep it on continuously if the transistors reach a temperature of 167° F (75° C). The operating manual warns you to stop transmitting and investigate the cause of the overheating. The fan is fairly quiet, but I found it annoying to have it turning on and off with each cw character being sent.

The cw keying waveform exhibits an excessive delay after key up. The changes suggested in the article by Don McClure, KB2Z, "Keying Improvements to the ICOM IC-730," July 1982 *QST*, pp. 23-27, would make it a better cw rig.

Operating Impressions

I first operated the '730 during the November SS Contest. It didn't take long to really appreciate the ease of operating this rig. With low power and "no antenna," I use the "hunt and pounce" method of contesting. The two VFOs plus memory made it easy to keep tuning and working stations, while jumping back to a pileup and seeking a chance to work a particular station.

The receiver has several "birdies" on each band. Most are just noticeable with no antenna connected, and do not move the S meter. There are three birdies that cause the S-meter needle to move just perceptibly, but these are outside the band edges. One signal at 17.9460 MHz reads S4.

Initially, the review unit seemed to have low audio output, with severe distortion at high volume levels. This was noticeable with the built-in speaker or an external speaker, but not with headphones. In this condition, the rig was totally unacceptable for mobile operation. The high ambient noise level in my car requires lots of audio from the radio, and the '730 just couldn't supply it without distorting the signals to an unintelligible level. Later on, the audio amplifier failed completely and the rig was shipped back to the factory for repair. It was returned promptly, and the audio problems were cured. The rig is now a pleasure to operate while mobile.

Doug DeMaw, W1FB, tested the '730 in anticipation of taking it on a hamcation trip to Barbados. When Doug reported to several station that their frequency was jumping during the QSO, they replied that *his* frequency was *also* changing. What could this problem be? The rig went back to ICOM instead of to Barbados. This repair took about three weeks, with a report that an intermittent had developed in the VFO power supply.

What don't I like about the '730? I would prefer to have separate VOX DELAY controls for ssb and cw operation, and I would like these and other controls to be located on the front panel instead of under the top cover. I would also like to be able to select the 150-Hz audio filter when needed for cw reception. I wonder why no 160-meter position was included. These concerns may be minor when compared with the many good features of the rig.

In conclusion, the IC-730 is a pleasure to operate. It has almost every feature you could ask for, either built-in or available as an accessory. Small size makes it ideal for a mobile installation or traveling, but it will serve nicely in the fixed-station operating position also.

Price class: IC-730, $829 (including mike); IC-PS15, $149; FL-45, $60; IC-EX203, $39. Available from: ICOM America, Inc., 2112 116th Ave., N.E., Bellevue, WA 98004 — *Larry Wolfgang, WA3VIL*

HEATH COMPANY GU-1820 AC POWER SYSTEM

Solar-electric power has yet to negate the utility of gasoline-powered ac generators. The latter can provide plenty of watts for operating electrical items, even when the sun is not shining! They are noisy, and they consume gasoline, but they're ideal for emergency and Field Day use by amateurs. The Heath GU-1820 is no exception.

I was surprised to learn that the Heath power system was supplied in kit form. I didn't fancy myself as a mechanic or engine specialist, nor do I at present. Therefore, I was relieved to find that the engine was preassembled and adjusted. A 5-hp Briggs and Stratton engine (3600 rpm) tended to "ice the cake," since that brand has such an outstanding reputation. It was all shiny and black, just waiting to be activated by a mighty pull of the starting rope!

The manufacturer rates the alternator at 2200 W maximum. It is a single-phase, 2-pole, revolving-field, self-excited mechanism. The power factor is 1.0, and regulation is ± 5%, no load to full load. The output is 120-V ac at 60 Hz. Running time is 1.75 hours per tank of fuel at one-half load (1100 W).

Assembly

An assembler commences by putting the frame together. You need some tools a bit more rugged than those designed for most radio work, so plan to have a 6- or 8-inch crescent wrench, a pair of pliers, a heavy-duty screwdriver and a socket-wrench set (if available). Watch out for skinned knuckles, for there are some sharp edges on the metal parts of the system.

The engine attaches next, then comes installation of the adaptor housing, followed by insertion of the alternator rotor. So far so good — and no confusing instructions of the kind found with kits for those swing sets, etc., that you've built for your children! If you've ever agonized over the poor language and vagaries of instruction sheets for toys and household items, you'll be delighted with the clarity of the Heath instruction manual.

Assembly of the end-bell parts (mostly electrical) is the next step. But first, the end bearing must be driven into the housing by means of a hammer and wooden rod (supplied). Do this step with care, lest the bearing not start correctly in the hole. Tap and inspect, tap and inspect, until you're sure the bearing is well into the hole and that it has gone into the housing correctly. If it becomes cocked during this step, damage (and frustration) will surely result.

Installation of the electrical wiring and parts comes next. The end bell contains nearly all of the wiring, an electrolytic capacitor, the brushes, a rectifier, a circuit breaker and ac outlet plugs. Once these components are in place you can install the stator for the alternator. Then, some final wiring is done. It consists of connecting the leads from the stator to the appropriate terminals in the end bell. It is necessary also at this juncture to polarize the alternator. The task is a simple one, consisting of attaching a 6- to 15-V dc source to the brushes while observing the proper polarity. This job takes about 15 seconds.

Finally, the end bell is bolted in place and some adhesive-backed labels are affixed to specific parts of the system. My, what a pretty sight the completed power system presented as I stood back and admired my work (and gingerly touched my skinned knuckles). I was anxious to "gas up" and pour in some oil so I could see if it actually would function. More on that later.

Some Problems

The first two alternator rotors had to be sent back to the factory because of damage. The end of the rotor that contains the slip rings for the brushes to contact is made of plastic. The first two units had broken plastic face plates, owing to improper packaging for shipment. The third and final rotor was packed very well, and it was in perfect condition. I assume that Heath has corrected the packaging problem after receiving our recommendations.

I experienced difficulty with the plastic insert (item B5) that mounts in the end bell to secure the brushes. The electrical terminals are affixed to the insert piece by means of sheet-metal screws. The latter must be inserted with great care (and I was careful), for as they develop threads in the plastic the insulating block can become chewed up by the screw. This will result in poor electrical joints; the sheet metal screw may vibrate loose in time. I stripped one of the holes and had to use the next larger size sheet-metal screw to ensure integrity in that part of the system. Use caution when doing this step! I think a better technique would be for the supplier to tap the holes in the plastic insert for, say, a no. 8-32 thread. Then, no. 8-32 bolts could be used to secure the brushes. If there is a weak link in the chain, I'd say this part of the system is it.

My final difficulty came during initial testing of the system. Upon starting the engine, my pulse hastened in anticipation of having ac

Heath Company GU-1820 Portable AC Power System

Manufacturer's Claimed Specifications	*ARRL Evaluations*
Engine type and rating: 5 hp, 4 cycle, Briggs & Stratton.	As specified.
Output voltage: 120 ac (nominal) at 60 Hz.	As specified.
Circuit voltage: 20-A reset circuit breaker.	As specified.
Frequency regulation: 4 Hz max., no load to full load.	As specified.
Voltage regulation: ± 5%, no load to full load at rated 3600 rpm.	No rpm check made, but regulation as stated.
RFI: Contains RJ-8 resistive spark plug.	No RFI noted when frame of unit grounded and generator operated 100 ft from radio antenna.
Running time: 1.75 hours per tank of fuel at half load (1100 W).	Not tested
Carrying method: Half-cradle handles.	As specified.
Weight: 84 pounds (38 kg) with oil and fuel in unit.	Not checked.
Dimensions (HWD): 15 × 16 × 31 in. (380 × 410 × 790 mm).	As specified

voltage available for my soldering gun, my test appliance. What ho? No power was available! A check of the output receptacle showed "zero volts." I removed the end bell, started the generator again and found that the missing voltage had appeared. Back went the end bell into position; no output voltage again! After removing the end bell once more, I spotted a damaged wire that had been squeezed between two metal surfaces. The insulation was punctured, and a short circuit resulted. The manufacturer warns against pinching the leads, but it's hard to ensure they're in the clear when the end bell is bolted on. I recommend considerable care when attaching the end bell.

The instruction booklet for the gasoline engine does not specify how much oil is required. It instructs the user to fill the chamber with oil, so I assumed I was supposed to bring the oil level up to the top of the filler hole, or nearly so. That's what I did. The system seems to run nicely, and there's no splatter of oil on the garage walls to indicate that I erred in my decision.

Final Coments

The last step in making the system ready to use is to set the governor for the proper speed to ensure the correct line frequency. This requires an electric clock and a watch with a sweep second hand. The process is a simple one and can be accomplished in a short period. Assembly time for me was approximately five hours. A person with better mechanical aptitude than I could doubtless do the job much faster.

The unit runs smoothly and starts easily.[1] It appears to be excellent for use during camping trips and Field Day exercise, and when emergency power is needed for communications during storms and other acts of God. Proof of field performance came when AK4L/VE1CER of the ARRL staff borrowed the generator for a DXpedition to St. Paul Island (VE1SP1 operation, July 1982). The plan was to use two 1200-W gasoline generators borrowed from the Nova Scotia government, plus the GU-1820. Some of the crew doubted that the Heath unit — though rated at 2200 W — would do the job, owing to the small size.

During the five-day operation, the operators had just over 12,000 QSOs, and the GU-1820 provided power for most of the contacts. The other power plants were old and hard to start, but from the first pull of the starter rope, the '1820 provided excellent service. The usual load for the Heath generator was two 100-W hf-band transceivers and a linear amplifier running at 400 W of output power (plus some table lamps).

If you've been considering a power plant, this may be the one to consider. Manufactured by the Heath Company, Benton Harbor, MI 49022. Price class: $480. — *Doug DeMaw, W1FB*

[1]Initial starting of the engine is difficult, owing to the lack of fuel in the carburetor and supply lines. After several yanks on the starting cord, I decided to remove the spark plug and drip about 6 drops of gasoline into the cylinder head. The plug was replaced, and the engine started on the first pull of the rope.

TET HB-35T TRIBAND ANTENNA

☐ This review has been delayed for a considerable time in an effort to resolve what, in my opinion, appeared to be mechanical problems with the antenna. During this period of evaluation (about seven months), the antenna has been raised and lowered at least six times; on two occasions, twice in one day. I am now quite familiar with and I like the antenna. It really performs. If you're thinking of purchasing one, there are some things you should know about it.

The HB-35T offers five elements on 10 and 15 meters, and four elements on 20 meters, on a 24-foot 7-inch boom. The first director functions only on the two higher frequency bands. Driven out of phase, the two rearmost elements are connected by phasing rods to a small piece of plastic midway between the two elements. Supplied originally, this was a piece of circuit board with the crossover etched into it. The manufacturer reports that this was not well received by some amateurs, though I saw nothing wrong with it, and it served its purpose. However, a replacement is being offered to all HB-35T owners, and the new crossover is now made by means of metal links crossing over and under the plastic. The two driven elements are responsible for the generous bandwidth offered by this antenna.

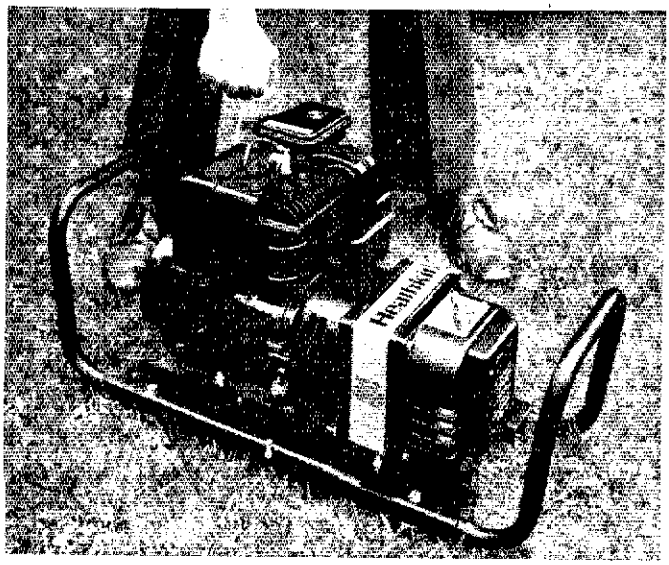
The manufacturer initially supplied triangular plastic wedges to fit between the boom and the U bolts at each element, and at the boom-to-mast mounting point. Apparently these were not entirely satisfactory, as replacements have been supplied to all purchasers, and present production has been updated to include wedges made of aluminum stock.

Disappointment

When first erected on the tower, the HB-35T showed a dismal and disappointing SWR of about 7:1 across each band. The tower was lowered, and the antenna was thoroughly inspected. I suspected that the coaxial balun supplied by the manufacturer might be defective, but, before replacing it, I decided to try something else first. When installed initially, the balun was strapped securely to the boom with nylon electrician's straps in front of the forward driven element. Could this balun somehow be coupled capacitively to the boom? The straps were removed, and the balun was stood on end, with only one strap holding the balun to the boom. The resultant SWR curves are shown in Fig. 5. A telephone conference with the manufacturer disclosed that 25% of the HB-35T antennas sold have evidenced the same problem.

Why not all of them? I don't know. Perhaps some other method of securing the balun to the boom was used. On a subsequent raising, the elements were mounted below the boom, and the balun was permitted to hang down slightly below the boom. This situation produced an SWR response almost identical to the one shown. The manufacturer says nothing about this potential problem in the instructions, and has not acted on my suggestion that the problem could be eliminated by a change in the instructions to indicate that the elements should be mounted below the boom. Apparently, the manufacturer intends to handle such problems on a case-by-case basis. Should you purchase this antenna, you now know what to do. The suggestion has been made to the manufacturer that a truss be provided to support the boom so that all the elements might be in a direct line. While this is not a serious matter, there is some sag in the boom. The manufacturer has indicated that there are no plans to provide a truss at this time.

It is recognized that an early model of this antenna was made available for review. However, Figs. 2, 4 and 5 of the instruction



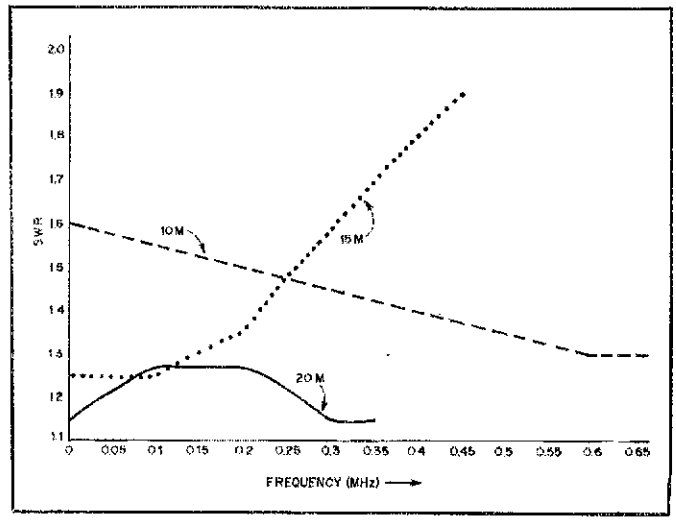


Fig. 5 — SWR curves of the TET HB-35T.

TET HB-35T Triband Antenna

Manufacturer's Specifications

Power capability:	3 kW
Nominal feed impedance:	50 ohms
Maximum element length:	27 ft 6 in.
Turning radius:	18 ft 10 in.
Suitable mast size:	1-1/2 to 2 in.
Weight:	49.5 lb.
Wind surface area:	8.1 square ft.
Wind load at 80 mi/h:	162 lb.

sheets were missing, and were not supplied until sometime later, well after the antenna was installed. I can feel for the inexperienced amateur who may be putting together his first triband array, and who runs into such a situation. It is frustrating and completely avoidable. (Simple household accessories frequently come with better instructions than those accompanying complex amateur antennas costing hundreds of dollars.) It is a general failing of most antenna manufacturers. The manufacturer advises that the HB-35T instructions are now complete.

So much for the gripes. It is impossible to make an element-dimension error. The tubing is drilled just where you are to insert a self-tapping screw to pin the sections together. Metric socket or open-end wrenches are a big help. Short of these, a small adjustable wrench may be used. The hardware is stainless steel, including the U bolts, and should be trouble-free for many years.

Comments

What do I like about the antenna? Just about everything else. The antenna exhibits excellent bandwidth. It has a rugged construction, and has survived a severe New England winter with no apparent deterioration in physical integrity or electrical performance. In the final analysis, it is an excellent DX antenna with countless foreign stations commenting favorably on the signal from W1SE while operating "barefoot," as well as at the legal power limit. The HB-35T is available from: TET Antenna Systems, 1309 Simpson Way, Suite F, Escondido, CA 92025. Price class: $330. — *Lee Aurick, W1SE*

INSTANT SOFTWARE ELECTRONIC BREADBOARD PROGRAM

☐ No one knows for sure who first came up with the idea. It was during the early days of Amateur Radio; an enterprising young ham with more enthusiasm than dollars wanted to test a new circuit. His bankroll would not stand the price of a metal chassis just to test an idea. What would serve as a substitute? Of course! A few minutes later, he was securing the major components of his project to his mother's breadboard. A couple of hours later, when terminal strips, wires, resistors and capacitors had been carefully connected in place, the unit was ready to test. History does not record the name of this brilliant young man, nor do we know the results he obtained. But the concept of using a breadboard for circuit prototyping was born.

In recent years, a number of manufacturers have introduced products that make circuit prototyping easy. All you need are the components and some hookup wires — no solder needed! What could be easier?

Now you can prototype linear circuits without solder or hookup wire. You don't even need the components! The Electronic Breadboard allows the user to design and simulate linear electronic circuits on a computer, and to evaluate voltages, currents, impedance and frequency response of the circuits. To run the program, you need a Radio Shack TRS-80® microcomputer, Model I or III, level II, with at least 16 K of memory. This program was not intended to analyze digital circuits, or ones that include reverse-biased transistors. Using this program you can: add or remove components, determine the voltage at a particular point in the circuit or at all points in the circuit, set the operating frequency for ac or dc operation, analyze circuit operation while using linear or logarithmic frequency sweeps, calculate the impedance at a particular point in the circuit, save and load circuit designs via cassette tape, and calculate the current through all voltage sources.

No matter what your level of electronics expertise, you can use The Electronic Breadboard. The beginner can practice Ohm's law problems, while the more advanced user may design a matching network for use in a new amplifier.

Capability

Resistors, inductors and capacitors, as well as current and voltage sources, can be simulated by the program. Page 18 of the program documentation booklet says, "By definition, a current source is considered to have infinite resistance so the current will not affect the resistance. On the other hand, an ideal voltage source, which the program is working with, has zero resistance." For active components you can choose operational amplifiers or bipolar transistors. Transistors must operate in their linear range — that is, never in cutoff or saturation.

Before you run the program, you should make a sketch of your circuit, numbering all nodes. The procedure for doing this is explained clearly.

It takes quite a while to load a complicated circuit. It is nice to be able to save a circuit on cassette for further analysis at a later time. When a circuit is loaded from a cassette, you have the option of increasing the number of nodes or voltage sources.

A simple command calls to the screen a list of all components in the circuit under evaluation. Working with 16 K of memory will allow solution of circuits in which the sum of nodes and voltage sources is less than 16. You could consider, for example, a 14-node circuit with one voltage source. There will be sufficient memory remaining for the circuit to contain 40 components. If your computer has more memory, you can add more nodes, voltage sources and components.

Current and voltage sources can be defined as dc or ac generators. Response tests can be run at a single frequency or in one of two sweep modes. In a linear sweep, the difference between test points is always the same; in a logarithmic sweep, the difference gets larger as the frequency increases.

When you call for a linear frequency sweep, you will have to define the minimum and maximum frequencies and the increment (step size) between test points within those limits. You will then select the node you want to examine during the sweep. Next, you select a graphic or tabular output of the results. Tabular results indicate frequency, voltage and phase at the selected node. Graphic results will show data for either voltage or phase at the selected node. While in the graphic mode, if you wish to return to the command mode, simply hold down the "S" key until you return. You will want to know that! I tried a graphic display of output from a cw audio filter; it took 53 minutes to compute and display the results. I should have read the documentation first!

Documentation

Just nine short pages give you all the information you need to run the program. Don't stop when you get to page 10! Beginning at that point, there is a section entitled "An Introduction to Electronics." It looks pretty simple at the start, and it is; but hidden throughout that part is some pretty important information.

A word of caution is in order. The documentation is not well written and there are errors. On page 14, the equivalent resistance for a pair of resistors is given as

$$R_{EQ} = \frac{R_1 R_2}{R_1 R_2} \qquad \text{(Eq. 1)}$$

The correct formula is

$$R_{EQ} = \frac{R_1 + R_2}{R_1 R_2} \qquad \text{(Eq. 2)}$$

The formula for resonant frequency is given on page 22 as

$$f = \frac{1}{2\pi} \sqrt{LC} \qquad \text{(Eq. 3)}$$

The proper formula is

$$f = \frac{1}{2\pi \sqrt{LC}} \qquad \text{(Eq. 4)}$$

In a discussion of imaginary impedance, the documentation says, "This is the mathematical 'imaginary,' where the impedance still exists but is just not directly observable." The word "imaginary" does not refer to the observability of the impedance at all; rather, it refers to the number scale that is used to represent it mathematically. Confusing? Read on!

Fig. 21 in the booklet shows an operational amplifier application. A plus sign is placed near the inverting input of the op amp. For those of us who are used to electronic terminology, this can be confusing! This is either mathematical terminology or an error. In the former case, the plus indicates the summing input; the inversion is ignored.

I ran into a program output that is not explained in the documentation. Under some conditions during ac circuit analysis, the program gave an ADMITTANCE UNDERFLOW error message and returned to the command mode. Evidently, the situation had the possibility of significant computational error. For that reason, you may not be able to run a frequency response on some circuits.

You could go to the public library and find the formulas necessary to perform the calculations that this program does. For less than the cost of the program, you could buy a scientific calculator to help you with the mathematics. If you already have your own computer, the calculator would not be necessary. While research and step-by-step problem solving would make you smarter, using The Electronic Breadboard is easier. It also leaves less chance for you to make an error.

The Electronic Breadboard is available on cassette for the Radio Shack TRS-80® Model I and Model III from Instant Software, Inc., Peterborough, NH 03458. Price class: $50. — *C. L. "Chuck" Hutchinson, K8CH*

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

AFSK SYSTEM FOR FAX

☐ A recent change in FCC regulations to permit the use of FAX on the lower ham bands encouraged me to develop this AFSK circuit for a Telefax machine that had not been used for a few years. The variable light intensity reflected from a FAX picture is converted to a variable audio-frequency-modulation source (AFSK). The circuit uses a Radio Shack 9400 voltage-to-frequency or frequency-to-voltage converter, and a Radio Shack IC Experimenter's PC Board. With all new parts, the system costs about $30, is easy to build and produces pictures with good resolution. Fig. 1 shows the schematic diagram of the modulator circuit.

Before assembling the photo-diode in the light tube, as shown in Fig. 2, you should check the alignment of the optical system. Put some printed matter on the drum and you should be able to see a clear image projected on the pin-hole plate. The brightest area should be centered around the pin hole. Readjust the position of the image-lens focus tube and light-focusing tube to meet these conditions, if necessary.

After installing the photo-diode, move the picture to a white area on the paper. Adjust the position of the photo-diode closer to or farther from the pin hole, so the light-to-frequency converter gives an output signal near 2300 Hz, as measured at pin 10. Now rotate the drum to a black area of the picture and check the output frequency. It should be about 1500 Hz. R1 should be preset for 2.75 V between the center pin and ground with a white spot on the picture, and 2.63 V with a black spot. R2 should be preset for 3.26 V between the center pin and ground. Adjust R1 and R2 until the output frequency varies between these values, as you rotate the drum from white to black areas. A word of caution: What appears to be black to your eye may not appear to be black on the photo-diode. For example, a soft lead-pencil mark is more black than that of a felt pen. This system is immune to any light except that which comes through the pin hole, but extraneous light falling on the transmitted picture, or shining through the pin hole, will reduce the contrast, and should be avoided.

A power supply for the AFSK modulator is shown in Fig. 3A. This is a 5-V Zener-diode-

*Assistant Technical Editor

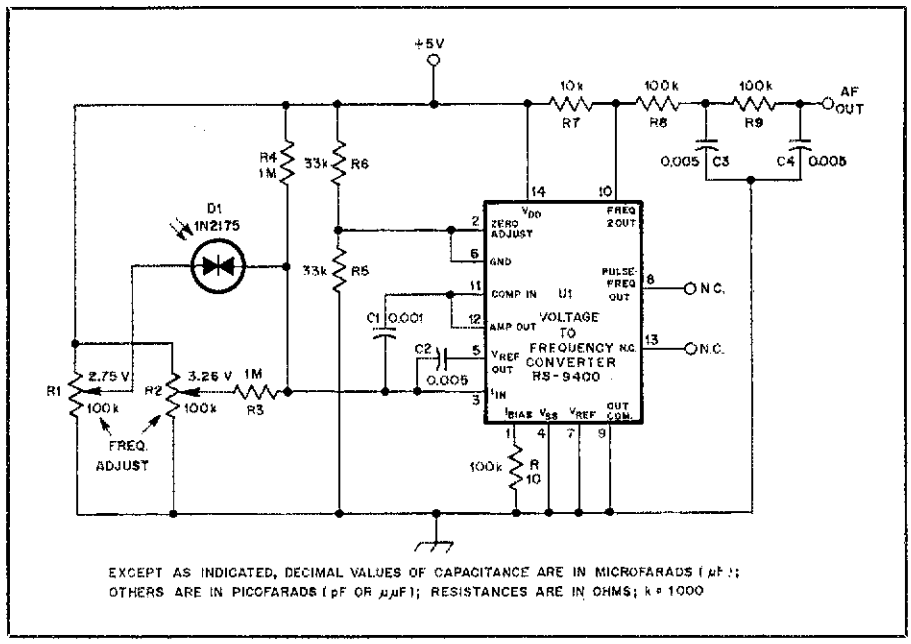


Fig. 1 — Diagram of an AFSK modulator for use with a FAX machine. U1 is mounted in an IC socket. Numbers in parentheses are Radio Shack part numbers.

D1 — 1N2175 Diffused Silicon Photo-Duo-Diode.
R1, R2 — 100-kΩ linear-taper potentiometer.
U1 — 9400 voltage-to-frequency converter (276-1790).
Circuit board — IC Experimenters Board (276-024) or Universal DIP Board (276-159).

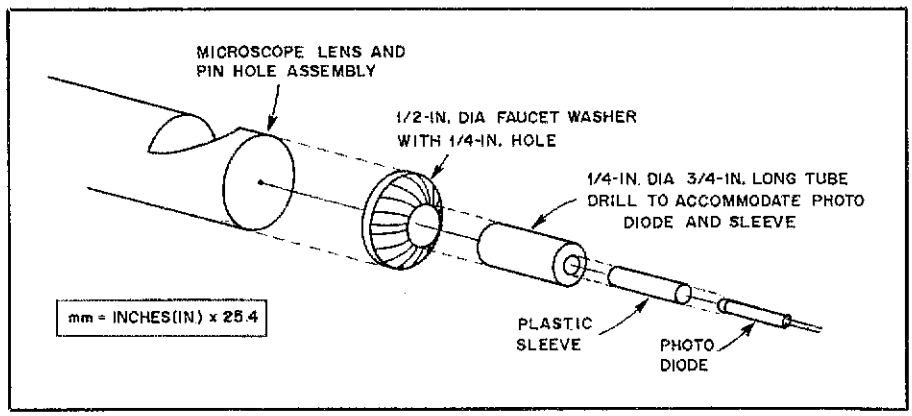


Fig. 2 — Mounting details for the photo-diode. The faucet washer is epoxied to the pin-hole plate. Be careful not to get any epoxy in the pin hole!

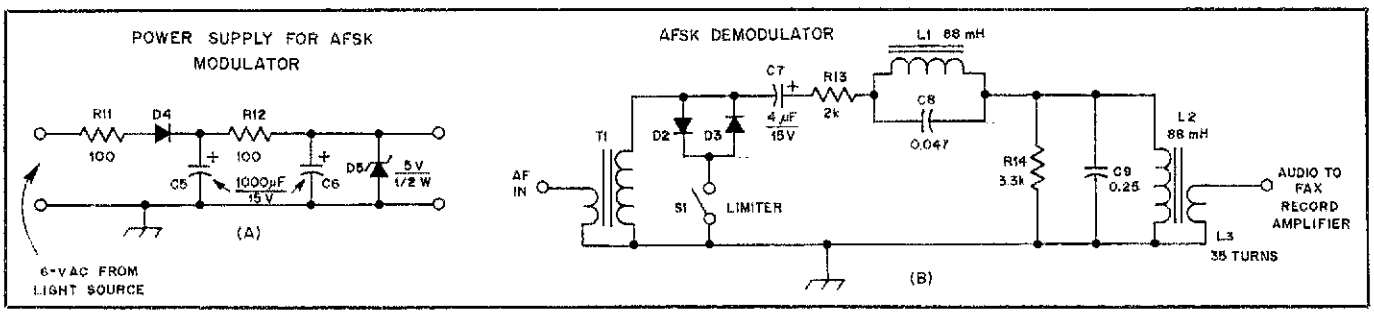


Fig. 3 — Schematic diagram of a power supply for the AFSK modulator is shown at A. An AFSK demodulator circuit is shown at B.

D2, D3, D4 — Silicon-rectifier diodes, 100 PIV, 1 A.
D5 — 1/2-W, 5-V Zener diode.
L1, L2 — 88-mH toroid.
L3 — 35-turn secondary wound over L2.
T1 — Audio-output transformer, 10 kΩ to 8 Ω, wired as a step-up transformer.

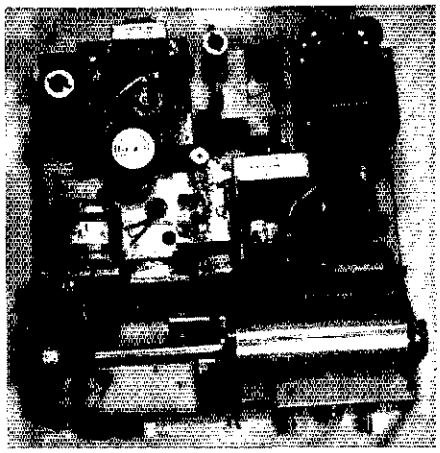


Fig. 4 — The completed FAX system.

regulated supply, with the ac voltage taken from the exciter-lamp supply. All components for the supply are mounted on a five-lug terminal strip, which is substituted for the single-lug stand-off terminal on the lamp supply.

A demodulator for receiving FAX signals is shown in Fig. 3B. A passive discrimination circuit adapted from a slow-scan TV circuit is used. A 35-turn secondary is wound on L2 for impedance matching. S1 allows selection of the limiter action provided by the diodes. The audio signal is fed into this circuit directly from the receiver speaker line. Fig. 4 shows a FAX unit with the modulator and demodulator circuits added. The modulator board is in the center, and the demodulator is mounted on the left-rear corner of the unit.

You must be able to tune in FAX signals accurately to receive proper pictures. This can be done by using an oscilloscope to look at the signals on the grid of the 6V6 stylus-driver tube (pin 5). The strongest pulses are the signals toward the black range.

You will find FAX operation near the popular SSTV frequencies. You should be able to identify this mode by the sound of the sync signals. — *Wally Lamb, WØPHD, Warren, Minnesota*

CIRCUIT LAYOUT PATTERN FOR RADIO SHACK UNIVERSAL DIP BOARD

☐ We have found the Radio Shack Universal DIP Board (276-159) to be versatile for wiring projects, without the need for a pc board. We made a copy of the board pattern on an 8-1/2 × 11-inch sheet of graph paper.[1] Copies of this sheet can be used to draw the components and wiring for the project, as was described in May 1982 *CQ*. This serves as a parts-placement diagram. A layout for the AFSK modulator circuit described in the previous Hint is given in Fig. 5.

We have built many small projects on these boards, and sometimes they come out smaller than if we used a published pc-board pattern. The circuit is laid out component side up, so be sure the ICs and transistors are shown as seen from above. — *Harold (NØARQ) and Todd (NØART) Mitchell, New Brighton, Minnesota*

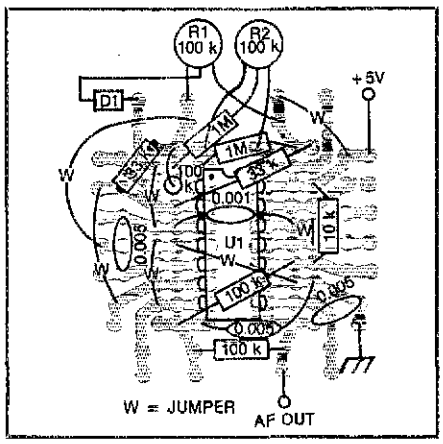


Fig. 5 — Parts-placement diagram for building the AFSK modulator on a Radio Shack Universal DIP Board.

WEATHERPROOFING ANTENNA CONNECTIONS

☐ Plumber's Putty, a nonhardening waterproof material, is available in tape form. It may be used to cover soldered connections, coaxial fittings and other outdoor, corrosion-prone connections. After applying the tape it should be kneaded to remove air bubbles and to provide a smooth surface. A small piece of this putty on the end of a screwdriver blade is handy for inserting screws in hard-to-reach locations. This tape comes in rolls 53 inches long by 1/2 inch wide, and is available in the plumbing section of K-Mart and other department stores. — *Harry Burhans, W3FM, Malvern, Pennsylvania*

SOLDERING STATION HINTS

Soldering-Iron Temperature Control

☐ When my 30-W soldering element burned out, I pressed an extra 50-W element into service. As expected, it was too hot for most work. An incandescent-light dimmer worked well for controlling the working temperature of the tip. You can purchase a ready-made unit, or the circuit of Fig. 6 can be built.[2] The dimmer should be wired in an electrical box that has a receptacle to plug in the soldering iron. This would be ideal for the construction of a soldering station for the workbench. The unit of Fig. 6 could also be used as a variable-speed control for your electric drill or other motor-operated devices. — *Wayne Hester, KD4QP, Mobile, Alabama*

[1]mm = in. × 25.4.

[2]J. Hall, "Motor-Speed Control for Power Tools," *QST*, June 1971, p. 34.

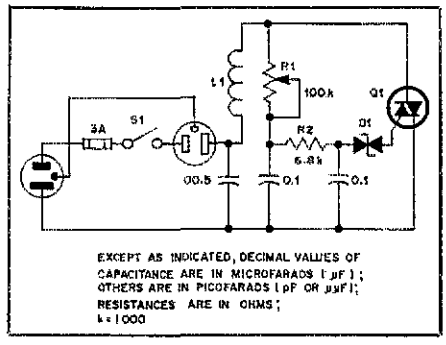


Fig. 6 — Schematic diagram of a light-dimmer circuit that can be built to control your soldering-iron temperature.

D1 — Diac, 2 A, 300 mW (Motorola MPT28, HEP 311 or equiv.).
L1 — 70 µH, approx. 18 ft of no. 18 enam. wire on a 1-1/2-in. long, 1/2-in. dia form.
Q1 — Triac, 8 A, 200 V (Motorola MAC2-4, HEP 340 or equiv.).
R1 — Linear-taper control, 100 kΩ.

Soldering-Iron Idler

☐ Two things frustrate me when I am soldering. The first is having to wait for the iron to heat up, and the other is replacing tips that have become inoperative because of overheating. What is needed is a soldering iron with two temperature settings: one for regular use, the other an "idle" setting that keeps the iron warm, but won't allow it to overheat.

My solution is to wire a diode (1N5404, 400 PIV, 3 A, such as Radio Shack 276-1144) in parallel with an spst switch. This assembly can be connected in series with a line cord and a receptacle in a box. With the switch open, pulsating dc is sent to the soldering iron, keeping it warm. When the switch is closed, the diode is bypassed and full line voltage reaches the iron. The tip heats to operating temperature in a matter of seconds. A similar circuit is used in the deluxe soldering station shown on page 17-2 of the 1982 edition of *The Radio Amateur's Handbook*. — *Timothy Garrity, WD9DZV, Chicago, Illinois*

Soldering-Iron Stand

☐ I purchased a soldering-iron holder at a Radio Shack store (catalogue no. 64-2078). This stand comes with a built-in sponge tray for tip cleaning. The stand is not heavy enough by itself, and will tip over easily. I removed the sponge tray to gain access to the hollow metal base. The base was filled with lead bird shot; then the sponge tray was replaced. Now I have a good soldering iron stand that stays where I put it, and it won't tip over. — *Dana Junkins, WA1YRE, Kittery, Maine*

Soldering-Iron On Indicator

☐ Here is an idea that I am sure has prevented a fire in my "shack" many times. I always plug my soldering iron into a "cube tap," and plug this into the wall outlet. Also, I plug a neon pilot light, or night light, into the cube tap. As I leave the room, the neon lamp warns that the soldering iron is on. I simply pull the cube tap to turn it off. I also have a metal L-bracket fastened to the wall. A hole in the free side holds the iron and keeps it safely off the table, but within easy reach. — *Russel Alexander, W7JWH, Sequim, Washington*

FREEZE DAMAGE TO COAXIAL CABLE

☐ A badly damaged length of aluminum hardline coaxial cable was brought to my attention by Fran Ziobro, K2BRF. Fran was checking a run of the cable in a water-filled conduit. A considerable length of cable was deformed,

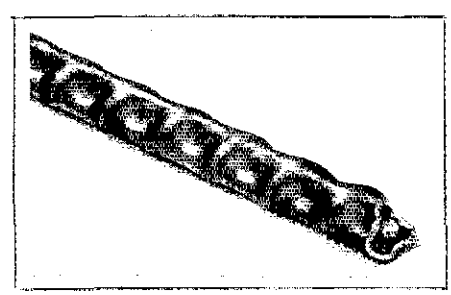


Fig. 7 — Damage to a piece of hardline cable caused by repeated freezing and thawing in a water-filled conduit.

as shown at Fig. 7. Over the years, this conduit had been exposed to below-freezing temperatures. Fran proposes that the hydraulic pressure from repeated freezing and thawing formed the relatively soft aluminum sheath around the center conductor and the webbed plastic support. The regularity of the depressions, spiraled along the cable, supports this assumption.

This failure emphasizes the necessity to provide a dry environment for coaxial cable, and to avoid freezing temperatures if possible. Cold temperatures and immersion in water appear to be required for this damage, but neither of these is good for any kind of coaxial cable. — *David Geiser, WA2ANU, New Hartford, New York*

AZDEN PCS-4000 TRANSMITTED-AUDIO SHAPING

☐ Having enjoyed using an Azden PCS-3000 for a year, I decided to trade it for the newer model, PCS-4000. This rig is also a pleasure to use, but the transmitted audio had too much bass response. This was not like my old PCS-3000.

I decided to do some audio shaping, and experimented with different capacitor values in series with the positive mike lead. (Capacitors in series will roll off the low-frequency response.) When I put a capacitor in series with the lead, a low-frequency oscillation modulated the rig. It sounded like an old-fashioned power-supply vibrator. Using a mylar capacitor instead of a disc-ceramic unit helped resolve the problem, but did not eliminate it. I decided to use a 0.02-μF mylar capacitor because a 0.01-μF unit cut off too much bass, and a 0.047-μF capacitor did not appreciably affect the audio.

Originally, the 700-ohm mike element shunted the audio-IC chip to ground. When the capacitor was placed in series with the mike element, the clip was lifted above ground potential and the circuit began to oscillate. I added a 2.7-kΩ resistor from the rig side of the capacitor to ground, and this completely stopped the oscillation. The resistor and capacitor were added inside the microphone case. These changes provide good transmitted audio from my rig.

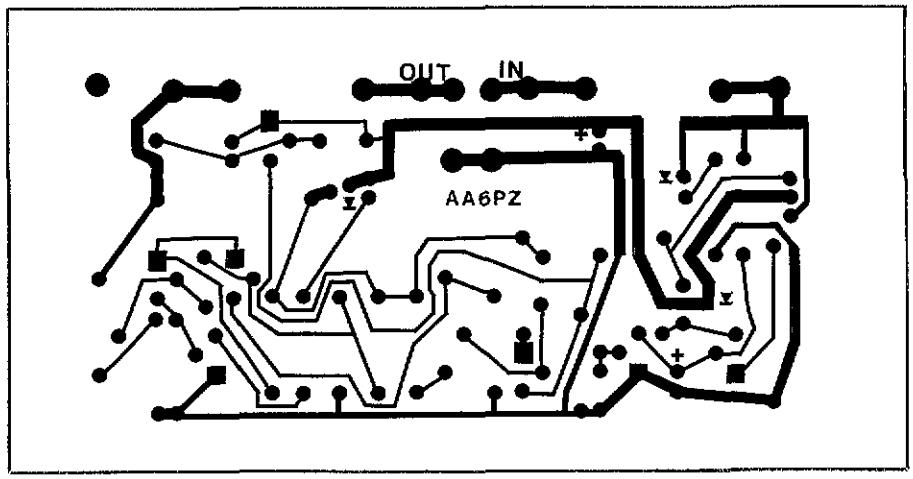
I had to turn the deviation control, VR404, counterclockwise approximately 3 degrees to bring the deviation back to 5 kHz after this modification. — *Lee Bahr, WØVT, Shawnee, Kansas*

OLD TIMER'S NOTEBOOK

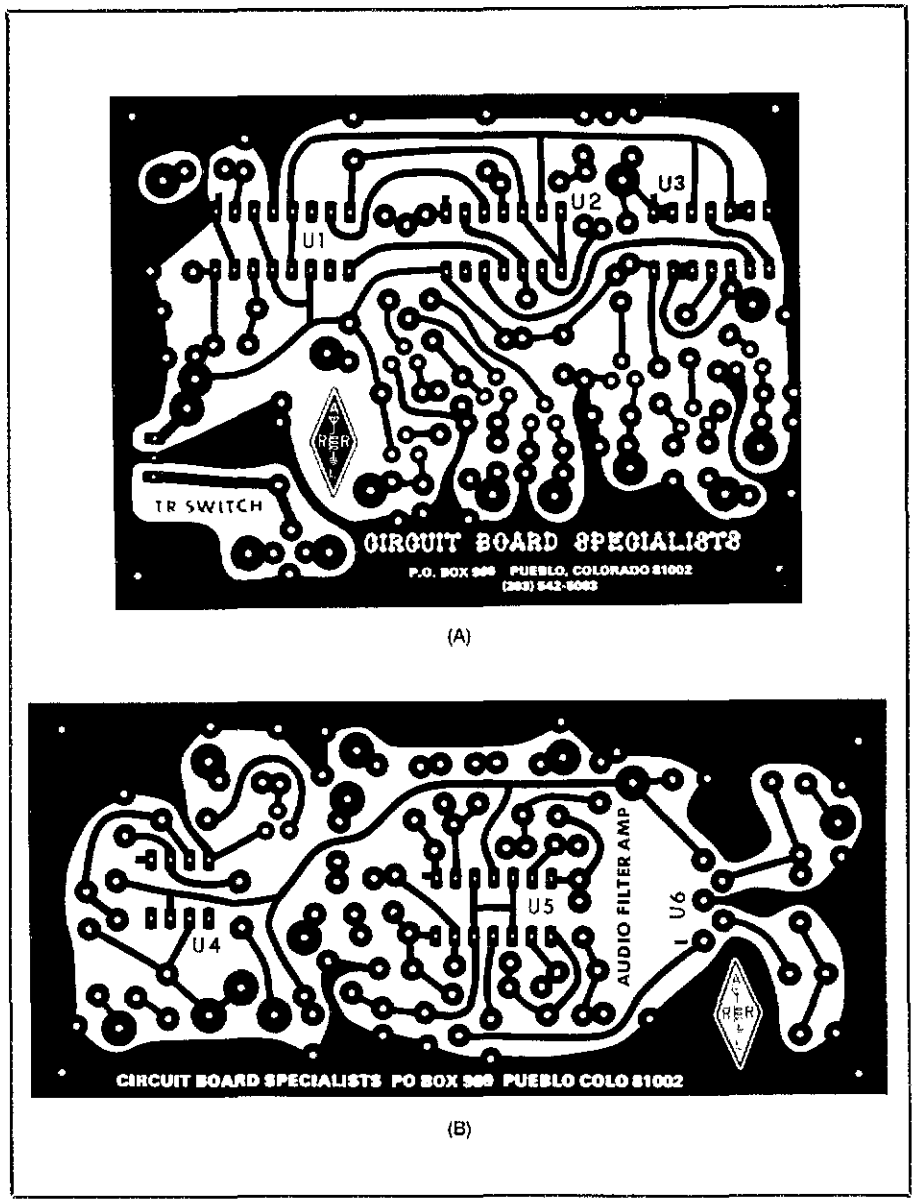
Window Feedthrough

☐ The problem of bringing transmission lines into the shack can be a sticky one, especially if one does not wish to drill window frames or walls, or to replace the panes of glass with plastic sheets.

My method is to make a sandwich out of any one of the foam materials used by upholsterers, and to bring the antenna feeders into the shack between two sheets of foam that have been cut to sufficient width, about an inch or so wider than the window opening. The other dimension should be great enough to provide a closure base for the window and screen or storm window. I have found this method to provide excellent weather protection if the windows are closed firmly and held down with a wedge or tack against the window frame. — *A. W. Smith, K3ZMS (Reprinted from* Hints and Kinks for the Radio Amateur, *7th ed., 1965, p. 89)* QST



Etching pattern for the Power Charger. Black areas represent unetched copper viewed from the foil side of the board. Pattern is shown actual size; parts-placement diagram appears on p. 20.



Etching pattern for the Universal T-R Controller logic and switching board (A), and the sidetone and audio board (B). Patterns are shown from the foil side of the board. Black areas represent unetched copper. The parts-placement diagrams for these boards appear on p. 42.

Technical Correspondence

Conducted By
Dennis J. Lusis,* W1LJ

MORE PROPAGATION NOTES

☐ Referring to Mackenzie's notes on long-range propagation,[1] I have shared similar thoughts since 1959. At that time, I was amazed by some of my 10-meter signal reports while using low power and poor antennas. I believed this very efficient propagation could be explained in ways similar to certain acoustics or sound-wave phenomena. While sound waves are not exactly the same as electromagnetic radio waves, there are similarities in their behavior.

In the acoustics field, there is a rather common phenomenon called "the whispering gallery effect." It occurs when low-level sound waves (i.e., someone whispering) are easily propagated from one side of a large room to another. Such rooms have either curved ceilings or walls. In the former case, the ceiling approximates an ellipse, and the whisperer and listener are at focal points. However, the latter case (the curved wall) is what suggested the idea of efficient ionospheric radio propagation without lossy earth reflections. In this case, the whisperer is located very close to the curved wall (typically spherical) as is the listener, who is a considerable distance away. The low-level sound waves are projected at very small angles to the wall and, through a series of efficient reflections, eventually arrive at the listener. This type of "whispering gallery effect" is not as intense as the focused ceiling variety, but can be startling when experienced.

The curved-wall sound-wave phenomenon has been studied for many decades — perhaps first in a truly scientific manner by Lord Rayleigh, who reported the findings in his 19th century acoustics masterpiece.[2] He described this propagation mode as "creeping and clinging," because of his belief that the sound energy creeps along in short steps and clings close to the wall. It is conceivable that the same thing could happen to radio waves in the ionosphere. If so, the Rayleigh type of ionospheric propagation mode would eliminate inefficient earth reflections.

The major difference between Rayleigh's and Mackenzie's theory is that the latter suggests a minimum number of reflections along paths that just miss hitting the earth. The Rayleigh-type mode generally would be composed of many reflections at very small angles, with relatively short distances between reflections. Mackenzie also believes that local wavestream dispersion from each ionospheric reflection is responsible for the signal returning to earth. While it may be true in some cases (more discussion later), I think a little differently about this. I believe that a wave propagated by the creeping-clinging mode (let's call it cc) could travel for thousands of miles with essentially *no* dispersion to earth until some major ionospheric discontinuity is encountered. Such discontinuity could be an ionospheric-storm effect, local ionospheric turbulence, low- or high-density ionized clouds, or the day/night F_2 layer discontinuity. When the main F_{2cc} wave front encounters the discontinuity, it is refracted/reflected to earth in the somewhat usual manner, resulting in relatively strong signal reception. These may also explain some sudden fadeout phenomena, which would occur when a cc mode loses its receiving-end discontinuity. Such phenomena could occur as the daylight/darkness boundary moves and the wavestream, formerly refracted down through the F_1 layer, has suddenly just exceeded the critical angle and is then reflected back upwards.

There are several possible variations on the cc mode idea. One possibility is that this type of propagation could occur in the E layer alone under certain conditions. This might explain some of the longer-distance sporadic E or E_s mode behavior. Another variation is the long-hop limiting case where the main wavestream just misses the earth (this is the example cited by Mackenzie). In actuality, there could be an infinite number of short- to long-hounce variations between the cc mode and the latter example. Questioning the number of reflections and reflection efficiency is appropriate here. Numerous cc-mode reflections along the F_2 layer would be more efficient than fewer, larger-angle reflections. Waves that reflect at large angles, particularly those that come close to the earth each time, must penetrate the F_1 and E layers twice between each reflection — resulting in further absorption loss. — *J. S. Gibson, W4SVH, Smyrna, Georgia*

MORE STATE-OF-THE-ART RTTY†

☐ Auto-start and anti-space are highly desirable features for today's RTTY operator. These may be obtained in a much simpler way than described by Witmer in November 1981 *QST*.

Fig. 1 shows an RTTY demodulator circuit that I developed for our local Navy MARS unit. It uses three transistors and an XR2211 PLL IC. Pins 5 and 6 of the XR2211 are complementary, lock-detect outputs. Pin 6 is used for the auto-start function and pin 5 provides the mark-hold action. Although the a-s circuitry is derived from the same IC that does the detection, sensitivity and bandwidth of both sections are identical, and the auto-start is positive and reliable. The a-s will trigger only if the signal is good enough to print, and it will not false on voice or noise signals.

Most operators prefer a short delay of a second or two for a-s turn on, and between 10 and 30 seconds for turn off. Both delays can be achieved by connecting an R-C combination from the base of Q3 to ground. Suggested values are 330 kΩ and 10 μF. Longer turn-on delays also can be achieved by increasing the size of the capacitor at pin 3 to 10-25 μF.

No tuning indicator has been included. The value of such devices is questionable. They don't truly indicate or aid in tuning, but merely show that the phase-locked loop has achieved lock — something we know anyway by the fact that the auto-start has turned on and the machine is printing.

It should be pointed out that this unit is state of the art in terms of its components, and will give a good account of itself on vhf, and, to a

†Adapted with permission from the Navy MARS publication *Kilowatt World-Wide*.

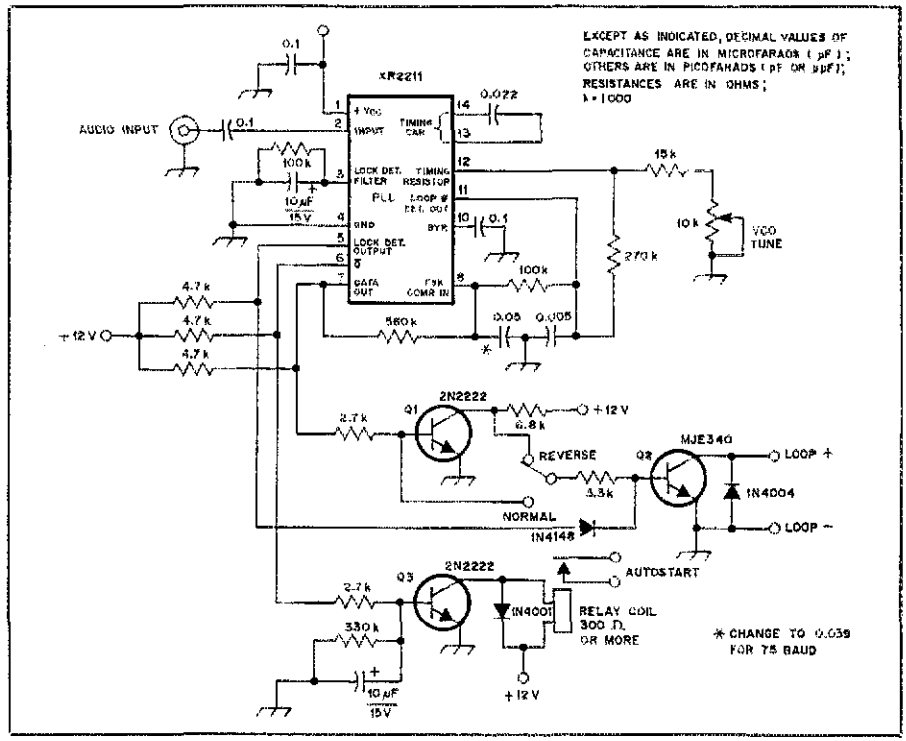


Fig. 1 — Schematic diagram of the W3KET PLL RTTY demodulator.

[1] S. B. Mackenzie, "Theory for Long-Range Propagation," *QST*, May 1982, p. 42.
[2] J. S. Rayleigh, *The Theory of Sound*, Vol. 2 (New York: Dover Reprint, 1945), pp. 126-129.

*Assistant Technical Editor

lesser extent, on hf. For hf applications, there are considerably better, though much more complicated, circuits available. — *Melvin Leibowitz, W3KET, Wilmington, Delaware*

STUB-MATCHING TABLES

☐ I have provided Tables 1, 2 and 3 to make it simpler and less expensive for amateurs to build their own stub-matching networks, as shown in Fig. 2. The tables are useful for three reasons: (1) The classic shorted-stub matching system suffers from mathematical, but not physical, complexity. (2) Most hams have access to 50-ohm coaxial cable and 300-ohm TV twin-lead. (3) Antenna tuners are made to operate into these two types of line.

By using these tables, it is possible to match coaxial cable directly to a balanced load if the lineup to the stub is rolled into a 3- or 4-turn coil, forming a balun. TV twin-lead cable can also be used to feed conventional beams or wire dipoles by using the information found in Tables 2 and 3.

When you are using these tables, it is necessary to multiply the length given by the velocity factor of the transmission line actually used. This value may be obtained from the ARRL *Handbook*. Table dimensions show the length from the load point to the tap, and the length of the shorted stub in air, rather than in a transmission line. — *Robert C. Wilson, KL7ISA, Bethesda, Maryland.*

Shorted-Stub Matching Tables

Table 1

Frequency (MHz)	Tap (in.)	Stub (in.)
7.2	117	672
10.1	83	479
14.2	59	341
18.0	47	269
21.3	40	227
24.5	34	198
28.6	29	169
52	16	93
147	5.7	32.9
222	3.80	21.80
432	1.95	11.20
1296	0.651	3.73
2350	0.359	2.06
3400	0.248	1.42

52 to 12 ohms; coaxial cable to 4-way split, coaxial cable to beam, etc.
mm = in. × 25.4

Table 2

Frequency (MHz)	Tap (in.)	Stub (in.)
7.2	102	698
10.1	73	497
14.2	52	354
18.0	41	279
21.3	35	236
24.5	30	205
28.6	26	176
52	14	97
147	5.0	34.2

300 to 52 ohms; twin-lead to 52-Ω antennas, lines, etc.

Table 3

Frequency (MHz)	Tap (in.)	Stub (in.)
7.2	119	669
10.1	85	477
14.2	60	339
18.0	47	268
21.3	40	226
24.5	35	197
28.6	30	168

300 to 72 ohms; twin-lead to dipoles, etc.

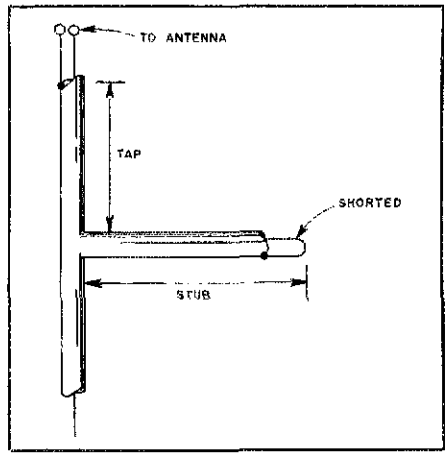


Fig. 2 — Physical configuration of a stub-matching network. Stubs should be made of the same type of cable used for the transmission line.

PAL SSTV?

☐ In June 1982 *QST*, Miller, W9NTP, proposes a compatible slow-scan color-television system patterned after the U.S. and Canadian NTSC fast-scan system. I believe that, in practice, his proposed system is unsatisfactory, primarily because of the NTSC technical limitations. I will compare briefly the Miller system with the Royle (G3NOX) system, which is featured in November 1980 *QST*.

Royle transmits color SSTV images by the field-sequential system; he sends three successive black-and-white SSTV images, each taken through one of the three primary-color filters — red, blue and green. As shown by the cover photo on the 1981 *Radio Amateur's Handbook*, the Royle system works quite well. It suffers from only two minor disadvantages when compared with the Miller system — a color image takes three times as long to transmit as does a black-and-white image, and the system is not compatible with existing equipment. Color images *cannot* be received in black-and-white on an unmodified black-and-white receiver.

The Miller system, however, suffers from two major disadvantages when compared with the Royle system. The Miller color-image quality will be much poorer than Royle's, and is actually more susceptible to interference and distortion. Miller's system will produce undesirable color fringes on the edges of objects (owing to limited color bandwidth), and chroma errors (caused by phase shifts in the color channel), resulting in performance that is less than acceptable.

To get an idea of what a Miller color SSTV image is like, look at the mediocre image produced by a computer on a home color-TV receiver. The image created in the computer is excellent — the color errors you see are caused mostly by the limitations of NTSC color transmission. Now take the RGB (separate unencoded red, blue and green) outputs from the same computer, drive an RGB color monitor, and enjoy an improved image! This is the essential difference in quality between the Miller and the Royle systems.

Phase errors and differential phase errors (amplitude-dependent phase shifts) are a constant problem in NTSC equipment. Multipath transmission, which is unavoidable on the hf bands, produces phase (and hence color) errors that are annoying. An entire industry has developed circuitry designed to alleviate these problems in the NTSC system — but has found little success. When European countries adopted color-TV standards in 1961, not one country adopted NTSC, but either PAL or SECAM — both of which reduce or eliminate the phase-error problems.

In conclusion, I feel that Miller's system is sacrificing to the image quality. The primary strength of his system is in compatability, which is much less vital in the amateur service than in a commercial context. — *Peter Traneus Anderson, KA1ETG, Burlington, Vermont*

Feedback

☐ In "Phase III with a Tetrode UHF Amplifier" (Aug. 1982 *QST*), plug and jack designations in Figs. 2 and 3 do not always agree between the drawing and the caption. In most cases, the reader should be able to identify the correct part reference number. Cinch connector part numbers are divided into three parts: a letter (P for plug, S for socket), followed by three numbers (the last indicates the number of pins), and some letters (AB for panel mount, CCT for use on cable).

The meter (Fig. 3) used by author Merry is calibrated with 0 to 1 and 0 to 3 scales. With resistor values shown, full-scale readings are: I_g and I_s 30 mA, E_p 3 kV and I_p 300 mA. If the 3-kΩ resistor connected to P3, pin 8 in Fig. 3 is changed to 10 k-Ω full-scale reading for I_p will be 1 A.

In Fig. 4, the anode of the bottom Zener diode should show a connection to the negative side of C6. The 100 μF filter capacitor in the bias supply is shown with reversed polarity.

A complete set of detailed drawings and photos is available from the author for a nominal charge. [This offer is not warranted by ARRL — Ed.]

☐ Please note these corrections to Fig. 1 of "Mobile Antenna Matching — Automatically," *QST*, Oct. 1982, p. 16. A ground symbol should be placed at the junction of pins 1 and 4 of U1 and the anode of D3. Test points B and C are located at pin 2 of U2 and the junction of R7 and R8, respectively.

☐ Jack Althouse, K6NY, correctly points out (see the W1FB Technical Correspondence item on baluns in Aug. 1982 *QST*) that the balun leads or internal inductance can shift the beam-antenna resonance lower in frequency. If this happens, the driven element sections will need to be readjusted for proper resonance with the balun in the circuit.

☐ Please refer to the ARRL International DX Contest results in Oct. *QST*, pages 76 and 77, for the following correction. The N5AU multi-multi and the N5CM1 multi-single phone scores were inadvertently omitted from the North Texas Contest Club aggregate entry in the Medium Class. With the addition of these scores, the club totals rise from 12,265,540 points and 32 entries to 18,983,830 points and 34 entries. The overall standing of the NTCC does not change; however, their corrected score is within 8% of the winning total, not a "distant" second as indicated in the text.

New Products

MYERS ELECTRONIC RESEARCH AMS MODULE

☐ Myers Electronic Research has developed a wide-band synchronous detection radio module (dubbed the AMS), which may be of interest to Amateur Radio experimenters and builders. The AMS uses seven ICs, counting the on-board voltage regulator. Among these ICs is a Plessey SL624, which is used as a synchronous a-m detector and provides signal-level information to a Plessey SL1621, which acts as the age system for the module.

The manufacturer specifies the AMS to have a usable frequency range of 200 kHz to 20 MHz, a 5-MHz sensitivity of 5 μV for a 10 dB S + N/N ratio with a 50%-modulated 1-kHz signal, a maximum input signal-handling capability of 265 mV, and an audio output level of 1 V rms into a 47-kΩ load. The power requirements are 9- to 15-V dc, with a current drain of 60 mA at 12 V. These specifications were checked in the ARRL lab and the AMS module passed with flying colors.

The AMS module is flexible. By placing a suitable crystal or mechanical filter ahead of the rf input to the module, it becomes an i-f amplifier operating at the filter frequency. A ferrite-rod antenna and a suitable tuning capacitor, substituted for the filter, transform the module into a broadcast receiver with built-in muting capabilities. An AMS direct-conversion (D-C) receiver can be made by using a tuned circuit at the front end and injecting a VFO signal (at the proper frequency) of a few millivolts in amplitude. Voltage present at the S/N pin may be measured with a high-impedance voltmeter. Thus, an S meter can be included.

Muting is accomplished by grounding a single pc-board pin. By linking the COM and SIG pins, muting may be referenced to the incoming signal level. In this mode, the MUTE potentiometer setting is proportional to the S-meter reading necessary for unmuting.

Further information may be obtained from Myers Electronic Research, Customer Services Division, 145a Ashley Rd., Altrincham, Cheshire WA14 2UW, England. Price class: Wired and tested, £53; kit, £39. — *Paul K. Pagel, N1FB*

MOTOROLA PRECISION SUPER BETA OPERATIONAL AMPLIFIERS

☐ Motorola is producing, and offers immediate delivery of, precision low-drift op amps with exceptional specifications and increased package options. These devices were formerly available exclusively from National. The LM11 op-amp series combines the best features of existing bipolar and FET op amps with a precisely controlled, ion-implanted super beta process. The super beta design allows reduction of input bias currents by more than an order of magnitude over earlier precision bipolar devices, such as the popular LM108A. The LM11 bias currents equal those of precision BIFET op amps at room temperature. Unlike BIFETs, however, the LM11 bias currents do not double every 10° C.[1]

Although bandwidth and slew rates are less than in BIFET op amps, the LM11 excels with lower input-offset voltage, offset current and significantly lower temperature drifts. Substantially lower power consumption eliminates warm-up stabilization time in critical applications.

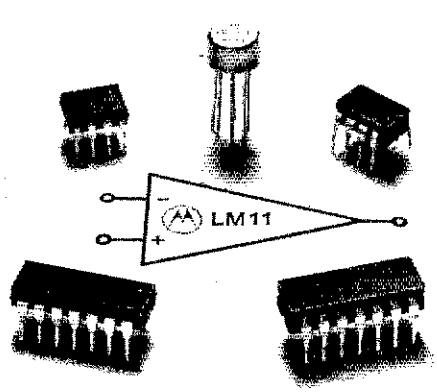
The LM11 is internally compensated, but external compensation can be added for improved stability when driving capacitive loads. The input offset voltage may be balanced with a single external potentiometer.

These Motorola devices exhibit improved bias and input offset currents at high temperatures, and bandwidth and bias current are consistent from device to device. In addition, the temperature coefficient of the input offset voltage (TCV_{IO}) follows a theoretical curve related to the offset voltage at 25° C. This means that the TCV_{IO} may be closely estimated from the V_{IO} at room temperature. For example: A V_{IO} of 100 μV will typically have a temperature coefficient of 0.35 μV/° C.

The precision characteristics of the LM11 make it ideal for applications in analog memories, temperature controllers, low-frequency active filters, light meters and logarithmic amplifiers. An LM11 can be substituted easily for other op amps in existing circuits to provide improved performance or to eliminate trimming operations.

The LM11 is offered in five packages, including 8-pin plastic and ceramic, 8-pin metal can, and 14-pin plastic and ceramic. It is available in two temperature ranges: −55 to +125° C and 0 to +70° C. The 0 to +70° C line (sufficient for Amateur Radio applications) can be obtained at a reduced price with somewhat relaxed electrical specifications. Prices range from $1.60 to $2.90 each in 100 to 999 quantities. According to the manufacturer, all devices are in stock and available from the factory and authorized Motorola distributors. For further information, contact Bob Benzer at Motorola Semiconductor Products Inc., P.O. Box 20912, Phoenix, AZ 85036. — *Paul K. Pagel, N1FB*

[1] °F = 9/5 °C + 32



SILICONIX HIGH-VOLTAGE MOSPOWER® FETS

☐ Siliconix is producing 10 DMOS power FETs with drain-to-source breakdown voltage (BV_{DSS}) ratings ranging from 350 V to 450 V. These devices come in the popular TO-3 package. Within this family are four high-power proprietary parts plus six second-source devices. The proprietary VN3500/4000 series specifies a power dissipation (P_{DISS}) of 125 W at 25° C, a 3-to 6-V threshold voltage for high noise immunity, and a -55° to +175° C operating and storage temperature range. The second-source IRF330/430 series offers a 75-W P_{DISS} rating, a 2- to 4-V threshold voltage, and a -55 to +150° C temperature range.

BV_{DSS} options for the VN3500/5000 series are 350 V and 400 V each with 5 A or 6 A I_D MAX, and 1-ohm or 1.5-ohm drain-to-source "on" resistance ($R_{DS(ON)}$) MAX measured at a high drain current of 3 A.

Devices comprising the IRF330/430 series are socket-compatible with power FETs from Motorola and International Rectifier. These devices have BV_{DSS} ratings ranging from 350 V to 450 V with I_DMAX specified from 3 A to 4 A. $R_{DS(ON)}$ MAX ratings, which range between 1 and 2 ohms, are specified at a 2-A drain current.

Proprietary Siliconix parts (VN4000A, VN4001A, VN3500A and VN3501A) range in price from $15.30 to $18.00 each in lots of 100 or more. The second-source parts are priced from $6.96 to $9.30 each in lots of 100 or more. For further information, contact Siliconix Marketing Services, P.O. Box 4777, Santa Clara, CA 95054. — *Paul K. Pagel, N1FB*

Some Thoughts on the Morse Code

By Victor C. Clark,* W4KFC

Persistent advocacy of a code-free Amateur Radio license by FCC and by some radio amateurs, and the emphatic opposition to the idea by a majority of the amateur community, suggest that certain aspects of this question may not have been fully understood or articulated.

All parties appear to be agreed on these points:

- An orderly growth of the U.S. Amateur Radio Service — perhaps at a rate of 7 to 8 per cent per year — is desirable.
- New ways need to be found to attract intelligent youngsters to this rewarding and educational avocation.
- The Amateur Radio Service, which has long enjoyed a reputation as orderly and efficient in its use of the radio spectrum, must continue to deserve that distinction.

The requirement to learn the Morse code is frequently cited as an effective screening device that tends to exclude the unmotivated and undisciplined from Amateur Radio activity. Having persevered to acquire the skill needed to qualify for an amateur license, according to this line of reasoning, the holder is unlikely to perform in a way that would place it in jeopardy. Why, then, would anyone want to change matters by experimenting with the requirement for Morse code proficiency?

Proponents of the codeless license offer the argument that many are denied access to Amateur Radio because of the requirement to learn the Morse code, a skill in which they have no interest and see little purpose. They contend that the Morse code in today's advanced technology is an obsolescent communications mode that has all but disappeared from commercial and military use, at least in this country. As such, it is regarded as presenting an unwarranted barrier to individuals who would otherwise benefit from participation in Amateur Radio.

On the surface, these are, indeed, persuasive reasons for abandonment of a traditional requirement that many a budding aspirant has found to be difficult, if not indigestible. Thus, radio amateurs who protest against creation of a codeless license appear to be suffering from a "dog in the manger" attitude. Because *they* had to learn the code to obtain *their* license, they are unwilling to welcome newcomers who have not met this test of fire. And it is a fact that no more convincing argument has been put forth by some of the traditionalists among us.

But let us examine for a moment this hoary communications mode known as the Morse code. Is it truly obsolete in this modern and sophisticated age, particularly as a means of effective communications in the Amateur Radio Service? Time was when many amateurs could neither manage nor afford the complexity of other than a cw rig; nearly everyone used code. Today, however, nearly every amateur possesses the means for communicating by single sideband or fm voice. In these circumstances, some may find it remarkable that enthusiasm for use of the Morse code persists today among an impressively large segment of the amateur population, and that many amateurs rarely employ another mode, although their equipment would enable them to do so. Is there something strange or wanting about these folks?

Could it be that there are qualities present in Morse code communications that escape the perception of those who have never mastered the skill? There obviously is pleasure for its practitioners in Morse code transmission and reception. They point out that the musical clarity of Morse, particularly on today's crowded bands, serves to project thoughts and ideas with a facility that far exceeds the expectation of the laboring apprentice, and is beyond the comprehension of the layman. Those who achieve true proficiency in the use of the Morse code claim it to be the great equalizer: Differences in age, voice pitch and timbre, accent and oratorical prowess are absent as a basis for prejudgment, while eloquence, expression and erudition are very much present.

The observation that the Morse code is slow and cumbersome is certainly valid during the learning process. There *is* drudgery involved in sending and receiving Morse, at least until one reaches the magic threshold where instant and effortless recognition first takes place, and it is no longer necessary to write anything down. For most individuals, this appears to occur somewhere in the range of 22-25 words per minute. Indeed, it is a regrettable fact that there are many Extra Class license holders today who have never really achieved true Morse code proficiency nor experienced its full benefit.

That those who have never undertaken even to learn the Morse code should regard the process disparagingly is understandable. Nor is it surprising that they should perceive code communications to be obsolete and awkward.

Is it really worth the effort? Well, let us consider a few of the virtues ascribed to the art of communications by Morse code, as set forth by those who have gained a measure of proficiency in its use:

- It is a unique, intimate, concise and effective communications skill employed throughout the world.
- It is the most efficient mode in terms of power required for long-distance communication, least susceptible to interference, and conserving of the radio frequency spectrum.
- It involves no accent or pronunciation problems, providing a widely understood international language.
- It employs simpler, more reliable and easily maintained equipment than any other communications mode.
- It is an equalizer, negating age, speech impediments and dialectical differences; it provides for ready acceptance of youngsters in an adult environment.
- It is the *only* radio communications mode that is understood readily by both man and machine.

The announced objective of the code-free license is to recruit desirable newcomers to Amateur Radio — particularly young folks who now are entering the computer field. Is it reasonable to expect that a no-code license will attract large numbers of worthy applicants for Amateur Radio licenses? No one can be sure. While the Morse code has never appeared to be a significant barrier to the young, perhaps such a license could serve to attract some new blood. Most seem to agree that it will be essential to require a demonstration of technical knowledge comparable at least to that of General class amateurs, should such a new class of license be created.

Whatever the future holds, however, we would like to offer the thought that, in appraising the intrinsic worth of the Morse code in Amateur Radio communications, the presumption of its obsolescence or inexpedience is shallow and has little foundation in fact.

*President, ARRL

Cable Capsule

An update on recent developments in the CATVI crusade, brought to you by the makers of RM-4040.

By Richard Palm,* K1CE

Specifically, ARRL has offered no evidence regarding the extent of the claimed cable/amateur radio interference. In short, ARRL is proposing to require cable systems to abandon certain frequencies without demonstrating either the dimensions of the alleged interference problem or whether ARRL's proposals will serve the public interest. — **National Cable Television Association**

[In earlier filings] the League did not append its voluminous file of U.S. cable television interference complaints because it did not wish to burden the Commission with this massive case file, nor duplicate the extensive Commission record of cable interference complaints. . . . However, given the contentions of NCTA . . . it is apparently necessary to exhibit for NCTA's benefit that which it already knows, by filing with these reply comments copies of only a few of the more serious complaints by radio amateurs from 25 states throughout the country concerning various instances of CATV interference. — **American Radio Relay League**

With all of the warmth of a contemporary East-West diplomatic exchange, these charges and countercharges characterize the formal comments in FCC's file for RM-4040. The League's rulemaking request, RM-4040 would bar CATV operation at Amateur Service frequencies. The NCTA labeled ARRL's request "excessive, burdensome and unwarranted," and raised the notion that amateur frequencies are *shared* with CATV. This sharing can continue, NCTA claimed, as long as cooperation exists between the two services.

In response, the League filed a massive appendix of CATVI complaints as evidence of the breadth of the problem, along with a fervent affirmation of its initial request. The notion of CATV/amateur frequency "sharing," of course, is without substance — on the one hand the Amateur Service is a legitimate, on-the-air spectrum occupant, while CATV is a nonbroadcast facility with *no* on-the-air privileges.

Background

The League jumped into the CATVI fray early in 1981 when it opposed a *Teleprompter Cable Communications Corporation* request for FCC approval of a special channel arrangement that would include amateur frequencies. (Ironically, the cable operator *was already using the special configuration* at the time of the request, and ultimately was fined for this use and for cable leakage). The ARRL said the operator should not have access to additional channels until it had reduced leakage and interference in accordance with federal regulations.

The matter of interference to other services predates 1981, however. CATVI drew Commission attention in 1976 with the release of Docket 21006, a proceeding to add frequency channeling requirements and restrictions, and provisions for cable leakage monitoring. The issue was how to ensure that CATV systems operating on air navigation, and aeronautical and marine emergency radio service channels, would not cause harmful interference to those safety-of-life services. A 1977 *Order* required regular monitoring on the part of the cable operator in the regions 108-136 and 225-400 MHz at all portions of the cable. A further rule proposal was issued in the docket in 1980 looking toward a relaxation of cable leakage standards.

The Commission's cable leakage advisory committee felt that the 20 μV/M limit was difficult to measure, and that a softer standard would encourage compliance by the cable operator. The League assailed the move as "highly anomolous and proposed without regard to the unique *de facto* incompatibility of cable mid-band operation and amateur VHF operation." The League declared forcefully, "An increase in permissible cable leakage levels is not in the public interest." The proposal is still on the Commissioners' desks awaiting a decision.

Epidemic

In 1982, the new RFI viral infection with symptoms of cable interference to amateurs, and hams' clean signals gaining entrance to "closed" cable systems reached epidemic proportion. Swift action was the mandate given by ARRL members suffering at the hand of irresponsible cable operators. The League responded with a January 12 petition for rule making asking the FCC to remove CATV operation from amateur frequencies, especially on the 144- and 220-MHz bands, where much amateur public service work is performed.

The action roused a sleeping NCTA when it discovered that the economic interests of its members could be "sacrificed" in the loss of certain channels. ARRL leaders immediately were asked to meet with NCTA officials, who empathized with the amateur's plight but requested a recall of the petition. The League declined, but was willing to hear what the industry's principal trade association had to say about possible alternative solutions short of federal intervention. If ARRL would agree to an extension of the comment deadlines in its petition (FCC RM-4040), NCTA would

*Assistant Manager, Membership Services, ARRL

spread the word among its members to clean up their act. In addition, NCTA would effect solutions in specific test cases in the field, demonstrating its problem-solving abilities, and sign a statement of responsibility in CATV/amateur-interference matters. NCTA had until September 1, the new RM-4040 comment deadline, to show the amateur community its stuff. NCTA tried, but . . .

. . . NCTA Failed

Standing its ground along the lines of the ARRL Board directive at Minute 73 of the 1982 Second Meeting, the League followed through on September 1 with Comments in its own petition. The Board had said, "Vigorous action shall be continued to assure the existence of adequate safeguards in the form of Federal regulation and enforcement so that the legitimate users of the radio spectrum are protected from the insidious and detrimental effects of radio frequency interference both from and to these [CATV] ostensibly closed systems." The League's comments reiterated its position with a report on the unfortunate lack of results from NCTA/ARRL cooperative efforts.

NCTA took the hard-line approach to RM-4040 with its empty allegations that the problem is "not as great as ARRL would have the Commission believe." Calling for the dismissal of the League's petition, NCTA said there was no evidence to support the amateurs' claims.

The ARRL reply, characterized by the quote on the outset of this article, came on September 15, when it again urged the Commission to act favorably on its petition and provide the relief sought on either a blanket basis or "on a case-by-case basis *automatically* upon receipt of a verified complaint of interference to or from an amateur station." The League hopes that in the future CATV will employ improved technologies so the present level of spectrum pollution might be controlled. "Only when the integrity of the CATV system is restored and the ingress or egress problem is solved should such prohibition be lifted," ARRL concluded.

The request is not as overly burdensome as NCTA would lead policymakers to believe — two channels of a total of 52 or more available hardly constitutes a change that "will severely curtail the operation of cable systems." This is especially true when the offsetting public benefit is considered, "including improved service to the millions of citizens served by Amateur Radio in times of emergency, reduction in FCC staff time in investigating and resolving a myriad of complaints, and avoidance of the need for congressional intervention."

Thus, the stage is set for Commission action on this important item. Whether or not amateurs will emerge with a new writ protecting them from encroachment by CATV services is now in the hands of the regulators. Be sure to stay tuned, and watch for details of developments in the CATVI arena on your favorite station.

On Other Fronts . . .

While federal rule-making battles are being waged at FCC, several other efforts should be noted. The CATVI fray is a multifaceted problem deserving a multipoint attack.

- *The ARRL RFI Task Group.* Composed of experts in the field, the Task Group serves as a team of advisors to the ARRL Board on matters of RFI and CATVI. Chaired by Hugh Turnbull, W3ABC, the group is actively engaged in several areas involving the cable issue. It continues to serve as liaison between ARRL leaders and industry representatives in Washington, coordinate activities in the field, and gather data for study.
- *The CATVI Desk.* More than a piece of office furniture, the CATVI Desk at ARRL Headquarters serves the membership by responding to requests for assistance in local CATVI cases. In addition, it reports directly to the RFI Task Group, and maintains close communications with the Task Group almost on a daily basis. The CATVI Desk fields many letters and phone calls from U.S. and Canadian amateurs every week. Its staff advises and compiles information for use in Commission proceedings and Board decisions. The author, Dr. Strangeleak, sits at the CATVI Desk.
- *Joint Cable and Amateur Advisors.* In response to an August 1982 League Lines item, ARRL members professionally engaged in CATV fields have registered their names with the CATVI Desk. When a serious complaint arises in an area, the local CATV/amateur advisor may be asked to serve as a diplomat to open channels of communication between the two groups. Mutual understanding and cooperation can often lead to swift and effective resolutions. CATV/amateur advisors are in a unique position to aid communications because they serve on "both sides of the fence." These advisors are able to head off potential problems in many instances. Preventive medicine is the order of the day in cable matters.
- *Industry Cooperation.* In spite of the formal, seemingly aggressive language of the ARRL and NCTA filings in RM-4040, cooperation continues on an informal basis. ARRL is not convinced that the problem can be ultimately solved on this basis; hence our filing the petition in the first place. However, it would be unwise

The Nuts-and-Bolts of CATVI

Q. How do I find the source of cable-television interference?

A. If CATV cable shielding is intact, cable signals should not break the squelch of common 2-meter fm hand-held or mobile rigs. If squelch *is* broken when your rig is tuned to CATV channel E (145.25 MHz), then chances are cable leakage is present and interference both *to* and from cable signals is likely. The leakage can be traced to its origin by using a relative-signal-strength meter in conjunction with your 2-meter rig. Walk or drive toward maximum smoke.

Don't worry about exact μV/M readings as specified in FCC regulations. The primary issue is harmful interference — if the cable leak is stronger than your friends' simplex or repeater signals, then the CATV system is violating the harmful-interference provisions of the FCC rules (Sec. 76.613[b]).

Q. What should I do if I experience CATVI?

A. The first step is to determine the origin of the interfering signals as outlined above: Where is the leak? Then, write a letter to the cable operator explaining the problem and his obligation to clean up the leak. Try to seek out someone within the company who has the technical background necessary to deal effectively with the problem. Enlist the support of other amateurs, including the ARRL OO/RFI coordinator in your section. Should the cable company adopt an uncooperative posture, write again outlining the continuing nature of the problem, and send copies to FCC Mass Media Bureau, Washington, DC 20554, and to the municipal government that holds the cable operator's contract. At this point, it becomes very much in the cable company's best interest to be responsive to the complainants as it can face federally imposed fines and local enforcement actions by towns' authority in franchise agreements. Lastly, have patience and, most of all, perseverance!

Q. What are the applicable FCC Rules?

A. The "closed" nature of CATV systems is found in their definition by FCC as *nonbroadcast facilities*. The limits for allowable radiation from a community unit are found in Section 76.605(a)(12):

Frequencies	*Radiation Limit (μv/m)*	Distance (feet)
Up to and including 54 MHz	15	100
Over 54 up to and including 216 MHz	20	10
Over 216 MHz	15	100

The harmful-interference section is found at 76.613(b):

(b) The operator of a cable television system that causes harmful interference shall promptly take appropriate measures to eliminate the harmful interference.

It is important to note that the above rules are independent of each other; e.g., a cable system may be within specifications for leakage, but can still be in violation of the harmful interference rules. In this case, the cable operator must reduce the leakage to the extent the harmful interference is eliminated.

to close off cooperative channels — wherever CATVI problems can be solved behind the scenes, so much the better. NCTA *has* been doing a good job of spreading the word to its membership. NCTA and the League will undoubtedly continue to work together toward meeting the mutual goals of both groups.

• *You.* Most important, the CATVI battle is at home — with the head-on collision of neighbors' interest in watching E.T. phone home and your interest in working a little 2-meter fm. It is at this level that the fight can reach intense, personal proportions. Original thinking often produces good results. ARRL is ready to assist.

Stalwarts in the CATVI fight include Bob Smith, NA6T, and Rich Helzer, WB6GVO, both of California's cable hotbed. Both have invested considerable financial and emotional resources into their local, and the national, situations. Scott Thompson, KB6CC, has won significant media attention, while Joe Eisenberg, WAØWRI, won a CATV exit from cable channel E in Lincoln, Nebraska. John Fuhrman, KØLFA, of Olathe, Kansas, has headed a successful effort in that area. Eliot Mayer, W1MJ, of Greater Boston Cable Corporation fame, carries on the classic battle in the Boston area.

Many other amateurs have struggled with CATVI and emerged victorious. For example, an almost single-handed effort by Rich Helzer, WB6GVO, won a crucial, favorable decision from the Commissioners themselves when *Sonic Cable TV* of San Luis Obispo, California, was fined $6000. The company was charged with two counts of cable signal leakage in excess of FCC specifications, and four counts of causing interference to a licensed service, in violation of Section 76.613(b). Helzer committed heavy personal resources during the year-long battle with Sonic, but is convinced it was worth it. "It's a local and national victory for Amateur Radio," he concluded.

A Few Minutes with Dr. Strangeleak

The amateur community continues to hold a vested interest in the development and deployment of CATV technologies that will eliminate the present problem. A practical system that lives up to theory can go a long way in reducing the age-old neighborhood RFI problem found with conventional broadcast television. An off-air system should remove the unfair burdens placed on amateur systems. The League and the amateur community will continue to work toward these ends. As developments arise, we will report them in the pages of *QST*. And, it's not a one-way street — we need to hear from you to take the pulse of the problem, and to follow up when appropriate action is called for. With continued efforts, we can cure this new strain of RFI virus. QST

Who's in Charge . . .

cont'd from page 12

malicious-interference problem by subjecting the jammer to 48 consecutive hours of "Ozzie and Harriet" reruns; the Affiliated Club Coordinator was actually able to compile a list of valid club addresses for ARRL Hq.; and the Section Traffic Manager actually was able to recruit a few hams for NTS during a forum at which nobody nodded out!

With all these things going on, you may be wondering if I have anything left to do as Section Manager. The truth is that finding the right volunteers for these slots is a time-consuming (although challenging) job. Once I find the right people, however, I let them express themselves and carry out their responsibilities as they see fit. A good executive permits his staff such wide latitude; I learned this in my management role at the sewage-treatment plant.

In this way, too, I have time to sit back and enjoy ham radio, to work some DX, ragchew, and so forth. I also write the Fredonia Section News column in *QST*. (That's the one in which everybody sends me reports of new calls, new rigs, new QTHs. I fold them into paper airplanes, and whichever ones fly the farthest make it into print.)

I now get to tell my ARRL director what to do because, as Section Manager, I'm a member of his Division Cabinet. This think tank, made up of the director, vice director, each SM in the division, advisory committee members and assistant directors, meets at least twice a year prior to the ARRL Board meetings to help the director formulate policy. The last Division Cabinet meeting was a doozy; it was a cross between the food-fight sequence in *Animal House* and the Russian roulette scene in *The Deer Hunter*. Sure it was hectic, but it was worth it, since each League member in Fredonia has a formal link to the League's policy making process through yours truly.

Now that this "radical" has become a key player in the organization, you may think I never fired off that incendiary letter to ARRL Hq. Wrong again! Since I've had so much time on my hands advancing Amateur Radio and the League through delegation, I worked enough countries to qualify for DXCC. But wouldn't you know it, they spelled my name wrong on the #$@$@ certificate! I've probably mellowed though; in my letter of complaint, I included a congratulatory note to the Long-Range Planning Committee. They dreamed up this new section structure, which got former deadbeats like me to stop complaining and start doing something constructive. Imagine me, Larry Lunchbucket, Section Manager of Fredonia. The LRPC must have been pretty slick to get me hooked! QST

Strays

STRAY HINTS

☐ "Strays" are those interesting fillers used when space allows in *QST*. Think you have an item with Stray potential? Here are some hints to help your submission become one. (1) Be sure the information will be of interest to most readers of *QST*. (2) Submit your material before deadline — the 8th of the second month preceding desired publication (i.e. arrive at Hq. before December 8 for February *QST*). (3) Any photographs you send should be good quality, black-and-white glossy prints. Color prints, slides and instant photos do not usually reproduce well.

Items submitted are normally acknowledged, but that doesn't necessarily mean that your Stray will be appearing in *QST*. We receive far more material than we can find room for. If you want your material returned, please include a statement to that effect and an s.a.s.e.

Follow the above hints and maybe your Stray will find a home in *QST*. — *Andrew Tripp, KA1JGG*

Dave Knaus, WA9POV (center), of the West Allis (Wisconsin) RAC, hands a check for $100 to ARRL Foundation President W1QV, as Central Division Director W9PRN looks on. The check was presented in memory of the late Central Division Director, Phil Haller, W9HPG. *(K9ZZ photo)*

I would like to get in touch with . . .

☐ any hams (and aspiring hams) who are deaf. Barry Strassler, Exec. Dir., Telecommunications for the Deaf, Inc., 814 Thayer Ave., Silver Spring, MD 20910.

☐ any amateurs who served in the U.S. armed forces on the island of Oahu or within three miles of Pearl Harbor from 0755 to 0955 PST on December 7, 1941. Earl H. Selover, W4LPF, 1200 Fordyce Dr., Chesapeake, VA 23320.

☐ any hams who have purchased an IBM personal computer. A. J. Lockle, K5BZU, 10338 Sageplum, Houston, TX 77089.

Captain, May I . . .?

By Richard Russell,* AC6M

Every once in a while, an Amateur Radio operator approaches the captain of an airliner and requests permission to operate a vhf transceiver while enroute. And from time to time, someone writes an article on operating a vhf hand-held radio aboard a scheduled airliner.

The word "scheduled" is significant inasmuch as all airlines that publish schedules are considered scheduled carriers and are governed by a set of rules called *Federal Air Regulations* (FAR). These rules are very explicit about the operation of electronic devices aboard scheduled airline flights. Section 91.19 states that no person may operate, nor may any operator or pilot in command of an aircraft allow the operation of, any portable electronic device on any of the following U.S. registered civil aircraft: Aircraft operated by an air carrier or commercial operator, or any aircraft while operating IFR [on instruments]. Exceptions are portable voice recorders, hearing aids, heart pacemakers, electric shavers or other portable electronic devices that have been approved by the operator of the aircraft. Most airlines have a policy that reads something similar to this: Approval for onboard operation of unauthorized devices will be based on genuine need and will not be given if merely for entertainment.

A Case in Point

There is good reason for these regulations, since at least one accident has been directly attributed to a passenger operating an fm broadcast receiver in flight. The pilot of a DC-3 was making an ADF (Automatic Direction Finder) instrument approach, which calls for him to start his descent to the runway when over the station. Station passage is indicated by the swing of the needle, which always points *to* the station. Accident investigators believe that the pilot received a premature needle swing, causing him to think he was over the station. His early descent caused the plane to hit a mountain. A number of people were killed, including the pilot and copilot.

During the accident investigation, it was established that a passenger had operated an fm broadcast receiver in the cabin. Subsequent testing of early imported radios revealed that they tended to produce considerable spurious radiation — enough to affect the aircraft radios.

The regulations thus remove the captain's authority to allow anyone to operate an unauthorized electronic device such as a radio enroute, and he is in violation should he allow this type of operation. The FAR also state that the pilot of a *nonscheduled airliner*, or business or private plane, *does* have this authority.

It is possible to obtain special authorization to operate aboard a scheduled airliner, but the procedure is lengthy and costly for the airline. A number of years ago, when this rule went into effect, a ham friend of mine asked me what procedure he should follow to get permission to operate on a trip he was planning. I advised him to contact the communications department of the airline involved and explain what he wished to do and on what flight. Of course, I thought it was a futile effort. Much to my surprise, however, the airline called him and, after much discussion, asked him to come to the airport. They rolled out an aircraft and had the amateur transmit and receive in and around the plane while a team of mechanics checked to see if any equipment was affected. After about two hours of this, he was given permission to operate on only the one flight — provided that the same aircraft and radio were used. This was an isolated instance; no airline is likely to go to this kind of trouble to test amateur equipment just because someone requests it.

Side Effects Unknown

As aircraft and their associated systems become more sophisticated, the use of electronics in the cockpit has increased. For example, if a 2-meter hand-held transmitter is keyed in the cockpit of a Boeing 747, it will trip the automatic pressure controller to the standby mode. The standby mode is merely the manual method of controlling the pressure in the aircraft, and it doesn't cause any problem. But it certainly makes the flight engineer wonder why that light came on. I mention this to demonstrate that operating unauthorized electronic equipment may affect other systems that we don't yet know about.

The best course is not to even ask to operate a transceiver aboard a scheduled airliner, as the captain, attempting to be a "good guy," may find himself slapped with a violation or a fine. Remember that the rule prohibiting operation aboard a scheduled airliner was made in the interest of safety — and for no other reason.

Planning to Operate from a Nonscheduled Plane?

If you plan to operate from a private or nonscheduled aircraft, here are a few simple rules to bear in mind.

- Operate while the plane is cruising only, not when it is making an approach.
- Use an earphone so you won't disturb other passengers.
- Don't shout into the mike; high ambient noise can tempt the operator to talk too loudly. Close-talk the mike to eliminate as much noise as possible.
- Use a good antenna; the cabin of an airliner is not conducive to emitting vhf signals efficiently.
- You won't make many friends if you attempt to operate through a repeater over a congested area, as you'll probably key up so many repeaters that you'll hear only a lot of interference that you've created yourself!
- Attempt to operate simplex.
- If you are flying over a sparsely populated area, you may be able to operate through a repeater, but you must pick your frequency and area carefully.

Many people will wish to work you, and you can have a ball operating from a small plane at 5000 to 10,000 feet. (See articles by Hallen, WA7NEV and Stewart, WA4MVI, in June 1979 *QST*, pp. 46-48, for more information about operating while airborne.)

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Dick Russell, AC6M, is a captain with United Air Lines in Los Angeles. An Air Safety Representative for the past 12 years, he presently flies the Super DC-8, but has been qualified on the Boeing 747 and 727. Licensed since 1962, he has also held the calls WB2FJW and WB6INN. He is active on 450, 220 and 144 MHz, as well as most of the hf bands.

The Ultimate QSO

Is intergalactic communications the next frontier for Amateur Radio? It could be, if more SETI-inclined hams tune their rigs to the stars.

By Dr. D. Kent Cullers,* WA6TWX and Scott Rathjen,** W7SW

Imagine yourself many years in the future sitting in your computer-controlled ham shack patiently waiting for the visual display and printer to show reception of the long-awaited signal from your first extraterrestrial contact! Motivated by a blurb in *QST* a few years back, you decided to set up an interstellar communication system and send out your first transmission. According to your calculation, based on NASA's promising Search for Extra-Terrestrial Intelligence (SETI) program, any day now the reply should be reaching planet Earth!

You've waited years for this moment. The suspense builds as you stare at the display. Reflecting, you remember your family and friends trying desperately to talk you out of spending the money and effort on such a venture — indeed, they think you've smoked one too many ICs! The sudden change in the display and the sound of the printer bring you back to reality. Proud, confident and yet amazed, you walk over to the printer and begin reading the contents of The Ultimate QSO.

All of this is not as spaced-out as it sounds. In the literal sense, space is what it's all about. Right now, many dedicated scientists (including a few fanatic amateurs, such as the authors) are seriously looking for life beyond our solar system. The reasoning behind this search can be stated simply. This galaxy contains billions of stars like the sun. Many of these stars probably have planets, and many of these may resemble Earth. It seems very likely that intelligent life has developed on some of these Earth-like worlds and that the inhabitants have developed technologies like ours. Clearly, one of the most essential technologies to intelligent life, anywhere, is that of communication, with all that it implies: radio, television, radio astronomy and, of course, Amateur Radio. These technologies are based on the laws of physics, which are the same in every part of the universe visible to us. Though the shapes may vary, a radio is a radio wherever it may be, and radio waves behave the same way whether they are transmitted from the ham down the street or from Alpha Centauri.

"All very well," you might say, "but I have never seen the alien follies on Channel 2." True enough, but this is partly because your antenna is inadequate and also, perhaps, because the aliens failed to attend the last WARC and are transmitting on the wrong frequency or with the wrong format. On the other hand, it is possible that we are especially lucky and the aliens are transmitting a signal designed for easy reception. Such a signal would have to be powerful, simple and on the "right" frequency (e.g., not on Channel 2).

Finding the Right Frequency

What is the right frequency? As it turns out, there is a region of the spectrum where the combination of star noise and atmospheric noise is at a minimum for any Earth-like planet in our galactic neighborhood. This region, which extends from about 1 to 3 GHz, contains along with many features interesting to radio astronomers not one but two amateur bands. Except for microwave ovens (which also transmit in this band), the density of Earth-originated transmissions is relatively low, at least so far. All of these factors make this band a good one to investigate for signals from beyond the Earth. More important, the low noise level in this band throughout most of our galaxy makes it a prime candidate for carrying interstellar traffic.

As you see, we've got the band all pinned down, if a band of 2 GHz can be considered pinned down, that is. But just to prevent overconfidence, the 3-dB points for star noise plus atmospheric noise are at about 0.3 and 10 GHz, so by doubling your power limits you increase the usable band by a factor of five. Furthermore, if you are an advanced alien, you may wish to transmit signals from outer space rather than from the surface of your planet. This will get rid of atmospheric noise and place the upper 3-dB point of your noise curve at about 125 GHz.

"Stop!" I hear you cry. "It's only getting worse." The point is that, although the 1- to 3-GHz region is the most usable interstellar transmission band from Earth, a much wider frequency band is at least plausible. Most of the searches to date have concentrated on the 1- to 3-GHz region. Basically, they have assumed cooperation from the alien civilizations being sought. This cooperation means that the signal being transmitted for our benefit is either a simple carrier or repetitive pulse that is either beamed at us or transmitted in all directions, and in the band that achieves the greatest distance for a given signal level. If our alien friends can muster an EIRP (real power × antenna gain) of 1 gigawatt, such a signal can be heard from more than 100 light-years away with our largest antenna, the 1000-foot dish at Arecibo.

System Adaptations

A statement like this should not be

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taken on faith, and the reasoning behind it is essential for designing your system to search for the Ultimate QSO. The important factor determining how far away a signal can be received is the following: the inverse square law. Everyone knows that signal power varies inversely with the square of the distance.

What is a little harder to grasp is the immense distances between the stars. One light-year, the distance light travels in a year, is about 10^{13} kilometers, or about 6-trillion miles! Our nearest star is 4 light-years away. To examine 1000 sun-like stars, one must search to a distance of 100 light-years. Under some assumptions, this should be enough to find one alien civilization. However, the nearest civilization may be even farther away than this.

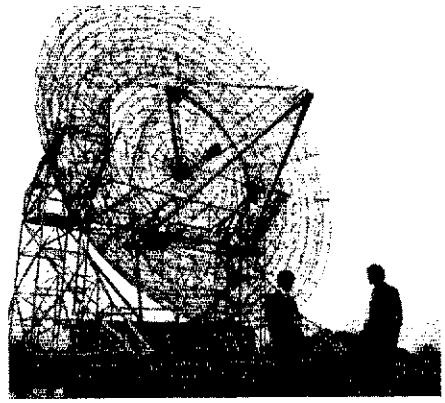
To illustrate the seriousness of this problem in familiar terms, imagine two hams talking on 10 meters with the two 10-dB gain tri-band beams, each running 1 kW, separated by a distance of 10 light-years. The received power in this sytem is 7×10^{-30} W, which yields a whopping signal at the input of your 50-ohm receiver of 1.9×10^{-8} μV. This signal level can be increased by enlarging the antenna areas and increasing the operating frequency, both of which will narrow the antenna beam. At a frequency of 1 GHz, using two parabolic dishes with 20-meter radii, a signal of 10^{-3} μV can be obtained. But this is still a small signal by amateur standards.

There are four solutions to this kind of problem. The first is to raise the power; the second is to further enlarge the antenna; the third is to reduce the receiver temperature; and the fourth is to reduce the receiver bandwidth. More power, at least from the Earth end of the link, is obviously not the solution. Even big DXers start to turn slightly green at average powers greater than 1 MW. A larger antenna is more feasible if it does not have to be steered. This is a possibility if the search for a signal is limited to some particular area of the sky, or if one knows precisely which star to examine.

In the latter case, it is necessary only to prop up your antenna and wait for the Earth to point you in the right direction. In the 1-GHz region of the spectrum, chicken wire is perfectly adequate antenna construction material, and homeowners with large lots could have antennas with hundreds of square meters of area for a moderate cost.

So you've already constructed your antenna using every square meter of available space, including the flower beds and the swimming pool, and still the expected signal is measured in micromicrovolts. What next? The reason the average amateur receiver can receive signals no weaker than about 0.1 μV is due primarily to two factors: the typical receiver temperature and the typical receiver bandwidth. The noise in a receiver is proportional to the product of these factors. You can receive a weaker cw signal than you can an ssb signal because the narrower bandwidth of cw eliminates interfering signals and some of the interfering noise. Lowering the temperature of your receiver can reduce noise in the same way, since random electron motions are less violent at low temperatures. (This is why radiotelescope receivers are often cooled by liquid nitrogen or liquid helium.)

For about $200, an amateur can build a 1-GHz amplifier with a noise temperature of about 100 K (-173° C), about two-thirds of the way between room temperature and absolute zero. Of course, this does nothing about star noise or atmosphere noise. But these figures are smaller than the receiver noise by about a factor of 10, so they can be neglected in calculating your system performance. The amount of noise in your receiver is (1.38×10^{-23})TB watts, where T is the temperature in kelvins, and B is the bandwidth in hertz. If the signal power is about equal to the noise power, the signal can be received, although with difficulty. Therefore, the required signal is $(6.9 \times 10^{-22}\ \text{TB})^{1/2}$ volts for a 50-ohm receiver.



Scott Rathjen, W7SW (left), and Dr. Kent Cullers, WA6TWX, are dwarfed by the Stanford Research Institute 150-foot radio telescope at Menlo Park, California. The dish may someday meet the challenge of making the "ultimate QSO."

In theory, any signal can be received if the bandwidth is narrow enough. However, narrow filters will ring for a time of about 1/B seconds. Thus, the narrower the filter, the slower the signal being received must change, so that the ringing in the filter does not mask the cw information. This means that if your alien contact is very far away and your receiving and antenna systems are not up to the job, you can still communicate with it using very narrow filters and very slow cw. Also, the speed of light being what it is, don't hold your breath. It is for reasons such as these that searches for and communication with alien intelligences will use computers extensively. Fortunately for the amateurs in the field, computers are getting less expensive.

Expanding the Search

So, after all this, what can you do? All of the searches conceived so far have been specialized; that is, they have concentrated on certain stars, certain frequencies or certain signal types. These special cases were selected on the basis of intuition and inspired guessing. So far, only a few hundred stars have been searched over a very few megahertz of frequency for only two basic types of signal: carriers and pulses. To search our galaxy thoroughly, our efforts would have to be expanded by a factor of more than 1 billion.

A machine that is the computational equivalent of millions of narrow filters is now being designed. Whether and when it is built is entirely uncertain; but if it is built, the machine could process the equivalent of 13 volumes of the *Encyclopaedia Britannica* every second for about five years. At the end of this time, we would have explored fewer than 1000 nearby solar-type stars between 1 and 3 GHz. The point of all this is that searching our galaxy is an enormous task.

One thing you can do is wait. Someday, someone will find a signal and, using a backyard antenna, you too could listen in. More interestingly, however, you can search for extraterrestrial signals now. There may be a strong signal out there that has not been discovered simply because no one has looked for it! *Most of the sky has not been searched in the 1- to 3-GHz band for signals at a level good amateur receivers can reach.* All you need is a fortunate guess about the frequency and direction. Total equipment cost, assuming a fixed antenna, can be less than $1000. Investing another $2000 can get you a steerable dish antenna that will allow you receive satellite TV and embark on a radioastronomy program. The universe is wide open and waiting for exploration, and you too can get in the act.

If exploring the universe for its own sake is not really your thing — your mind being of the practical kind — think of the fame (and the fortune) you'll get as the discoverer of the first extraterrestrial signal! One final note: After your Ultimate QSO, take the money and run. Don't wait for your QSL card.

Scott M. Rathjen, W7SW (ex-WA7LDZ), graduated from the University of Washington with an MEE. Formerly a design engineer with the Boeing Aerospace Company, Scott currently is the team leader of the Planetary Detection Feasibility Study and a member of the Search for Extra-Terrestrial Intelligence (SETI) program at the NASA-Ames Research Center in California. As WA7LDZ, he achieved 5BWAS and DXCC.

Dr. D. Kent Cullers, WA6TWX, became a radio amateur in 1961. As a graduate student at the University of California in Berkeley, he became interested in vhf and uhf Amateur Radio while designing a communications system for scientific balloons. Dr. Cullers now develops computer algorithms to be used in the first phase of NASA's SETI program. In his spare time, he experiments with uhf and is trustee of a repeater on Grizzly Peak in the Berkeley hills.

You and Your Special Service Club

Your ARRL Board of Directors has set the challenge. The rest is up to you.

By Sally O'Dell,* KB1O

The ARRL Board of Directors has approved a new class of affiliated club — Special Service Clubs (SSC). What will it take to join the ranks of these clubs who go the extra mile? What will set these clubs apart in the years to come?

They will guide and lead the way as Amateur Radio develops and grows. In the beginning, hams developed spark-gap and learned how a signal could move through the air with a special type of magic. Later, we worked with tubes and learned still more. Today, with solid-state devices and miniaturization the norm, we are still branching off in new directions. We are looking toward the future and wondering what it will bring. The Special Service Club Program can help us shape that future into a form we want; we'll need active, effective, involved and informed clubs.

The affiliated-club category consists of the ham clubs that successfully complete the affiliation process (see Fig. 1); maintain 51% ARRL membership; and communicate with us regularly regarding officer changes, address of liaison, activities and other club information each year. (Report forms for the following year are mailed each December to active affiliated clubs and are due back during the first quarter.) Today, approximately 1750 clubs in the U.S. and Canada are actively affiliated with the American Radio Relay League.

Special Service Clubs will be those well-rounded, general-interest, actively affiliated clubs that are continuously working toward being effective representatives of Amateur Radio and the ARRL in their communities. They will truly *be* Amateur Radio locally. Those activities best handled at the local level will pass to the SSC, which will become an integral part of the field organization. The goal is greater participation and improved effectiveness in those areas where *you* and your club are the experts.

What Is It?

The Special Service Club Program won't begin officially until March 1, 1983, when your club (with the assistance of your Affiliated Club Coordinator) will complete an application.[1] Your club may be close to qualifying as a Special Service Club now if it is active in a variety of areas. Activities carried out since September 1 may count toward your first year as an SSC. The criteria for becoming an SSC have intentionally been left flexible, as different locales present different challenges, problems and needs. And you'll work with your section's Affiliated Club Coordinator (ACC) in planning your programs. The decision as to whether your programs qualify will be made at the section level.

What are these program areas? Each SSC will establish a meaningful program in each of six major categories: Public Relations, Emergency Communications, Training, Technical Advancement, Other Operating Activities, and Miscellaneous Activities. As the actual programs and their suitability are left to the club and ACC to decide, we offer only suggestions here. Whatever you choose must be coordinated with and agreed on by your section's Affiliated Club Coordinator.

Public Relations encompasses all sorts of activities that place Amateur Radio in the public eye. Speak to your local newspaper columnists and TV/radio reporters and describe an Amateur Radio event that will take place shortly (Field Day, an exhibit at the local library, a display at the local mall, your Simulated Emergency Test exercise, a well-known guest speaker at your club meeting, an open house with the movie, *QST — The World of Amateur Radio . . .*). Suggest that a story about a local ham or the club president would be a good piece for the family section of the local paper. Ask the reporter to bring a photographer to catch the subject talking to Australia or the USSR on equipment that any average ham has in the shack. Some cities have a regular column on ham radio in the weekly or daily paper. What ideas can you offer to your affiliated club?

Often, common problems resulting from TVI, RFI, CATVI, and antenna or zoning ordinances can benefit from effective PR programs. Such problems can usually be resolved in a way that reflects favorably on Amateur Radio. Form a committee in your club to assist in clearing up these problems in town. After all, you have the most at stake — who cares most about getting the job done well? Routinely pass news about outstanding amateur contributions in the field to the ARRL section Public Information Officer and to ARRL Hq. for regional and national dissemination. Periodically, reinform your federal, state and local officials about Amateur Radio. Any of these ideas, or others of your own, would be deemed meaningful programs in the Public Relations category. Note that for Amateur Radio to flourish you'll need ongoing activity, not simply a one-shot effort, to develop a presence in your community.

While you are active in Public Relations, you can also become involved in the **Emergency Communications** category of the program. If your club has already been active in emergency communications for years, you may need only to review your procedures, tie up the loose ends, and make sure all members are adequately trained in the proper techniques. The objective is to develop your club into an effective, efficient emergency-communications resource in your community. We all hope your services will never be needed, but, if disaster strikes, your local RACES/ARES organizations will *know* they can count on your Special Service Club to field a competent, trained team of skilled communicators.

You and Your SSC

The Special Service Club program will become effective on March 1, 1983. After this date, Affiliated Club Coordinators will begin accepting applications from existing affiliated clubs. Application forms and guidelines will be mailed to actively affiliated clubs in early 1983.

[1]Notes appear on page 64.
*Club Program Manager, ARRL

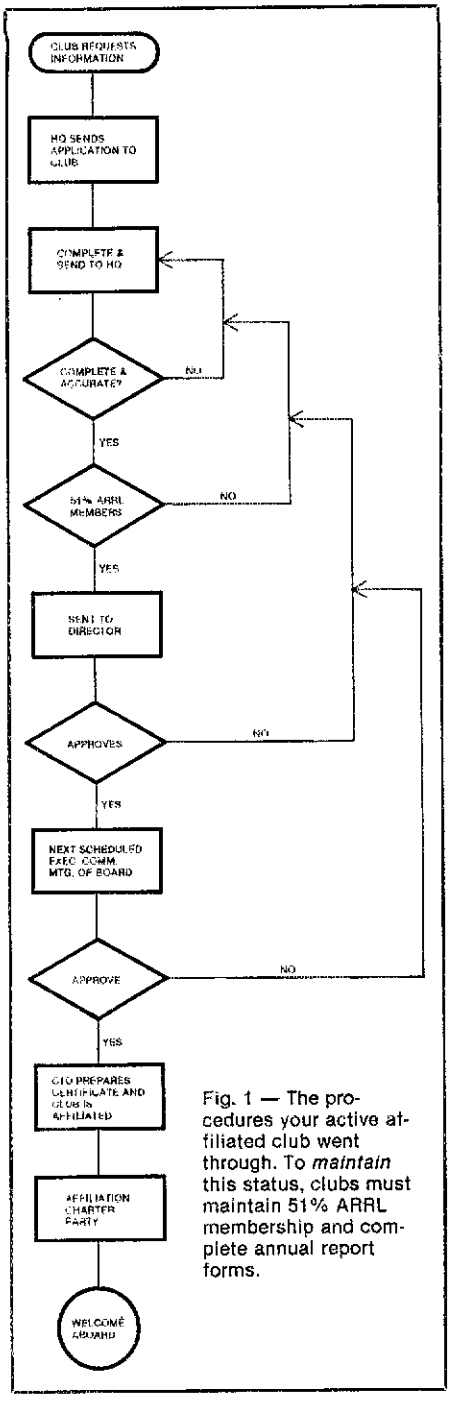


Fig. 1 — The procedures your active affiliated club went through. To *maintain* this status, clubs must maintain 51% ARRL membership and complete annual report forms.

One way to help maintain skills is to ensure regular representation of your club's area of coverage in the appropriate National Traffic System nets. You should educate your club members so that each understands where he or she fits in the emergency-communications plan and what the proper emergency-communications techniques are. (All members, whether they participate actively in other emergency communications activities or not, should be knowledgeable and capable of assisting effectively.)

The third category for these active, involved clubs is **Training**. Your club can participate in or organize licensing classes for new or upgrading amateurs — or both — at least once a year. You can provide some form of "continuing education" for club members once they attain the class of license they desire, or your club can maintain a program to encourage and assist new amateurs in getting on the air. Elmering should not be a lost art within Special Service Clubs. Any of these would serve as meaningful training programs if done conscientiously.

Several clubs that responded to the initial report of the ARRL Long-Range Planning Committee expressed doubt about the **Technical Achievement** category. "How can we be expected to develop the state of the art or make significant contributions to the technical side of Amateur Radio?" sounded loud and clear. That's the point: Your club is not expected to cut new ground. A Special Service Club, however, *is* expected to bite into a few technical areas each year and, through discussion, foster a positive, open-minded attitude toward unfamiliar topics. A program could consist of sponsoring a local working group for a specific technical activity, depending on your members' interests. You might investigate ATV, moonbounce, computers, OSCAR or vhf propagation, with the stipulation that news of group activities be shared with the club at large (Aha! Another meeting night program) and with the ARRL section Technical Coordinator.[2]

Another way to foster technical awareness and familiarity is to maintain an up-to-date club library of Amateur radio and technical publications for the members' use, or to contribute them to the local public library. You could also introduce club members to new activities as a club, such as designing circuits and building and testing club projects. Any of these ideas, or others that *you* can develop with your Affiliated Club Coordinator, would benefit the club and individuals in it; after all, one of Amateur Radio's reasons for being is technical competence!

The **Other Operating Activities** section consists of just that. The focus is on-the-air operating. A partial menu of possible activities includes sponsoring programs that are responsive to the work of the ARRL Interference Task Force. (These programs should be coordinated through your section OO/RFI Coordinator.) You can encourage high operating standards or participate as a club in Field Day and at least one other ARRL operating activity. Many clubs encourage "operating etiquette" with new and aspiring hams through a get-them-on-the-air-properly Elmer program. Then there are sponsoring repeaters, traffic nets (all nets should be coordinated), traffic net training or managing QSL bureaus. What meaningful program are you doing now that would fall within this category? Let your ACC know.

The last category is **Miscellaneous Activities.** Your club should establish ongoing programs or activities in at least three areas, or propose suitable substitutes. The more of these areas covered by your club, the more effective you will be.

Your club can begin by maintaining a permanent club address (such as a P.O. Box) and a telephone directory listing for inquiries and referrals, to establish a local ARRL and Amateur Radio "presence." Plan on passing along ARRL bulletins to club members on a regular basis. One established method is through a weekly net or a monthly club newsletter (don't forget to send copies to your Division Director, Section Manager, Affiliated Club Coordinator and Hq.). Monthly meetings will draw your members into a close-knit group of interested people. You can also chronicle your club's history. Many clubs produce (and update as necessary) a brochure on Amateur Radio activities in the club's particular locale.

Focus on Youth

Young people are becoming interested in Amateur Radio through club-sponsored and -supported Amateur Radio Explorer Posts. Many clubs work with local educators to get Amateur Radio into the local schools, either as an extracurricular club activity or as an official part of the science curriculum. Your club can help set up a school station and follow it through over the years or conduct an Amateur Radio demonstration. (OSCAR tracking and communication is a popular program.) Another activity involving youth is conducting a demonstration for a local Scout troop. Try sponsoring a scholarship or participating in an active Big Brother/Sister program. You can provide a pool of merit badge counselors for the BSA Radio Merit Badge, or host a local scout troop for the "Jamboree-on-the-Air" in October.

Has your club considered coordinating efforts with the Hq. staff to produce specific slide/tape or videotape presentations? These can be distributed later to other affiliated clubs through the film-lending library. The time to think about coordinating your efforts is now. Your Special Service Club can participate in leadership seminars or assume responsibility for administering specific annual national ARRL projects.

One possibility is an annual photo contest. Or, you might consider producing an annual Field Day slide show. Perhaps your club would enjoy sponsoring an OSCAR 8 anniversary commemorative operating event. You can create club technical/tutorial projects that can be adopted by other clubs into their programs or continuing education. These could arise from your previous year's Technical Advancement activity.

In addition, you can provide technical assistance to those who are unable to do certain tasks themselves, such as assist

hams who can no longer do antenna work.

Remember to ensure your club's representation at "League Official" meetings called by your Director.

What's In It for Us?

Each of the special segments of this program represents a lot of work. Why would any club want to become involved? As an Amateur Radio operator and a member of a club, you're probably involved in many of these activities already. Without much more effort, your club will qualify. There are some additional reasons. One terrific reason to participate is the recognition that Special Service Clubs will have as members of the group. The clubs will be fully supported by Hq. and listed in *QST* in the earliest available issue after approval.

Special Service Club members will be permitted to identify themselves as such on their QSLs, stationery, newsletters, T-shirts and other club material. A suitable insignia will be available from Hq. Clubs will be responsible for distribution to members.

Special Service Clubs will be listed in a special club section of the *ARRL Repeater Directory*. Each club will be identified as one that has a strong ARRL commitment. Relevant contact and meeting information will be given. This will help your club steer the visiting ham in a friendly direction.

We hope to be able to offer these other benefits to Special Service Clubs. They will receive from Hq. lists of new licensees in their area. New ARRL members in the area will be referred to them automatically. Through their greater involvement with League officials, they'll receive closer personal attention. The clubs will have the authority to process and present certain ARRL awards. Affiliated Club Coordinators will offer leadership and training seminars to club leaders at division conventions. Finally, the clubs will receive news and pertinent information quickly from a variety of sources.

We want to serve you as effectively as possible to help your club grow and become a strong Amateur Radio presence in your community. Contact Hq. with your suggestions on other benefits that we can offer SSCs. If we can, we will work them into the program.

Accept the Challenge

The decision is yours. Now what do you do? The first step for an active club is to continue doing all the good things that you're doing right now. Clubs that are and have been active (since September 1982) in the six specific categories should continue with their activities. When they apply (after March 1, 1983) these clubs will be credited for the time and effort that they have spent already. Other clubs that have not begun an active program should start planning now.

Finding Your ACC

The Affiliated Club Coordinator is a new section-level appointment in the restructured ARRL Field Organization. Because the transition period to the new structure (headed by a Section Manager in each section) will take up to two years, not every section will have an ACC on January 1. Check with your SCM/SM, page 8 of every *QST*, for details.

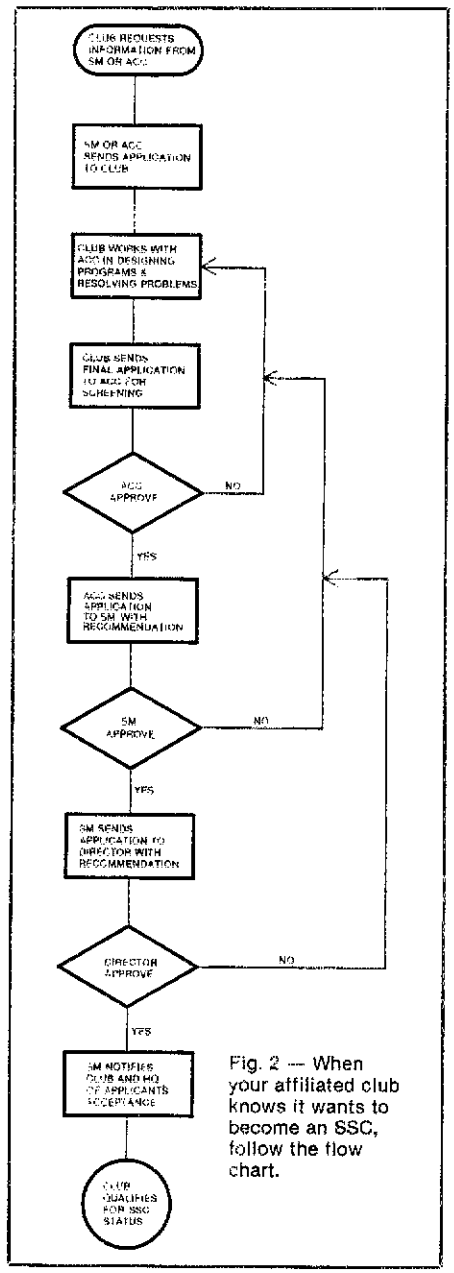


Fig. 2 — When your affiliated club knows it wants to become an SSC, follow the flow chart.

The SSC program will kick off on March 1 and application forms will be distributed at that time. Any actively affiliated club may request an SSC application form from its Affiliated Club Coordinator. The key to the program's success is your club's striking a close working relationship with the rest of the field organization. When all questions concerning the application have been settled, the Director, SM and ACC will approve the application, notify the club of its acceptance, and inform Hq. On notification, Hq. will begin working with the club and the ACC (see Fig. 2).

Every SSC's program of activities will be reviewed each year. The annual cycle for each SSC will officially begin with the first day of the quarter following its acceptance. Hq., however, will begin working with the new Special Service Club candidates immediately. Periodically during the cycles, each participating club's progress will be reviewed within the section. These very informal reviews are designed to spot potential problems and to improve our working together. Late in a club's annual cycle, the Special Service Club and the Affiliated Club Coordinator will discuss the previous cycle and the club's strengths. They will also discuss ways to improve weak areas and whether the club wishes to renew its commitment for the following year.

The end-of-cycle review will not be a unilateral evaluation. It will not determine, yes or no, whether a club has met its commitment or whether to deny it Special Service Club status. The review will be a process by which all those involved are helped to better meet the needs of the others and to provide more effective service within the scope of their responsibilities. In the rare case in which differences simply cannot be resolved after a sincere, extended effort, either the club or ARRL may withdraw from the program.

At the end of a year, having successfully established and maintained programs in the specified areas (as determined by the Affiliated Club Coordinator), a Special Service Club will be presented with a certificate of recognition and appreciation for its efforts during the year on behalf of Amateur Radio and the ARRL. Certificates will be presented at an appropriate ceremony where possible.

This program is *your* program. It will evolve in whatever direction you steer it. Assess your club's resources and your members' desires. Then go out and develop your ideas. You might not realize how many good ideas you have until you start putting them down on paper and discussing them as a club. Your Director, Section Manager, Affiliated Club Coordinator and Hq. staff look forward to working with you in creating a stronger presence of Amateur Radio in your community.

Notes

[1]Editor's Note: The Affiliated Club Coordinator (ACC) is a new field official responsible for liaison between the affiliated clubs in the section and the rest of the ARRL organization. Appointed by the Section Manager, the ACC assists affiliated clubs in meeting the League's objectives at the local level, *including* the training of new amateurs and the sponsoring of hamfests.

[2]The Technical Coordinator position is explained in "New Life for ARRL Sections," June 1982 *QST*, p. 55.

[3]D. Sumner, "New Life for ARRL Sections," June 1982 *QST*, p. 54.

QST Abbreviations List

These abbreviations, compiled and updated annually, appear in QST and other League publications. Keep them handy for easy future reference.

A — ampere
ac — alternating current
ACC — Affiliated Club Coordinator
ACNF — AMSAT coordination and network frequency
A/D — analog-to-digital
af — audio frequency
afc — automatic frequency control
afsk — audio frequency-shift keying
agc — automatic gain control
Ah — ampere hour
alc — automatic load (or level) control
a-m — amplitude modulation
A.M. — morning
AMSAT — Radio Amateur Satellite Corporation
anl — automatic noise limiter
AOS — acquisition of signal
ARA — Amateur Radio Association
ARC — Amateur Radio Club
ARES — Amateur Radio Emergency Service
ARS — Amateur Radio Society; Amateur Radio station
ASCII — American National Standard Code for Information Interchange
ASSC — Amateur Satellite Service Council
ATV — amateur television
avc — automatic volume control
AWG — American wire gauge
az-el — azimuth-elevation

BASIC — beginner's all-purpose symbolic instruction code (computer language)
b — byte; a group of bits or binary digits, usually eight
bc — broadcast
BCD — binary-coded decimal
BCI — broadcast interference
bcl — broadcast listener
bit — binary digit
BFO — beat-frequency oscillator
BM — bulletin manager
BPF — band-pass filter
BPL — Brass Pounders League
bps — bits per second
BPT — bipolar transistor
BW — bandwidth
BWL — loaded bandwidth

C — Celsius
CAC — Contest Advisory Committee
CATVI — cable-television interference
CB — citizens band
CCIR — International Radio Consultative Committee
CCITT — Consultative Committee for International Telegraph and Telephone, a part of ITU
ccw — coherent cw; counterclockwise
c.d. — civil defense
CD — Communications Department (ARRL)
CMOS — complementary-symmetry metal-oxide semiconductor
coax — coaxial cable or connector
COR — carrier-operated relay
CP — code proficiency (award)
CPU — Central Processing Unit
CRRL — Canadian Radio Relay League
CRT — cathode-ray tube
CSMA — carrier sense multiple access
ct — center tap
CTCSS — continuous tone-coded squelch system (PL)
cw — continuous wave (code); clockwise

D/A — digital-to-analog
dB — decibel
dBc — decibels referenced to carrier level
dBd — antenna gain referenced to a dipole
dBi — antenna gain referenced to isotropic; a dipole has a gain of 2.14 dBi
dBm — decibels referenced to 1 mW
DBM — doubly balanced mixer
dc — direct current
D-C — direct conversion
DEC — district emergency coordinator
DEMUX — demultiplexer
DF — direction finder; direction finding
DIP — dual in-line package
DOC — Department of Communications (Canada)
dpdt — double-pole double-throw
dpst — double-pole single-throw
dsb — double sideband
DTL — diode-transistor logic
DTMF — dual-tone, multi-frequency
DVM — digital voltmeter
DX — long distance
DXAC — DX Advisory Committee
DXCC — DX Century Club

E — voltage
EAROM — electrically alterable read-only memory
EC — emergency coordinator
ECAC — Emergency Communications Advisory Committee
ECL — emitter-coupled logic
ECO — electron-coupled oscillator
eirp — equivalent isotropically radiated power; erp referenced to an isotropic antenna
EME — earth-moon-earth (moonbounce)
emf — electromotive force (voltage)
EMI — electromagnetic interference
EMP — electromagnetic pulse
EOC — emergency operations center
EPROM — erasable programmable read-only memory
EQX — equator crossing
erp — effective radiated power
EUV — extreme ultraviolet radiation

f — frequency
F — farad; Fahrenheit
FAX — facsimile
FCC — Federal Communications Commission
FD — Field Day
FET — field-effect transistor
FF — flip-flop
FL — filter
fm — frequency modulation
FMT — Frequency Measuring Test
fot — optimum working frequency
FSD — full-scale deflection
fsk — frequency-shift keying
ft — foot

g — gram
GaAs FET — gallium arsenide field-effect transistor
GDO — grid-dip or gate-dip oscillator
GHz — gigahertz
gnd — ground

H — henry
HAAT — height above average terrain
HDLC — high-level data link control
hf — high frequency
HFO — heterodyne-frequency oscillator
hpf — highest possible frequency
Hz — hertz

I — current
IARU — International Amateur Radio Union
IC — integrated circuit
i-d — identification, identifier
ID — inside diameter
i-f — intermediate frequency
IMD — intermodulation distortion
in. — inch
in./s — inches per second
I/O — input/output
IRAC — Interdepartment Radio Advisory Committee
IRC — International Reply Coupon
isb — independent sideband
ITF — ARRL Interference Task Force
ITU — International Telecommunication Union
IW — Intruder Watch

J — joule
j — indicator for reactive component of an impedance (+j inductive; −j capacitive)
JFET — junction field-effect transistor

K — kilobyte, Kelvin
k — kilo, 1000
KB — keyboard
kg — kilogram
kHz — kilohertz
km/h — kilometers per hour
kW — kilowatt
kWh — kilowatt hour

L — inductance
lb — pound
L-C — inductor-capacitor
LCD — liquid crystal display
LED — light-emitting diode
lf — low frequency
lhcp — left-hand circular polarization
LMO — linear master oscillator

LO — local oscillator, League Official
Loran — long-range navigation
LOS — loss of signal
lp — log periodic
lpm — letters per minute
lsb — lower sideband
LSB — least-significant bit
LSI — large-scale integration
luf — lowest usable frequency

m — meter (distance or band)
mA — milliampere
mAh — milliampere hour
MARS — Military Affiliate Radio System
MDS — minimum discernible signal
mf — medium frequency
mH — millihenry
MHz — megahertz
mi — mile
mike — microphone
mini-DIP — dual in-line package, 8 pins
mi/h — miles per hour
mi/s — miles per second
mix — mixer
mm — millimeter
MO — master oscillator
modem — modulator/demodulator
MOS — metal-oxide semiconductor
MOX — manually operated switching
ms — millisecond
m.s. — meteor scatter
m/s — meters per second
MSB — most-significant bit
MSI — medium-scale integration
MSTV — medium-scan television
muf — maximum usable frequency
MUX — multiplex; multiplexer
mV — millivolt
mW — milliwatt

nbfm — narrow-band frequency modulation
nbvm — narrow-band voice modulation
n.c. — no connection
NC — normally closed
NCS — National Communications System
ncs — net control station
NF — noise figure
nH — nanohenry
NIAC — National Industry Advisory Committee
NiCd — nickel cadmium
NM — net manager
NMOS — n-channel MOS device
NO — normally open
NOI — Notice of Inquiry
npn — negative-positive-negative
NPRM — Notice of Proposed Rule Making
NR — Novice Roundup (contest)
ns — nanosecond
NTIA — National Telecommunications and Information Administation
NTS — National Traffic System (ARRL)

OBS — official bulletin station
OD — outside diameter
OES — official emergency station
OO — official observer
op amp — operational amplifier
ORS — official relay station
osc — oscillator
OSCAR — Orbiting Satellite Carrying Amateur Radio
OTA — operational transconductance amplifier
OTC — Old Timer's Club
oz — ounce

P — power
PA — power amplifier
pc — printed or etched circuit
PEP — peak envelope power
PEV — peak envelope voltage
pF — picofarad
PIA — public information assistant
PIO — public information officer
PIV — peak inverse voltage
pk — peak
pk-pk — peak-to-peak
PL — Private Line (Motorola trademark)
PLL — phase-locked loop
pm — phase modulation
P.M. — afternoon/night
PMOS — p-channel MOS device
pnp — positive-negative-positive
pot — potentiometer
ppd — postpaid
PRAC — Public Relations Advisory Committee
PROM — programmable read-only memory
PRV — peak reverse voltage
PSHR — Public Service Honor Roll
psk — phase-shift keying
PTO — permeability-tuned oscillator
PTT — push-to-talk
PV — photovoltaic
PVC — polyvinyl chloride

QCWA — Quarter Century Wireless Association
QRP — low power (less than 10-W input)

R — resistance
RACES — Radio Amateur Civil Emergency Service
RAM — random access memory
R/C — radio control
R-C — resistor-capacitor
RCC — Rag Chewers Club
revr — receiver
rev/min — revolutions per minute
rf — radio frequency
rfc — radio-frequency choke
RFI — radio-frequency interference
rhcp — right-hand circular polarization
RIT — receiver incremental tuning
RM-(number) — number assigned by FCC to a petition for rule making
rms — root-mean-square
RO — radio officer
ROM — read-only memory
RS — Radiosport Satellite (USSR)
RST — readability-strength-tone
RTL — resistor-transistor logic
RTTY — radioteletype

s — second
s.a.e. — self-addressed envelope
s.a.s.e. — stamped s.a.e.
SCM — section communications manager
SCR — silicon-controlled rectifier
SEC — section emergency coordinator
SET — Simulated Emergency Test
SGL — state government liaison
shf — super-high frequency
SM — section manager
S.M. — silver mica (capacitor)
SNR or S/N — signal-to-noise ratio
spdt — single-pole double-throw
spst — single-pole single-throw
SS — Sweepstakes; spread spectrum
ssb — single sideband
SSC — Special Service Club/AMSAT Phase III special service channels
SSTV — slow-scan TV
STM — section traffic manager
SWL — shortwave listener
SWR — standing-wave ratio
sync — synchronous, synchronizing
SYNCART — synchronous satellite carrying Amateur Radio transponder

TA — technical advisor
TC — technical coordinator
TCA — time of closest approach
TCC — Transcontinental Corps
TE — transequatorial (propagation)
tfc — traffic
THz — terahertz
THD — total harmonic distortion
tpi — turns per inch
T-R — transmit-receive
T-T — Touch-Tone, trademark of Bell Telephone Co.
TTL — transistor-transistor logic
TTY — teletypewriter (from Teletype, trademark of Teletype Corp.)
TV — television
TVI — television interference

uhf — ultra-high frequency
UJT — unijunction transistor
UoSAT — University of Surrey educational/research satellite (Great Britain)
usb — upper sideband
UTC — Universal Coordinated Time

V — volt; voltage
VCO — voltage-controlled oscillator
VCXO — voltage-controlled crystal oscillator
VFBO — variable-frequency beat oscillator
VFO — variable-frequency oscillator
vhf — very-high frequency
vlf — very-low frequency
VMOS — vertical power FET
VOM — volt-ohm-milliammeter
VOX — voice-operated switching
VR — voltage regulator
VRAC — VHF Repeater Advisory Committee
VSWR — voltage standing-wave ratio
VTVM — vacuum-tube voltmeter
VUAC — VHF-UHF Advisory Committee
VXO — variable crystal oscillator

W — watt
WAC — Worked All Continents
WARC — World Administrative Radio Conference
WAS — Worked All States
wbfm — wide-band fm
wpm — words per minute
wVdc — working voltage, dc

X — reactance
xcvr — transceiver
xmtr — transmitter
xtal — crystal

Z — impedance
Z — see UTC

5BDXCC — Five-Band DXCC
5BWAC — Five-Band WAC
6BWAC — Six-Band WAC
5BWAS — Five-Band WAS

° — degrees
α — alpha; angles; common-base forward current-transfer ratio of a bipolar transistor
β — beta; angles; current gain of common-emitter transistor amplifiers
γ — gamma; angles
Δ — delta; increments
δ — gamma; angles
ε — epsilon; base of natural logarithms (2.71828)
θ — theta; angles
λ — lambda; wavelength; longitude
μ — mu; micro (10^{-6}); amplification factor; permeability
μP — microprocessor
π — pi; 3.14159
Σ — sigma; summation
T — tau; time constant; time phase displacement
ϕ — phi; angles; latitude
ψ — psi; angles
Ω — omega; resistance in ohms
ω — omega; angular velocity, $2\pi f$

Happenings

Conducted By Carol L. Smith,* AJ2I

- *U.S. Amateurs, Welcome to 10 MHz*
- *Cable-Television Interference — Storm Still Brewing*
- *Cable-TV Company Fined $6000*
- *New Transmitting-Power Measurements for Amateurs Proposed*
- *Cordless-Telephone Waiver — Temporary Solution to a Sticky Situation*

More Cable Television Interference — RM-4040 Update

The CATVI skirmish heated up when Storer Broadcasting Company submitted its Reply Comments on RM-4040 on September 15, *setting off a flurry of further legal activity.* (For more information about the League's efforts to get cable television off amateur frequencies, see "Cable Capsule," p. 56, this issue.) In its Comments, Storer claimed that

• *the situation is not as serious as ARRL contends.* "There have been few documented instances of interference between cable systems and amateurs," they stated.

• *RM-4040 would adversely affect the public interest.* "The only certain effect of ARRL's drastic proposal would be to withdraw program service from the public."

• *the situation is not as widespread as ARRL says.* "This result [withdrawing program service from the public, as Storer claimed — Ed.] is clearly unwarranted from the few specific instances where cable system interference has been documented."

• *amateurs and the cable industry can resolve the problem voluntarily.* "Consistency with the FCC's 'unregulatory' goal would suggest that the same faith should now be placed in cable and amateur industry groups to voluntarily resolve interference problems." Stating further that "cable operators and Amateur Radio operators working together can tailor a solution satisfactory to all," Storer offered remedies to the CATVI problem through one of its staff engineers. He suggested *(a)* "Many Amateur Radio operators' claims of cable television interference occur when both the amateur and the cable system are operating within all FCC rules." *(b)* Amateurs should "move to [frequencies] where there will be less interference. Since amateurs are free to roam within the entire area of their band assignments, *there is no value in the cable* operator's offsetting the TV channels, as we do to accommodate FAA stations." *(c)* Amateurs should turn their beam antennas away from the source of interference.

The ARRL quickly filed a motion to strike Storer's Reply Comments from the record. The League asserted that

• *Storer's Reply Comments were not a "reply" to anything, but rather Storer's own opinion on the subject of CATVI.* In fact, Storer had not submitted comments in this proceeding. By filing its Reply Comments at the last minute, ARRL declared, "Storer has carefully made certain that the League and others would have no opportunity to reply to its comments merely by submitting them as Reply Comments. This is patently unfair to the League and should not be permitted. As Storer failed to file its comments by the September 1 comment date, its comments should be stricken and deleted from the record in this proceeding."

• *Storer attempted to irresponsibly minimize the problem, and that reflects a serious lack of understanding of the situation.* "Without the slightest support, Storer claims that the relief requested by the League in this proceeding is 'clearly unwarranted from the few specific instances where cable system interference has been documented.' The League has documented in its Reply Comments, and the Commission has documented in its own files, many cases of CATVI occurring in over half of the states in the United States. Cases of CATVI are increasing faster than the Commission can address them. Storer's attempt at minimizing the problem is thus an irresponsible one under the circumstances."

• *Storer's comments show their ignorance of the source of the interference problem.* Storer tried to relate two totally different situations — (a) FCC's delegation of amateur licensing exam administration to volunteers, and (b) the resolution of interference problems to the private sector. "Particularly intolerable," said the League, "is Storer's statement that the ARRL, now being given amateur testing responsibilities, should certainly be able to assist its members in avoiding interference with cable systems operating within FCC specifications. This statement is a perfect example of why the League's petition was filed in the first place. CATVI is not a problem with Amateur Radio. Amateurs *cannot* avoid interference on amateur frequencies from leaking cable systems, nor can they avoid the interference *caused to cable subscribers from* properly operating amateur transmitters when the amateur signals access the cable as a result of a now common lack of system integrity."

• *the solutions proposed by Storer's staff engineer are totally unsatisfactory.* "If there is interference between the two services as a result of cable leakage," the League declared, "then regardless of the level of leakage the cable system is not operating in accordance with Section 76.613(b) of the Rules, which requires that the operator of a cable television system which causes harmful interference shall promptly take appropriate measure to eliminate the harmful interference. Cable systems routinely ignore this requirement, believing that the 'permissible' leakage levels are the only criteria for determining cable operator responsibility in interference cases."

*Membership Services Assistant, ARRL

Hams Not Alone — Other Services Plagued by CATVI

According to an FCC news release, the Engineer-in-Charge of the Commission's San Diego, California, Field Office issued, on October 15, 1982, a Cease Operations Order to Times Mirror Cable Television, which serves the city of Escondido, California. The Order directed Times Mirror Cable to cease its use of Channel F (151.25 MHz). The cable company's operations were causing "harmful interference to communications of the California Department of Forestry."

Cable TV Company Fined

Sonic Cable TV, operator of cable systems in Grover City, Arroyo Grande and Pismo Beach, California, must pay $2000 for having "signal leakage in excess of that permitted by the rules," and $4000 for "failing to correct harmful interference to Amateur Radio operators." According to an FCC News Release, local amateurs had complained that Sonic's cable system was causing harmful interference to their communications. During subsequent inspections, Commission engineers found instances of "excessive signal leakage" and substantiated the presence of harmful interference at various local Amateur Radio operators' homes located in communities served by Sonic.

"It was apparent," the Commission added, "that Sonic had failed to take adequate steps to resolve harmful interference *and excessive signal leakage on its* systems, and *both of these violations threatened the FCC's regulatory goal of compatibility between the shared use of frequencies by cable systems and various co-located over-the-air licensed services.*" [emphasis added]

Sonic Cable TV is not unknown to League members living in that area. In fact, several amateurs had complained to ARRL about Sonic's interference, and the League had attached some of those complaints to its Reply Comments to RM-4040.

The League further renounced the Storer engineer's suggestion that if a fixed amateur station receives interference from cable leakage, the amateur station operator should rotate his or her beam antenna away from the cable leakage source. "This is absurd. Many, probably most, U.S. amateur stations have omni-directional VHF antennas, which cannot be rotated. Further [the engineer] is actually suggesting that amateurs not communicate with other amateurs in certain directions, depending on the orientation of their antennae in relation to the leaking cables. This constitutes a de facto frequency reallocation and an obvious deprivation of the ability to carry on effective emergency and other public service communications as a result of cable leakage.

"The remainder of the [engineer's] suggestions are not 'solutions' at all, but an effort by Storer to usurp amateur frequencies," the League continued. "If this is Storer's idea of amateur 'cooperation' in resolving interference complaints, no cooperation from the amateur community may be expected. The League and its members are willing to cooperate in resolving instances of cable interference, but not to the point of acquiescence in deprivation of those frequencies assigned to the Amateur Radio Service."

Storer retaliated by filing an Opposition to the ARRL's Motion to Strike. Storer said its Reply Comments were "intended to amplify and clarify several arguments in NCTA's Comments, as well as to offer responsive alternatives to the sweeping 'remedies' suggested by numerous RM-4040 supporters." They urged that the League's motion be dismissed.

"If this is Storer's idea of amateur 'cooperation' in resolving interference complaints, no cooperation from the amateur community may be expected."

10 MHz — INTERIM AUTHORIZATION GRANTED

October 28, 1982, was an historic day for U.S. amateurs, who have long been awaiting the first use of the new WARC bands. At 3 P.M., EDT, the FCC temporarily released portions of the 10-MHz (30-meter) band for General, Advanced and Extra Class licensees on a *secondary, non-interference* basis.

As part of its campaign to have WARC-allocated frequencies made available for U.S. amateurs as quickly as possible, the ARRL had urged that the FCC release 10.100-10.150 MHz immediately. The League stressed that 10 MHz would help bridge the gap between the bands presently available at 7 and 14 MHz. Amateurs would be better able to fulfill their public service obligations to foster international goodwill and to enhance their ability to provide reliable, voluntary noncommercial communications. The Commission agreed with these objectives, and said, "Although the ratification process for the Final Acts of WARC-79 is not yet complete, we believe that the public interest supports amendment of our rules to allow amateur operators in the United States temporary use of the frequencies 10.100-10.109 MHz and 10.115-10.150 MHz on a secondary, non-interference basis. (ITU Radio Regulations permit the use of frequencies inconsistent with the ITU Table of Frequency Allocations '. . . on the express condition that harmful interference shall not be caused to services carried on by stations operating in accordance with the provisions of the Convention and of these Regulations.' The frequency band 10.109-10.115 MHz must be reserved for ongoing government operations.) Such an amendment will permit amateur operators located in the United States to continue to communicate fully with the world amateur community and furthers both WARC-79 and United States policy in this regard."

The FCC cautioned that the order "may be effective for only a brief period, and that official action by the U.S. and the Commission regarding the Final Acts of WARC-79 will ultimately determine the parameters within which we may act in relation to use of the 30-meter band in the Amateur Radio Service. Therefore, Amateur Radio operators in the United States would, at this time, be ill advised to invest heavily in equipment which can only be used for this frequency band."

Until permanent allocations are made (after Senate ratification and FCC action on WARC-79) these conditions for Amateur Radio use of 10 MHz apply:

- *A1 and F1 (including A2J) emissions only.* Cw and RTTY are permitted; voice modes are not.
- *250 watts maximum input power.* "The power input to the transmitter final amplifying stage supplying rf energy to the antenna shall not exceed 250 watts, exclusive of power for heating the cathode of a vacuum tube(s)."
- *10.100-10.109 and 10.115-10.150 MHz.* Do not transmit anywhere else. The FCC will issue citations for out-of-band operations.
- *secondary, non-interference basis.* Avoid interfering with stations in the Fixed Service; they have primary allocation rights.

First reports describe that band as "exciting, with propagation characteristics of both 20 and 40 meters." 10 MHz offers short-path and long-path conditions, and it seems to be open 24 hours a day. Expect 1000-mile and good ground-wave ranges in daytime, and long DX paths in late afternoon and evening. With over 70 countries currently active, 10 MHz is an attractive addition to amateur frequencies. Enjoy!

NEW POWER MEASUREMENTS — PR DOCKET 82-624

FCC wants to eliminate its archaic transmitting power measurement and effective radiated power (erp) definitions and rules in favor of techniques more in line with modern technology. The Commission's proposed rule changes would

- *define and measure amateur transmitter power in terms of output power.* Thus, amateurs won't have to buy expensive equipment for measuring input power, and they won't be exposed to potentially hazardous conditions while measuring input power on ssb rigs.
- *measure power output in peak envelope power (PEP).* PEP is applicable to almost all emission modes and is easily computed from carrier power.
- *authorize 1500 W as maximum PEP output.* Popular modes will have no decrease in actual authorized power.
- *"grandfather" a-m dsb operation for five years only.* A-m operators may use the current transmitter power limitations for five years then must follow the 1500-W maximum like everyone else.
- *define effective radiated power (erp) in PEP.* The revised definition clearly specifies that measurement is of *transmitter power* delivered to the antenna, based on a PEP measurement. Any a-m repeater operations that would be forced to reduce their power could get a Special Temporary Authorization to continue without power reduction.
- *limit Novice class subband operations to 200-W PEP output.*
- *apply a 50-W PEP limit in the 420-450 MHz band in protected military zones.*
- *convert power limitations in 1900-2000 kHz from dc input power to PEP output power.* This protects Loran-A systems.
- *delete requirements that amateurs provide a means for accurately measuring transmitter power.*

The Commission stressed that it wishes to be fair to all amateur operators. Noting the value of amateurs' input to rules changes, FCC specifically invites comments about (1) the proposed power limitations and (2) the five-year "grandfather" period for a-m dsb operators. Suggestions and comments are also welcomed about the following unresolved issues.

(1) *determining an acceptable standard for audio input level to be used during those power measurements that would require a source of modulation.* A reproducible standard, such as using a two-tone audio generator as the modulating signal, with the generator output level set just below that which causes overload distortion in the emitted radio-frequency waveform, is desired. FCC needs to specify in the rules actual methods that may be used by Commission enforcement personnel.

(2) *Impedance matching of measuring equipment to amateur transmitters during a station inspection.*

(3) *Possible exceptions to the PEP output definition for pulse transmissions, type P emissions.*

Interested persons may file comments on or before February 1, 1983, and reply comments on or before March 1, 1983. Indicate "PR Docket 82-624" on the cover, and mail to Secretary, Federal Communications Commission, Washington, DC 20554.

CORDLESS TELEPHONES GET WAIVER — NOT ALL BAD NEWS FOR HAMS

The FCC recently granted a petition to exempt cordless telephones from certain technical and certification requirements (§15.7) *if* specific conditions are met. The Commission also stated that cordless phones might "best be shifted to a different part of the frequency spectrum," and it plans to institute another rule making early in 1983 to establish new rules and frequencies for the devices.

The ARRL opposed the Electronic Industries Association and the American Telecommunications Corporation petitions for waiver (see June *QST*, p. 62) because of the severe interference potential that cordless telephones pose to amateurs operating at 1.8 MHz and above. Both FCC and ARRL lab tests found, in fact, that the units *didn't* live up to FCC specifications. Until new operating fre-

quencies are found for cordless telephones, however, the conditions set forth in the waiver are *not unfavorable to amateurs.* The requirements for cordless telephones are

- *the telephone shall operate at 1625 to 1800 kHz.*
- *rf currents on the power cord and telephone line shall not exceed 90 mA on any single power conductor, 12 mA on the telephone line and 12 mA when measuring all power cord conductors together, including ground conductor.*
- *the base unit must be certified as meeting the conditions of the waiver.*
- *the base unit must have a label attached with a "caveat emptor" statement* that says, "The base station of this phone is a radio link operating under the terms of a waiver granted by the FCC. Use of this phone may not ensure privacy of communication. Operation is subject to two conditions: (1) It may not cause harmful interference, and (2) it must accept any interference received, including that which may cause undesired operation."

The waiver applies only to cordless telephones manufactured until October 1, 1984. Units sold under the waiver will be allowed to operate for the lifetime of the device.

FOUL LANGUAGE VIOLATES COMMUNITY STANDARDS

Hildebrand, ex-N6BHU

David Hildebrand, of Hollywood, California, is no longer a ham because he violated FCC Rule 97.119, which prohibits transmission of obscene, indecent or profane words, language or meaning.

At his hearing, Hildebrand didn't deny that he participated in the conversation in question. He argued, instead, that the language he used was not obscene by Los Angeles community standards, and was the kind of language that has been used by amateur operators for a long time without objection from the FCC.

The presiding judge ruled, however, that Hildebrand's language was so patently offensive that it couldn't represent community standards. Furthermore, Hildebrand's language was vulgar, sexually explicit and indecent according to legal standards. Though the Commission can't censor or interfere with the rights of free speech through radio communication, it *can* impose sanctions on licensees who engage in obscene, indecent or profane broadcasting.

After finding that the transmissions in question demonstrate that Hildebrand does not have the necessary qualifications to remain a Commission licensee, the judge ordered Hildebrand's station license, N6BHU, revoked and his Technician class operator's license suspended. — *from FCC News Release*

FOUNDATION FOR AMATEUR RADIO SCHOLARSHIPS

The Foundation for Amateur Radio has announced the 1982 winners of the 10 scholarships it administers: The John W. Gore Memorial Scholarship ($900) — Richard E. Church, Jr., WA2YMS, Central Square, New York; The Richard G. Chichester Memorial Scholarship ($900) — Theodore S. Rappaport, N9NB, West Lafayette, Indiana; The Edwin Van Deusen Scholarship ($350) — Steven J. Gies, KA9EHI, Stevens Point, Wisconsin; QCWA Silent Key Memorial Scholarship ($500) — Brian D. Miller, KAØDGT, Englewood, Colorado; QCWA Silent Key Memorial Scholarship ($500) — Marc Vernon, K19V, Hinsdale, Illinois; Radio Club of America Scholarship ($500) — Stephen Carlson, KA9KME, Wauwatosa, Wisconsin; The Edmund Redington Memorial Scholarship ($500) — Nicholas L. DiFiore, N8DNF, Warren, Michigan; Young Ladies Radio League Scholarship ($300) — Susan Beth Solomon, KA2FLL, Uniondale, New York; Amateur Radio News Service Scholarship ($500) — Wayne B. Ditsworth, NØBGI, Cedar Rapids, Iowa; Columbia (MD) Amateur Radio Association Scholarship ($500) — Richard A. White, Jr., KA3T, Columbia, Maryland.

These scholarships are open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. This year, applications were received from 31 states, Canada and India. The Foundation for Amateur Radio is a nonprofit organization representing 50 clubs in Maryland, the District of Columbia and northern Virginia. It is devoted exclusively to promoting the interests of Amateur Radio and to the scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service.

Information about the scholarships to be awarded next year will appear in the April or May issues of the major Amateur Radio publications. — *Hugh A. Turnbull, W3ABC, 6903 Rhode Island Ave., College Park, MD 20740*

FCC PROPOSES TO CUT LOGGING REQUIREMENTS

On its own initiative, the Commission has proposed to eliminate many logging requirements for Amateur Radio operators. Routine logging, in fact, would no longer be necessary, though it would still probably be desirable for amateurs' personal benefit. In its proposal, Notice of Proposed Rulemaking in Docket 82-726, the FCC stated:

> The logging requirements specified in Section 97.103 were intended to serve a variety of regulatory purposes, most of which are no longer valid. The requirements for noting various aspects of routine station operation were intended to provide the Commission with a means to verify when the station was in operation and whether communications from the station were of a permissible nature. The Commission has rarely used this information from the log, preferring to rely instead on monitoring data it has collected. Other regulations for logging actually imply requirements which more appropriately should be explicitly stated elsewhere.

It emphasized, however, that

> Nothing in our proposal would prevent station licensees from maintaining a station log in the current fashion or from including in it any information that they so desire to include. In fact, the few requirements for record keeping that would remain in the rules could be satisfied quite adequately by the traditional amateur station log. The Commission is merely interested in giving licensees a choice of either maintaining a thorough and complete chronology of all station operation for the licensee's personal benefit or maintaining only those records that the Commission may need to review to determine that the station is being operated in good faith within the rules.

The FCC proposal would

- *eliminate dates when fixed or portable operation was initiated and terminated, and the locations of such operations.*
- *eliminate notations describing third-party traffic sent and received.*
- *eliminate listing of control operators other than the station licensee.*

Instead of requiring a notation in a log of control operation, the FCC states, ". . . we are proposing to let each individual licensee determine how he or she wishes to document the identity of control operators other than the station licensee. This documentation could be in the form of a statement signed by the control operator acknowledging the times and dates during which he or she was the control operator, or it could be in any other form the station licensee finds adequate. In any instance where such a record did not exist, the Commission would presume that the station licensee was the control operator."

- *eliminate requirements that the station log for remotely controlled stations must contain a description of measures taken for protection against unauthorized operation, a description of the provisions for shutting down the station in case of a control-link malfunction, and a description of the means for monitoring the transmitting frequencies.*

A record of some operations will be necessary, but may be kept in any form that could be made readily available to the Commission.

The FCC proposal would require

- *technical documentation of repeater operation.*

> §97.85: (g) Each station in repeater operation transmitting with an effective radiated power greater than 100 watts on frequencies between 29.5 and 420 MHz, or 400 watts on frequencies between 420 and 1215 MHz, shall have the following information included in the station records during any period of operation:
>
> (1) The location of the station transmitting antenna marked upon a topographic map having contour intervals and having a scale of 1:250,000 (indexes and ordering information for suitable maps are available from the U.S. Geological Survey, Washington, D.C. 20242, or from the Federal Center, Denver, CO 80255);
>
> (2) The transmitting antenna height above average terrain (see Appendix 5);
>
> (3) The effective radiated power in the horizontal plane for the main lobe of the antenna pattern, calculated for the maximum transmitter output power which occurs during operation;
>
> (4) The maximum transmitter output power which occurs during operation;
>
> (5) The loss in the transmission line between the transmitter and the antenna (including devices such as duplexers, cavities or circulators), expressed in decibels; and
>
> (6) The relative gain in the horizontal plane of the transmitting antenna.

- *auxiliary operation.*

> §97.87: When a station has one or more associated stations, that is, stations in repeater or auxiliary operation, a system network diagram (see §97.3[v]) shall be included in the station records during any period of operation.

- *operation of stations by remote control.*

> §97.88: (a) A photocopy of the remotely controlled station license shall be posted in a conspicuous place at the station location.
>
> (f) The station records shall include during any period of operation:
>
> (1) The names, addresses, and call signs of all persons authorized by the station licensee to be control operators; and
>
> (2) A functional block diagram of the control link and a technical explanation sufficient to describe its operation.
>
> (g) Each remotely controlled station shall be protected against unauthorized station operation, whether caused by activation of the control link, or otherwise.

- *Engineers-in-Charge of Commission field locations may require that certain individual station licensees maintain a log with certain items of information that are currently required.* The FCC stresses that "this authority would be used on those occasions when it would clearly benefit Commission enforcement activities. We specifically invite comments as to the desirability and scope of this authority."

Interested persons may file comments to this proposal, NPRM Docket 82-726, on or before January 14, 1983. Reply comments are due on or before February 14, 1983.

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Geomagnetic Predictions and Amateur Radio

In mid-October, the weekly CRRL news bulletins began carrying geomagnetic predictions, *a simple but useful indicator of what kind of propagation to expect on our Amateur Radio bands. These predictions are supplied by the Geomagnetic Prediction Service, Division of Seismology and Geomagnetism, Earth Physics Branch, Energy, Mines and Resources Canada, a department of our federal government. What are these predictions and how do they work? We are grateful to Dr. J. Hruska and Dr. Alan Goodacre, of Geomagnetic Prediction Service, for permission to reprint this paper.*

It was recognized fairly soon after the advent of radio and the discovery of the ionosphere that there is a relationship between geomagnetic field disturbances and the quality of radio propagation, and that each of these is fairly closely related to processes occurring on the sun. Most Amateur Radio communications occur via "reflections" from the E and F layers in the ionosphere. These are not necessarily sharp features in the variation of electron density with height, but their presence does cause radio waves to bend and be returned to earth, rather than escape into outer space.

We know that there are daily, monthly and seasonal variations in radio propagation, and even longer-term variations such as the 11- and possibly 22-year cycles. The latter changes are linked to the number of spots on the solar disc. There are also cyclic variations in geomagnetic-field activity. Of course, these variations — particularly the 11-year variation — show an excellent agreement with the sunspot cycle, with maximum geomagnetic activity occurring at or a little after the maximum sunspot number.

Since good long-distance radio propagation conditions tend to occur when sunspot numbers are high, one might conclude that the best propagation occurs when the magnetic field is disturbed. However, this is true for only certain kinds of propagation. Generally speaking, high solar activity and corresponding geomagnetic disturbances seem to be required to enhance the overall level of ionization in the ionosphere, but good quality propagation tends to occur, during the years of sunspot maximum, in the short, quiet periods between bursts of solar and geomagnetic activity.

Geomagnetic predictions divide the earth's magnetic field into three classes: *quiet, unsettled* and *active*. Since I became aware of these predictions, much of my Amateur Radio operation has been on the 10-metre band, and so my remarks are based mainly on observations in Ottawa, on this band, during the recent solar sunspot cycle peak.

Good propagation in the northern latitudes usually occurs during the *quiet* geomagnetic periods. At such times, I have recorded very strong double and triple around-the-world echoes along a polar, great-circle path, following the dawn-dusk terminator between daytime and nighttime ionospheres. Long-path propagation was also in evidence according to contacts being made by amateurs in other countries.

During the more *unsettled* and *active* conditions, east-west propagation usually becomes poorer, but paths between the Northern and Southern Hemispheres remain the same or become improved. Radio reflections from aurora are often heard. During the vigorous solar and geomagnetic activity of April 11-13, 1981, I was fortunate to see a red aurora. Normally, visual aurora tend to be light green. Simultaneously with the aurora, very-short skip signals from the Great Lakes Region were heard on the 10-metre band, along with long-range signals from New Zealand.

Finally, during very *active* geomagnetic conditions, the result of certain kinds of eruptions on the sun, there may be complete radio fade-outs. I have personally heard the 15-metre band go dead in a few seconds as a result of a solar flare.

There are, of course, other tools such as the solar flux that one can use to help predict propagation conditions, but if an amateur is interested in contacting friends or relatives overseas, or optimizing time for a DX contest, geomagnetic-field predictions can be very helpful in planning ahead. — *Alan Goodacre, VE2AEJ/3: EMR Canada* Geomagnetic Bulletin *No. 2-81*

VE3OT RETIRES; VE3CDM NEW CRRL PRESIDENT AND ARRL DIRECTOR

After nearly three years of dedicated service, Mitch Powell, VE3OT, has retired as CRRL President and ARRL Canadian Director. Mitch began his school year with an unexpectedly heavy teaching schedule, and felt that he would not be able to do justice to both his job and his League work. Mitch indicated his continuing support for ARRL and CRRL, and his intention to remain part of the CRRL team. The new CRRL President and ARRL Canadian Director is Tom Atkins, VE3CDM, of Willowdale, Ontario. Tom has served as president of RSO and Ontario director of CARF. He was one of the founding directors of CRRL. New CRRL Vice President, Secretary and ARRL Canadian Vice Director is Harry MacLean, VE3GRO, of London, Ontario. Harry is editor of this column and the CRRL *QST* news bulletins.

CRRL NEWS

☐ The CRRL Board met briefly at the 1982 RSO Convention, held in Waterloo, Ontario, on October 1, 2 and 3, and then conducted a CRRL general meeting. Those in attendance approved changes in the CRRL Constitution that will (1) make the CRRL President and the elected ARRL Canadian Director one and the same, (2) make the CRRL Vice President and the elected ARRL Canadian Vice Director one and the same, (3) expand the number of regional directors on the CRRL Board from three to five, to provide better representation for members in British Columbia and the Atlantic Region, and (4) have the CRRL regional directors elected in years alternate to the years in which the CRRL President-ARRL Canadian Director and CRRL Vice President-ARRL Canadian Vice Director are elected, to ensure a continuity in CRRL affairs.

The recent change in CRRL leadership will not affect the operation of CRRL Box 7009. CRRL workers in London, Ontario, will continue to process membership renewals; fill orders for CRRL and ARRL publications and materials; mail out free operating aids, information sheets and contest forms; and generally help with your concerns.

☐ Congratulations to Tom Wong, VE7BC, who was awarded the CRRL Certificate of Merit for his contribution in bringing BY1PK on the air, and to Gwen Burnett, VE3AYL, who was voted CRRL Amateur of the Year. Gwen is editor of the Canadian Amateur Radioteletype Group *RTTY News*, and the person whose enthusiasm and hard work has been the driving force in that organization for over 15 years. Gwen was presented with her award at the banquet at the 1982 RSO Convention.

☐ Congratulations also to Harold Moreau, VE2BP, who was reelected Section Communications Manager Quebec, and Bill Munday, VE5WM, who was reelected SCM Saskatchewan. Both ran unopposed, and begin new two-year terms on January 1, 1983.

☐ Last month we reported that CN Rail had officially recognized ARES, the ARRL-CRRL Amateur Radio Emergency Service. Shortly after formal letters had been exchanged, an eastbound VIA Rail Passenger train collided with a stationary freight train in Ingersoll, Ontario. Sixty-five people were taken to the hospital. ARES people were on the scene in minutes. Were they recognized for who they were? Were they admitted to the scene of the accident? You bet they were! CN Rail has recognized ARES — officially. QST

Moose Jaw ARC, the oldest continuously functioning Amateur Radio club in Canada, is celebrating its 60th anniversary. If you work two Moose Jaw stations on high-frequency bands after September 1, 1982, you qualify for this award. For more information, contact Murray Button, VE5ACM, 1105 - 14th Ave., S.W., Moose Jaw, SK S6H 7S4. *(VE5WM photo)*

*163 Meridene Crescent West, London, ON N5X 1G3

International News

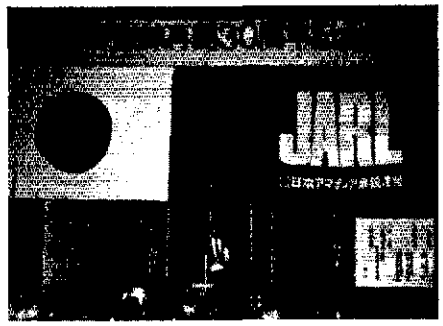
Conducted By Richard L. Baldwin,* W1RU

Japanese 30th Anniversary Celebration

On October 9, 1982, in Tokyo, the Japanese Amateur Radio League sponsored a celebration of the 30th anniversary of the reopening of Amateur Radio in Japan after World War II. In a large and tastefully decorated hall in the Okura Hotel, 450 prominent Japanese amateurs gathered to witness the formal ceremony. Appropriate speeches were made by Mr. Shozo Hara, JA1AN, president of the JARL, Mr. Shinzaburo Tanaka, director of the Japanese Radio Regulatory Bureau, and Mr. Richard L. Baldwin, W1RU, president of the International Amateur Radio Union.

At the conclusion of his prepared remarks, Mr. Tanaka added some informal comments concerning the progress that was being made toward working out arrangements for a reciprocal operating agreement between the United States and Japan. Much of the ceremony was recording on videotape for a historical record that JARL keeps of significant Amateur Radio events in Japan.

Following the ceremony, all 450 guests, including many directors and officers of JARL and a number of foreign visitors, participated in a two-hour-long stand-up buffet in an adjoining hall. It was a well-planned and well-executed affair, and an excellent opportunity for the renewal of old friendships and the making of new friendships.



A magnificent backdrop for the speakers at the 30th anniversary celebration of JARL. *(W1RU photos)*

At a dinner party following the 30th anniversary celebration: (l-r) Shozo Hara, JA1AN, president of JARL; Yutaka Kashahara, JA1CLN, chief of JARL's international section; Phil Weaver, VS6CT, president of the Hong Kong Amateur Radio Transmitting Society.

The 30th anniversary celebration came at a time when the IARU is being restructured and strengthened, and at a time when Amateur Radio in Japan continues to grow vigorously. For those reasons, the remarks of JA1AN and W1RU will be of interest to a number of our readers, and are reproduced below.

Address by JARL President Shozo Hara, JA1AN

Representing our fellow amateurs engaged in the art of Amateur Radio, it is indeed a great pleasure to have here with us, Mr. Tanaka, director of Radio Regulatory Bureau, Ministry of Posts and Telecommunications, representatives from Amateur Radio societies overseas, and many other distinguished guests to observe this ceremony commemorating the 30th anniversary of the reopening of Amateur Radio in Japan.

As is already known to you, Amateur Radio in this country came into existence as an experimental station in 1927 and, since then, it had made a smooth development with a wide spread throughout the country, but, unfortunately, the operation was suspended during the Pacific War.

However, with the cessation of the Second World War, our senior amateurs conducted a campaign for the reopening of their activities, and, through their difficult and energetic efforts in their negotiations with the authorities and parties concerned, their hard work bore fruits in July 1952. On behalf of all our members I wish to extend my deep respect to the authorities of that time and our elders who laid the foundation of our status today.

Since the reopening, this service has attained its 30th anniversary, and, along with the development of social, economical and cultural fields and the growth of technological innovations in industry, Amateur Radio also went on increasing to the extent of seeing today about 530,000 stations of which the number stands unrivaled in the world true to the worthy name of the "land of Amateur Radio." This is all due to the understanding and cooperation extended to us by all quarters concerned, to whom I wish to give my appreciation today.

Now, first of all, Amateur Radio is basically a hobby; however, in considering the fact that it is greatly serving the society by promoting international friendship, diffusing and advancing the knowledge of science and technology in the time of emergencies and disasters, it is my intention to further enhance our activities of Amateur Radio to contribute to the advancement of social and cultural aspects in Japan and overseas. I therefore ask all parties concerned to give us their continued guidance and support to this end in the coming years.

Lastly, I would like to close my address by earnestly wishing the growth of our service and all the prosperity and health to all those who are observing this ceremony with us today.

Remarks of IARU President Richard L. Baldwin, W1RU

The end of WW II resulted in many changes. In particular, technical advances during the war encouraged the interest of many people, both old and young, in scientific hobbies. Amateur Radio, long a slowly growing group of enthusiasts, began to spread at a much-more-rapid rate following WW II.

Nowhere has that explosive growth been more startling than in Japan. We are gathered here today to celebrate the 30th Anniversary of the reopening of Amateur Radio in Japan. No other country in the world now has so many radio amateurs as Japan. The whole world operates with Amateur Radio equipment designed and manufactured in Japan.

The Japan Amateur Radio League has become increasingly influential in the worldwide leadership of Amateur Radio. Although I never had the privilege of knowing previous presidents of JARL, for the past 10 years I have had the honor of working closely with Shozo Hara in many international meetings. His presence at these many meetings all over the world is typical of the expanding influence of Japan and JARL in the work of the International Amateur Radio Union. Certainly, because of the substantial growth of Amateur Radio in Japan these past 30 years, it is entirely appropriate and necessary that JARL play such an important role.

And what of the future? First, I expect that the growth of Amateur Radio in Japan, under the capable leadership of JARL, will continue. I am sure that 20 years from now you will have another gala celebration to take note of the 50th Anniversary of the reopening of Amateur Radio in Japan. I would like very much to be present on that occasion, but I am afraid that I will be beyond radio range at that time!

Presidents of IARU and JARL will come and go, but it is certain that Amateur Radio, both in Japan and worldwide, will continue to grow. There are over 1 million radio amateurs now. I would not be surprised if there were 5 million radio amateurs 20 years from now.

Sometimes amateurs ask the question, "What will Amateur Radio be like 20 years from now?" In my opinion, that is the wrong question. We should be asking, "What do we *want* Amateur Radio to be like 20 years from now?" and then work toward those goals. What do you want Amateur Radio to be like 20 years from now? What do *I* want Amateur Radio to be like 20 years from now? I have several dreams.

I would like to see the DX capability of Amateur Radio be used for more than just obtaining a QSL card from rare countries. Just think what a wonderful influence 1 million radio amateurs or 5 million radio amateurs can have toward international friendship and understanding. Japanese think differently than Americans, and French think differently than Brazilians, but citizens of one country communicating and talking person-to-person by means of Amateur Radio can contribute substantially to worldwide understanding. I think we are not yet making full use of that capability.

As Amateur Radio grows, we need to develop new techniques for more efficient use of the frequency bands. An increasingly greater percentage of radio amateurs use radiotelephone, and there need to be innovative techniques for narrowband voice communication. There is a great challenge here for Japanese technology, and I hope that you will accept that challenge.

The Amateur Radio Service is but one of many radio services competing for space in the radio frequency spectrum. We were quite successful at WARC-79, largely because of a well-coordinated worldwide effort. The challenges will be even greater in the future, and the radio amatuers in each country must convince their administration that Amateur Radio is a worthwhile radio service which operates to the benefit of the public in general. The method will vary from country to country, of course. Perhaps Amateur Radio can be justified in a particular country for the contributions it makes to technical progress. Or perhaps the contributions of Amateur Radio will be in such public service areas as emergency communications. Or perhaps the training of young people so that they can naturally develop into scientific careers. In any event, we must continue to demonstrate the value of Amateur Radio.

One dream that I have is that there someday be an international Amateur Radio license, so that an Amateur Radio operator of any one country can visit and operate in any other country without restriction. A first step to such a dream, of course, is universal reciprocal-operating permits. We have made much progress in that area, but much remains to be done.

In conclusion, let me emphasize that Amateur Radio around the world has made great progress in the last 30 years, especially in Japan. As President of the International Amateur Radio Union, I applaud the leadership provided by JARL. I look forward to your continued progress and continued leadership in the years ahead. May your next 20 or 30 years be equally dynamic.

*Vice President International Affairs, ARRL

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Biological Effects of RF Energy — Part 2

The potential hazards of rf energy have become of increasing public concern in both the home and in the workplace. This month we continue our discussions on the nature of the beast with a focus on rf energy sources, levels of safety, FCC interests and information resources.

Q. Is it safe to use an electronic cardiac pacemaker near an rf source, such as a microwave oven?

A. In the past, there have been some problems due to rf radiation interfering with the proper operation of implanted electronic pacemakers. Because pacemakers are electronic devices, they can be susceptible to electromagnetic signals, which could cause the pacemaker to misfire and thereby incorrectly regulate the user's heartbeat.

This problem has now been remedied largely by the incorporation of electromagnetic shielding into the design of modern pacemakers. This shielding prevents undesirable rf signals from being picked up by the electronic circuitry in the pacemaker. There has also been a degree of concern over the potential for the "leads" of pacemakers to pick up rf signals, but this does not appear to be a serious problem. Patients with pacemakers may wish to consult their physician if they believe they may have a problem related to rf interference.

Q. How safe is the radiation emitted by radio and television broadcasting towers?

A. Radio and television broadcasting antennas emit rf radiation at various frequencies between about 500 kHz and 900 MHz. The intensity levels on the ground resulting from these emissions depend on several factors, including the design characteristics of the antenna, the power transmitted to the antenna, the height of the antenna and the distance from the antenna. Calculations can be performed to predict what field intensity levels would exist at various distances from an antenna. Energy at some electromagnetic frequencies is absorbed by the human body more readily than energy at other frequencies. Therefore, if a hazard existed, the amount of energy absorbed would depend on the frequency of the transmitted signal as well as the intensity.

Public access to broadcasting antennas normally is restricted so that individuals cannot be exposed to high-intensity fields that can exist in the immediate vicinity of an antenna. Maintenance workers occasionally are required to climb antenna structures for such purposes as painting, repairs or beacon replacement. Both the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have reported that in these cases it is possible for a worker to be exposed to hazardous levels of rf radiation if the antenna is "live." Therefore, precautions should be taken to ensure that maintenance personnel are not exposed to radiation levels above those recommended by OSHA.

Measurements made by EPA and others have shown that rf field intensity levels in inhabited areas near broadcasting facilities are generally far below levels believed to be hazardous. There could be exceptional situations in which exposure levels may be higher than deemed advisable, but for the most part it does not appear that the general public is endangered by radio and television broadcasting towers.

Q. Is there any danger from microwave point-to-point relay towers? What about microwave dish antennas used for satellite-to-ground communication?

A. Point-to-point relay towers transmit and receive microwave signals to communicate telephone and other messages across relatively short distances. The microwave signal is restricted to the directed beam between the transmitting antenna and the receiving antenna. Therefore, dispersion of microwave energy outside of the relatively narrow beam is normally insignificant. In addition, antennas on microwave relay towers use very-low levels of power, levels that are much lower than those used by broadcasting transmitters. An individual would have to stand directly in the beam in the immediate vicinity of a transmitting microwave antenna to be exposed to microwave levels that might be considered hazardous. As an added margin of safety, relay tower sites are normally not accessible to the general public.

As with point-to-point relay links, the beams used for satellite-to-ground transmissions are highly directional, and access to the ground-station site is restricted. Therefore, these stations generally result in no danger to the public from excessive exposure to microwaves.

Q. Is there any hazard associated with hand-held walkie-talkies?

A. Hand-held portable radios are generally low-powered devices designed to be used to transmit and receive messages over relatively short distances. Because of the low power levels used by these devices, they normally would not be considered possible sources of overexposure to rf fields. However, questions relating to the safety of these devices have arisen because the rf signal is transmitted in the immediate vicinity of the user's head.

At least one manufacturer of these devices has conducted extensive tests to measure the amount of rf energy absorbed in the head of an individual using one of these radios. The only potential hazard found by the manufacturer would occur if the antenna tip were placed directly at the surface of the eye — an unlikely occurrence. If the radios are used according to the instructions of the manufacturer, they do not appear to result in hazardous absorption of rf energy. However, the safety of these devices is a continuing area of investigation.

Q. Which federal agencies are responsible for protecting the public from hazardous levels of rf radiation?

A. Several agencies have primary jurisdiction for controlling hazardous levels of rf radiation. BRH issues standards for the emission of radiation from microwave ovens, X-ray equipment and other medical devices, television sets and sunlamps. As discussed previously, BRH has established a radiation safety standard for microwave ovens that limits the amount of radiation that an oven can leak throughout its lifetime.

OSHA is responsible for controlling exposure of workers to hazardous chemical and physical agents. In 1971, OSHA issued a radiation-protection guide for exposure of workers to rf radiation based on earlier recommendations of the American National Standards Institute (ANSI). The guidelines, covering the frequency range between 10 MHz and 100 GHz, stated that exposure of workers should not exceed a power density of 10 mW/cm^2, as averaged over any six-minute period of the workday. OSHA has now proposed to rescind these guidelines. However, they may be revised or reissued in the future.

The responsiblity for developing a federal standard for exposure of the general public to rf radiation rests with EPA. There is at present no federal standard for exposure of the general public to rf radiation. However, EPA is in the process of developing "Federal Guidance" that will recommend levels of exposure for the general public. If approved, the guidelines will be transmitted to other federal agencies for implementation.

Q. What is the role of FCC in controlling potential rf hazards?

A. The FCC licenses and approves equipment and facilities that generate rf and microwave radiation. Although the Commission would not knowingly authorize a facility or device that resulted in a potential hazard to health, its primary jurisdiction does not lie in the health and safety area. Therefore, FCC must rely on other federal agencies for guidance with respect to safety hazards. The Commission's policy has been not to establish its own health and safety standards, but it expects its licensees and applicants to comply with rf health and safety regulations established by other federal agencies. FCC, which is presently looking into its responsibilities in this area in Docket 79-144, maintains a limited program in this area. Questions regarding hazards of rf radiation can be directed to the Federal Communications Commission, Office of Science and Technology, Technical Analysis Division, Washington, DC 20554.

*Assistant Manager, Membership Services, ARRL

Correspondence

Conducted By Peter R. O'Dell,* KB1N

THANKS, BARRY!

☐ May I recommend that we all send one of our QSL cards to Senator Barry Goldwater, as an expression of gratitude for all that he has done for the amateur and Amateur Radio as a whole. I am referring to his work over the many years to write RFI legislation and get it on the books.

I wrote Sen. Goldwater a letter of thanks and enclosed my QSL. He responded at once and seemed very pleased that someone recognized his efforts. His address is: The Honorable Barry Goldwater, United States Senate, Washington, DC 20510. — *Bob Ropes, W9JU, Kokomo, Indiana*

ROCKS AND COPS

☐ After listening to the latest DXpedition to PY0, St. Peter and Paul Rocks, I am compelled to comment on the excellent operating practices by both the people on the Rocks and the North American amateurs.

First, I was very happy to see that those very experienced operators down on the Rocks decided to run split and did not require the stations calling to bunch up in the bottom 50 kHz of the 20-meter band. They spread them out all the way to the top end of the band. This tactic made everything much more impressive and cleared out all that old, useless stuff, like ragchews, nets, phone patches and all the other junk that every good red-neck DXer knows is of slightly lower status than 2-meter fm.

Second, I should like to pass on my sincere thanks and congratulations to the "Kilocycle Cops" who tried so hard to keep the expedition's transmit frequency (below the American phone band) clear. The fact that they would voluntarily go down outside of their authorized frequencies armed only with their Dick Tracy badges and unidentified transmissions to protect them from the wrath of transgressors is inspiring. They did such a fine job that at times it was impossible to hear the DXpedition due to the friendly, helpful comments and suggestions they were making to those poor deluded souls who thought the band was for something else besides the DXpedition.

Finally, since I was one of the lucky ones who got into the log (and may or may not be in it if this gets published before the QSLs come out), it is very nice to know that this type of operation limits the QSO rate. What would it have been if some of those regimented systems, like call sign districts, had been used? Well, now there's not as many people creeping up on my country totals. — *Thomas W. Roynon, VE5UK, Saskatoon, Saskatchewan, Canada*

CATVI, THE AVERAGE HAM AND THE REAL WORLD

☐ Reading Mr. Raimondi's and Mr. Wanderer's letter (Technical Correspondence, Sept. 1982 *QST*) you might get the idea that all cable TV systems are quality built and, therefore, these cable systems couldn't possibly interfere with an amateur's use of the 2-meter band. They stress the need of not using frequencies that might be interfered with by cable television. Finally, they have the gall to ask the amateurs to help the cable television industry coexist on our *exclusive allocation* of frequencies.

If CATVI problems are not severe, why can't I use my local repeater that was in use long before the midband was thought of in Fort Bragg, California? Why can't I work meteor scatter this year when I have been able to every other year? The midband spurs from Channel E are rampant on 2 meters. I wish they would take their figures and shove them down the trunk line feeding this "state of the art system." Maybe that would plug up the leaky cable, and then I could use 2 meters.

The equipment might be state of the art, but the installation quality of most systems is so poor that most Amateur Radio stations put the cable head-ends to shame. My city's system has been cited 22 times within five months by FCC, with repeat violations in some instances.

Why do the amateurs have to coordinate anything with the cable television industry? The amateurs were using the *exclusive allocation* long before cable television mid and super band were a twinkle in the engineer's eye. — *Robert Odell Smith, NA6T, SCM San Francisco, Fort Bragg, California*

BEGINNERS AND NOVICES

☐ How does one fulfill the Amateur Radio code of conduct? Among other things, how does one strive to operate according to the state of the art and maintain balance in one's responsibilities? I can't afford the time or the money. I love the hobby, but these are my frustrations. I look to *QST* for inspiration. But monthly I am reminded of state-of-the-art equipment I cannot afford and projects that are beyond my grasp.

You would do well to bring greater balance to *QST*, giving more attention to the care and feeding of the Novices and beginners. Perhaps your multitude of advertisers could show their support by making their products more affordable. I share ARRL's concern for the newcomer; quite obviously, I am one. — *Bruce Chadbourne, KA2PAS, Vestal, New York*

SUPPORT

☐ I have been reading with satisfaction the successful result of League efforts for the past several months in *QST*. Though no one member should expect complete agreement with the League, I am gratified to see ideas put into action with positive results. As a member of the Old Timers Club, I cannot recall so many accomplishments in so short a time. I commend the League on its progress with H.R. 5008. Revision of the Communications Act of 1934 was long overdue. I am also impressed by recent successes with antenna zoning ordinances, future non-hf codeless licenses and 20-meter phone expansion.

I have no doubt that the amateur community will respond to this challenge with nothing but the utmost integrity. As individuals, we may not always agree, but as members, we cannot deny that, indeed, the ARRL is "of, by and for the amateur." — *Don Griffith, N0RF, Newburgh, Indiana*

☐ I want to thank ARRL for its Official Observer program. Recently, I received a report from K5WG, and that report helped me with a problem with my hf rig I didn't know it had. — *William Maves, N9DFZ, Menomonie, Wisconsin*

MORE NO-CODE

☐ Being, as I am, a confirmed code hater, I was disappointed by your opposition to the no-code license.

The code is thoroughly antiquated and getting more so all the time as solid-state electronics grows in sophistication and decreases in cost. Furthermore, it is clumsy and fatiguing. I operated a lot of cw when I was a Novice, but as soon as I passed 13 wpm, I set the key aside and have not touched it since. I never appreciated the gift of speech so much as when I tried to carry on meaningful conversations by laboriously grinding out every letter.

Of course, the code may have its place, but does it have to be forced down the throat of every ham? It may be of value in some rare emergency situations, but 13 wpm would not be needed there — 5 wpm should be ample to do the job. Furthermore, I cannot see any justification for exclusive cw subbands. If cw is as good as its proponents say it is (narrow bandwidth and all that), it should be able to work through phone QRM.

The use of the code as an exclusionary device is another matter entirely. Code-lovers threaten us with CB-type chaos and inanity if the code requirement is dropped or loosened. The flaw in that argument can be readily seen if you note that a good many of the hams that have been disciplined for malicious interference have been Extra Class licensees, and thus have demonstrated code mastery, not just at 13 wpm, but at 20 wpm! Obviously, no exam can certify emotional stability or mental health.

What good is the code, anyway? It certainly has no intellectual content whatsoever. Rather, it is a low-level neuromuscular skill akin to shorthand and typing. Some of my fellow Mensa members have been excluded from full ham privileges just because they have had trouble mastering a mere secretarial skill. If some sort of exclusion is needed, it would make much more sense to tighten up the theory exam.

It is true that international treaties mandate a code requirement in the hf bands. However, these treaties do not specify what the required code speed must be. I think any requirement beyond 5 wpm is totally unreasonable. — *Charles E. Cohn, KB9XV, Clarendon Hills, Illinois*

☐ Looking at it from a cold, purely logical point of view, we might think that these are not really very useful arts anymore. But we would suffer a tremendous loss by throwing code out. Amateur Radio is many things to many people. Cw is the discipline, the heart. Let's not lose it. — *Daniel C. McKenzie, A19D, Dubuque, Iowa*

*Public Information Officer, ARRL

On Line

Conducted By Stan Horzepa,* WA1LOU

Basic Duping

Ask, and you shall receive. Accompanying K5QY's piece, "Computers and Contests," in October's On Line, I asked readers to pass along contest logging and duping tips. Well, I opened my mailbox the other day and received a nice letter from Chuck Hemminger, WA1PCJ, who described and listed a duping routine that he wrote in BASIC. The following are excerpts of WA1PCJ's letter.

"I read your recent column in *QST* about computers and contests. I have in my hand a 54,000-point 1978 Sweepstakes contest log and dupe sheet that was generated by a BASIC program and was printed on an ASR-33. All duping during the contest was done by computer.

"Of course, BASIC is too slow after a few contacts if you are searching a sequential list of each previous contact. There are, however, several methods available to circumvent this problem. Personally, I have written a BASIC program using a "Hash Table," which is generally adequate. The table must be at least 20% larger than the maximum number of expected contacts. The only problem has been slow 'garbage collection' in some BASIC interpreters. Below is a listing utilized for the hashing function. This is the heart of a much larger program that collects the rest of the exchange, stores the contact, prints the log and eventually prints a sorted dupe sheet.

"Any amateur should be able to write a program to suit his needs. In BASIC, one can easily modify the program to the requirements of other contests. I have one I used in a 10-10 contest that stores and checks numbers as well as calls.

"Not that I'm one who can only program in BASIC; this year, I will use an enhanced machine-language program that still uses the hash table concept. With 40k of available RAM, it will hold over 5000 contacts. Among other features is a system to mark and number each new section worked. I have not seen fit to include a disk filing routine, though it would be easy to add one to the source listing. The main reason for writing it in machine language was to eliminate the overhead of the BASIC interpreter, not for speed in operation.

"Anyone with a Digital Group computer who would be interested in this program may contact me." — *Chuck Hemminger, WA1PCJ, 20 Harrison Ave., Northampton, MA 01060*

After reading Chuck's letter, I sat down at my TRS-80® and typed the program into my machine. After I added one line to CLEAR some memory in the TRS-80, the program ran smoothly and quickly — very quickly considering that it's a BASIC program! The only thing that can slow things down is the "garbage collection" problem that WA1PCJ mentioned, but there are software routines that get around the problem. Read the literature on your particular computer and you will surely find that someone, somewhere has written a routine to avoid "garbage collection."

With WA1PCJ's hash table at hand, you now have the foundation for building a program to meet the needs of whatever contest you plan to participate in. Good luck and Happy Holidays from WA1LOU.

WA1PCJ Hash Table

```
 10 MAX = 1024
 20 DIM A$(MAX)
 30 FOR I = 1 TO MAX : A$(I) = "*" : NEXT I
 40 INPUT "Call ";I$
 50 REM Hash Call
 60 H = 0
 70 FOR J = 1 TO LEN (I$)
 80 H = H + ASC(MID$(I$,J))
 90 NEXT J
100 H = H-INT(H/MAX)*MAX
110 REM Dupe Check
120 IF A$(H) = "*" THEN A$(H) = I$ : GOTO 40
130 IF A$(H) = I$ THEN 170
140 H = H + 1
150 H = H-INT(H/MAX)*MAX
160 GOTO 120
170 PRINT "Dupe Call"
180 GOTO 40
```

UNIVERSAL PX REVISITED

In October's On Line, I discussed the efforts of Radio Netherlands to permit program exchange between different brands of personal computers. Their "BASICODE/Esperanto" software package is now available on cassette and includes a detailed handbook.

Translations have been produced for Acorn Atom, Apple II, Cosmicos, DAI, Exidy Sorcerer, OSI Challenger, PET/CBM, Philips P-2000, TRS-80/Video Genie and South West Technical Products computers. The handbook includes information for developing translations for other computers.

The complete package costs 30 Dutch Guilders for Airmail delivery to the U.S. and Canada. If you are interested, send an s.a.s.e. to WA1LOU for full details and an order blank. (Radio Netherlands will only accept payment via an International Money Order. While 30 Dutch Guilders currently equals $11 and change, the bank I did business with charged an additional $8.50 for the money order itself! Maybe you can do better.) — *Thanks to W6HDO for relaying this info*

QZX LIVES!

In August's On Line, I mentioned the publication of a monthly newsletter, *QZX*, which was devoted exclusively to the exchange of technical information about Amateur Radio applications for the Sinclair/Timex computers. The newsletter folded almost immediately after that announcement appeared in *QST*. *QZX* guru K2MI was deluged and was "forced to bow out because of the tremendous workload involved in handling so many letters, phone calls and radio calls, proofreading, editing, printing, addressing, mailing, etc. — enough work for a half-dozen people!"

Good news, port-fans! K5XY has taken up the torch and plans to publish *QZX* shortly. Details have not been worked out yet, but if you are interested, send an s.a.s.e. to Alex Burr, K5XY, 2025 O'Donnell Dr., Las Cruces, NM 88001.

PX

This installment of PX offers six stocking-stuffers for you computer hackers out there in Santa-fand. If you desire a particular program, send an s.a.s.e. (preferably no. 10, business size) to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Request the desired program according to its catalog number.

"RTTY Receive" and "RTTY Send" programs for the Sinclair ZX-80 computer (with 1k RAM and 4k ROM) were submitted by Brian Davis, W9HLQ. Included is a design for a two-chip, one-transistor circuit to interface the ZX-80 with a RTTY loop. "RTTY Receive" features unshift on space, reception and display of 1-200 characters, ASCII reception and speed changes by means of program modifications. "RTTY Send" features automatic carriage return/line feed at 62 or 70 characters, automatic figures/letters shift when sending numerals or letters, unlimited "canned" messages, and ability to chain message buffers (order program catalog number 7).

An OSCAR orbit program written on an Atari 800 computer was proffered by Bill Zaner, WB6IYS. The program calculates when OSCAR (or any other satellite) is in range for a minimum of 10 minutes (order program catalog number 8).

Bruce Small, KM2L, wrote two programs for the Atari 400 and 800 computers with 16k RAM. The first program, "Morse Keyer," audibly produces code from as many as 10 messages of 99 characters each for code practice or mcw (order program catalog number 9).

KM2L's second program, "Vertical Antennas," graphically displays field-strength patterns for vertical antenna arrays of 10 or fewer antennas (order program catalog number 10).

The remaining two programs are translations of W9AV's "Microcomputer QSO Robot" program, which appeared in the July 1981 issue of *QST*. A previous PX contributor, Gary Lippert, K7VBY, submitted a translation of W9AV's program for the Atari 400 and 800 computers (order program catalog number 11).

Mike Rice, KA9FSQ, translated "Microcomputer QSO Robot" for the Radio Shack Color Computer with 16k RAM and Extended Color BASIC (order program catalog number 12).

And while we are on the subject of W9AV's "Microcomputer QSO Robot," Joe Janus, KB3WZ, submitted the following modification to lines 420, 430 and 450 to permit the program to generate and display random code at the speed selected by the operator for code practice. The modified lines are as follows:

```
420 CLS: PRINT "RANDOM CODE PRACTICE"
430 X$ = CHR$(RND(90))
450 IF I<1 OR I>47 OR I = 21 PRINT " ": FOR J = 14 TO 7*SI: NEXT: GOTO 430 ELSE PRINT X$;
```

*72 Stiles St., Waterbury, CT 06706

How's DX?

Conducted By Ellen White,* W1YL/4

The DXCC Process

Year in, year out, hundreds of new applicants for the prestigious ARRL DX Century Club Award make ready to apply for the coveted DXCC. But, what *is* this process all about? How can we — as applicants — make sure that we apply correctly? Generally speaking, what actually takes place when our cards arrive at "Mecca"?

Each day, the ARRL truck goes to the Newington, Connecticut, Post Office and picks up the mail — hundreds of pieces destined for all ARRL departments. Certainly, the incoming mail for DXCC purposes represents a considerable chunk of any mail bag! The incoming mail is opened in the Controller's Office and date/time stamped. Postage and monies are noted and detached. The DXCC mail is then brought down to the Communications Department, which oversees the DXCC operation — DXCC being just one of the many CD functions with regard to the ARRL operating programs.

Five people are involved in the DXCC process: Don Search, W3AZD, overseeing the operation; Brian Downey, WA1KSF, working side by side with Don; Carol Carpenter and Paula Hinkel, DXCC aides of good cheer; and active part-timer Bill Webb, WB1GOO. One of this crew will "log in" each piece of DXCC mail — mail handled equitably in a consecutive fashion. The incoming record notes date, name and call, and an incoming number. This procedure makes it relatively simple to determine the number of pieces of DXCC mail received over any specific period and also makes it easier to locate your individual submission should that need arise. To prevent the necessity to ask about receipt of your valued pasteboards, you might wish to include an addressed and stamped postcard *with* your cards, to be signed at Hq. and returned to you — a process that should allay your fears.

After logging, the DXCC application/endorsement awaits handling in sequence, a process that might take 1 or 2, months depending on the volume on hand. The first part of the hands-on operation includes preparation of return labels for the cards (and, as appropriate, the new certificate) and verification of the master record form. If you've prepared this form yourself (and it is urged that you do so), the procedure is speeded up enormously. The record itself is compared with the cards and the QSLs reviewed. A count is made of the actual credits earned, a credit slip prepared, and the packet made ready for the outgoing mail. While the credit slip reflects the date of "handling" of your material, the actual receipt date at Headquarters is the date on which your cards are credited. The card return will include forms that will pave the way for proper submission of the next endorsement, the current DXCC List, a handy postage-rate card, and other useful items.

Monthly stock has to be taken to prepare copy for our Amateur Radio journal. The hundreds of endorsements/new applications must be sorted appropriately, listed, and double-checked. Now is the time for certificates to be typed and shipped to new members.

At the end of summer your reporter had an opportunity to talk at some length with both Don and Brian, reviewing typical questions and unearthing some tips for you, the applicant.

What happens if there isn't any return postage accompanying the DXCC material? The packet is "checked in" but set aside, and the applicant notified as to what is missing.

How do you suggest sending in 100+ cards? Probably the most effective way (domestically) is by Certified Mail.

Can I have a friend carry my cards to Headquarters while he is in the area? This happens frequently, particularly during the summer touring months. We will attempt to check the cards, but the actual crediting procedure will then "wait in line" to be handled in a consecutive manner.

How can I tell if I have any "phony cards" in my batch? Double check each card against your log. Don't send a card that doesn't represent a contact you made in good faith. If you have a question about lack of clearness on some entry on the card, *don't* make any alterations. Call attention, as necessary, via a note attached to the card or to the correspondence.

W3AZD "plugged in" to the telephone is a familiar sight in the DXCC section of the ARRL Communications Department! *(W1YL/4 photo)*

I'm a first-time applicant; what should I do? Write to ARRL, with an s.a.s.e., and ask for a "DXCC kit," noting how many of the DXCC awards you're applying for (mixed, phone, cw, RTTY, 160 Meters, Satellite).

Does the U.S. itself count as a country? Yes!

With CQWW just past and the ARRL DX Test upcoming in a couple of months, there are sure to be many who will complete qualifications for the DXCC Award. If you're one of this group, please write to ARRL and request the DXCC package, follow the forms carefully, be meticulous about the submitted cards, and proudly join in on the fun of participating in the ARRL DXCC, the open-ended DX Contest of all time.

DXCC COUNTRY DELETIONS

The following countries have been deleted from the DXCC List: KP3, KS4, HKØ and 8Z4. For more information, see DXCC Notes on page 78.

THE CIRCUIT

☐ Arkansas DX Association: Their annual DX meeting and banquet is scheduled for December 4 at the Ramada Inn in Fort Smith, Arkansas — starting with festivities on Friday evening. Those interested should drop a line to Harold Wilson, KB5RF, at his Callbook address, for further details. A good time is always had by participants.

☐ HZ1AB is looking for old QSLs prior to 1977. They should go to K8PYD marked "replacement." Rare countries and prefixes would be greatly welcomed. Look for them on 20, Wednesday evenings sunset until Thursday sunrise, QRV on 14.110 ± at 1900Z for skeds. During 160 operations, they've found it profitable to be QRV on 7.050± for info./skeds. The crew anticipates an active winter, plus soon-to-be-added RTTY capability. (Note: January sunrise time for HZ1AB is close to 0243Z; sunset around 1316Z.)

☐ EA4AXW, alias KA3V/YN1ZBD/YN1JSM/TG9ML/WB3IPZ — with various peripatetic operations as /ZB2 and /EA9 — prefers cards via his manager, K5BDX, Box 999, Springtown, TX 76082.

☐ VU2LQA has ceased operations from New Delhi, returning to Germany. Cards from 1980 on go to manager W2YTO, 1979 and earlier to DK3LQ, B Meroth, Bredow Allee 38, D.5300, Bonn 1, Federal Republic of Germany.

☐ W9FIU/KS4: DK2WH worked him close to 12 years ago and is still looking for info on how to obtain the card. Gunter would welcome input to Gunter Hartmann, Rubensstr. 17, 6120 Erbach, West Germany.

☐ Jarvis: Richard Laviolette, 3570 Corsica Way, Vancouver, BC, Canada V5S 4J3, is working on a monologue on Jarvis and looking for any information on former radio operation on the island. This might include KP6AK and KP6AL, IGY stations in 1958 or before, including pre-WW II possibilities.

☐ IDXF notes that Moody, VS5MS, is again active 1000-1500Z, 14.205-250. QSL via N2OO. VS5MS also reports that VS5TX will be QRT soon, enroute to VS6. Moody notes that Brunei will soon have a new prefix, commemorating their independence after years as a British protectorate.

☐ 4S7YL/8Q7AC/VS9YL, a friendly lady known across the world, became a silent key earlier this year after a period of illness resulting from an automobile accident. Sincere regrets from all DXers go out to OM Wick, 4S7WA, and family.

☐ A magazine item *(Amateur Radio*, June 1982) relates the never-give-up-on-that-QSL theme! VK3BZ recently received a card for a contact he made on August 29, 1932, accompanied by a letter from W5KL, ex-W4AGI, explaining the delay. He (W4AGI) was a young lad in 1932 with little money but he wrote the card out, filing it for mailing in future times. Recently, Leland (now W5KL) found the card along with another 19 VK and ZL ones that had met the same fate. For old-timers who may have worked W4AGI in the '30s, he is still very active on all bands under W5KL.

☐ P42E, Curacao, was operated during the CQWW cw by AA4S, W8LRL, N8II, N4RV, KC8C, AA6RX, K4BAI, K3EST, WA2SPL and N4MM, out after a world record. The group, manned in part by the Potomac Valley Radio Club, operated somewhat before and after the weekend. Cards go via WA2SPL.

☐ Mike Colesante, KC8C, 7707 Lee Hwy., Apt. 203, Falls Church, VA 22042, volunteers his aid as a manager for an active cw contest station.

☐ Isle of Man operation in the phone CQWW was planned by DL4FF (using GD5BLG), DF7FH (GD5CGV) and YL DK9ZL (GD5ZZZ). In the cw portion in November, the group planned to activate Monaco 3A, with operation starting several days ahead of the event. Cards must be sent to the home calls in Germany.

☐ GU (Alderney/Guernsey) was activated for the CQWW cw, 1200Z November 25 until 2400Z

*19620 SW 234 St., Homestead, FL 33031

November 28, GU5VS/A, all bands 160 through 10. The operators were G5VS, G5APC, G3SXW and G3TXF. All cards go via G4HNP.

☐ VU stations can now operate on a 50-kHz spectrum on 80 — 3500-3540 and 3890-3900 kHz. To commemorate the 9th Asian Games, to be held in New Delhi, Indian Radio Amateurs are permitted to use VU9 in lieu of VU2 (call suffix remaining the same).

☐ The Canadian DX Association has elected new officers: Pres. VE3IPR, V.P. VE3MR, Secy.-Treas. VE3FEA, Recording Secy. VE3MV. CANAD-X is reached via Box 717, Station "Q," Toronto, ON M4T 2N7, Canada.

☐ SMØAGD has operated from 5W1DQ (as guest operator), ZK1AF, 3D2DX, C21NI, T3ØCB and T2AGD. At the time of preparation of this column, he was expected to go to FW8, where Eric was scheduled to board an Australian yacht for passage to American Samoa. Plans on the book were for T31 and KH1, possibly other islands enroute to Honolulu, late in November. All cards for him go via SM3CXS. Thanks especially to the Northern California DX Foundation, which has been aiding Eric from the start of his Pacific DXploits since early May.

☐ Contesters take note! VE3GCO has come up with the *CQ Contest Amateur Radio Operating Book*, consisting of more than 100 pages in 3-ring format. Complete rules, official scoring, and entry and log sheets are provided, along with maps, checklists, operating aids and suggestions, statistical tables and more. ARRL and CQ Contests are covered, along with REF, WAE, All Asia, PACC, H-22, CanAm, Bermuda, YV, HK, VK/ZL/Oceania, RSGB, CARF, OK DX, SP DX, SeaNet, YO, SAC, ITU, IARU Radiosport, etc. Postage-paid cost is $8 Canadian for VEs and Ws, $10 U.S. for DX. This is not to be confused with the *Awards Directory* Garry still markets. Additional input from him at VE3GCO, Garry Hammond, 5 McLaren Ave., Listowel, ON N4W 3K1, Canada.

☐ The newly formed Western Pennsylvania DX Association has now elected permanent officers, replacing the interim board that helped WPDXA grow to its current figure of 70. Membership offers many advantages, including a DX repeater, bimonthly paper, auto call list, slide show, etc. Newly elected officers include Pres. WB3GPR, V.P. KG3K and Secy. KB3KV. Inquiries about the association go to Wayne Albert, KB3KV, 1508 Ligonier St., Latrobe, PA 15650.

☐ Buffalo Award — offered by the Kansas DX Assn. to amateurs outside the continental U.S., based on working 20 Kansas stations plus 5 KDXA members, for contacts made on or after September 1, 1980. Use any band/mode. Applicant shall submit normal log info; cards not required. SWLs also encouraged to submit log info for the award. KDXA will supply a current membership list (of 80 members) upon receipt of s.a.e. and 1 IRC. Applications for the award should be accompanied by 4 IRCs or $1 U.S. and sent to KDXA, Box 454, Salina, KS 67401 USA.

☐ A4XX planned to operate for a 40-hour period on November 27-28, in celebration of the 10th Anniversary of the founding of the Royal Omani Amateur Radio Society; sideband only on 10-15-20 simultaneously. The Oman Award with Tenth Anniversary Endorsement may be claimed for working A4XX on 3 bands, with a special card available for single-band contacts. Log extracts (certified by a club official) should include 5 IRCs, or equivalent, and go to the Awards Mgr., ROARS, Box 981, Muscat, Sultanate of Oman (by May 31, 1983).

A happy holiday season, one and all, from sunny south Florida! QST

QSL Corner

Administered by Joan Becker, KA1IFO

The ARRL DX QSL Bureau System (Incoming)

Within the U.S. and Canada, the ARRL DX QSL Bureau System is made up of call area bureaus that act as central clearing houses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free and ARRL membership is not required.

How it Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL Membership Overseas QSL Service. Members send cards to their outgoing bureau, where the cards are packaged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus, where volunteer workers sort the incoming QSLs by the first letter of the call sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an s.a.s.e. for a prompt reply.

Claiming your QSLs

1) Send a 5- × 7-1/2-in. s.a.s.e. to the bureau serving your district.

2) Neatly print your call sign in the upper left hand corner of the envelope.

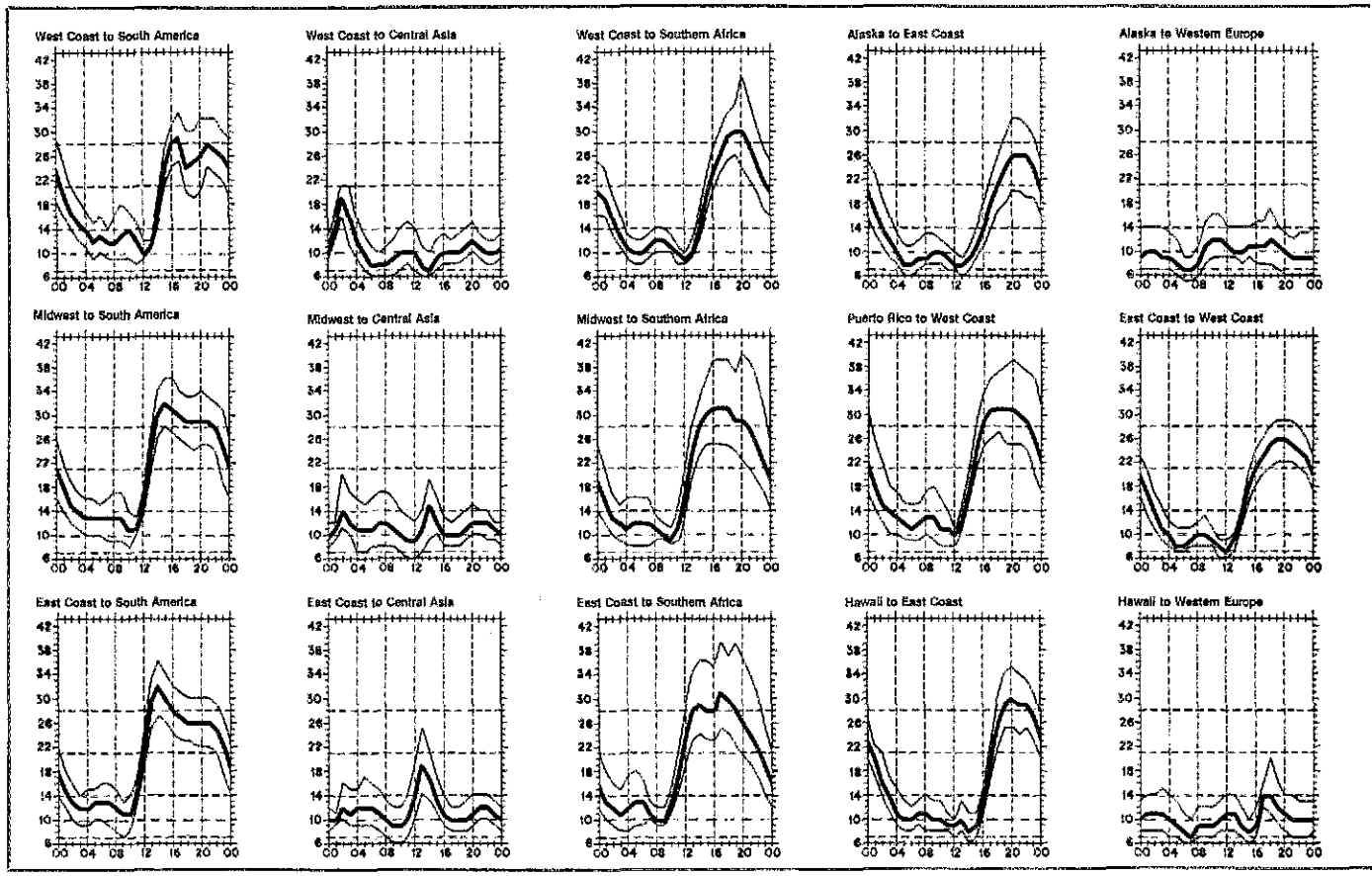
3) A preferred way to send envelopes is to affix a 20-cent stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.

4) When requesting *any information* from the bureau serving your district, always include an s.a.s.e. for a prompt reply.

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of s.a.s.e.'s. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. A period of 6 to 8 months, or longer, may take place before you receive your cards.

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area



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

bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

Do keep self-addressed 5 × 7-1/2 in. envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of First-Class postage.

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs are the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade. Please send envelopes with new call, in addition to envelopes with old call.

Do include an s.a.s.e. with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column in September 1982 *QST*.)

Don't send envelopes to your "portable" bureau. For example, WA1SQB/2 sends envelopes to the W1 bureau, *not* the W2 bureau.

ARRL DX QSL BUREAU SYSTEM

First Call Area: all calls* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls* — NJDXA, P.O. Box 599, Morris Plains, NJ 07950.

Third Call Area: all calls* — Leon Lapkiewicz, K3GM, P.O. Box 6238, Philadelphia, PA 19136.

Fourth Call Area: single-letter prefixes — Mecklenburg ARS, Call Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes — Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls* — ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.

Sixth Call Area: all calls* — ARRL Sixth (6th) District DX QSL Bureau, P. O. Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls — Willamette Valley DX Club, Inc., P. O. Box 555, Portland, OR 97207.

Eighth Call Area: all calls — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

Ninth Call Area: all calls* — Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls* — WØ QSL Bureau, Ak-Sar-Ben Radio Club, P.O. Box 291, Omaha, NE 68101.

Puerto Rico: all calls* — Radio Club de Puerto Rico, P.O. Box 1061, San Juan, PR 00902.

U.S. Virgin Islands: all calls — Graciano Belardo, KV4CF, P.O. Box 572, Christiansted, St. Croix, VI 00820.

Canal Zone: all calls — LPRA, P.O. Box 9A-175, Panama 9A, Republic of Panama.

Hawaiian Islands: all calls* — John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls* — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls — MARC, Box 445, Agana, Guam 96910.

SWL — Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

QSL Cards for Canada (VE and VO) may be sent to: CRRL Central QSL Bureau, Kennebecasis Valley Amateur Radio Club, Box 51, St. John, NB E2L 3X1. Or, QSL cards may be sent to the individual bureaus.

VE1* — L. J. Fader, VE1FQ, P.O. Box 663, Halifax, NS B3J 2T3.

VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.

VE3 — The Ontario Trilliums, P.O. Box 157, Downsview, ON M3M 3A3.

VE4* — Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5 — Charles Zsoka, VE5AAD, 1108 Walker St., Regina, SK S4T 5N4.

VE6* — G. D. Holeton, VE6AGV, 4003 1st St., N.W., Calgary, AB T2K 0X2.

VE7* — Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.

VE8* — Rolf Ziemann, VE8RZ, 2888 Lanky Ct., Yellowknife, NT X1A 2G4.

VO1, VO2 — CRRL VO QSL Bureau, P.O. Box 6, St. John's, NF A1C 5H5.

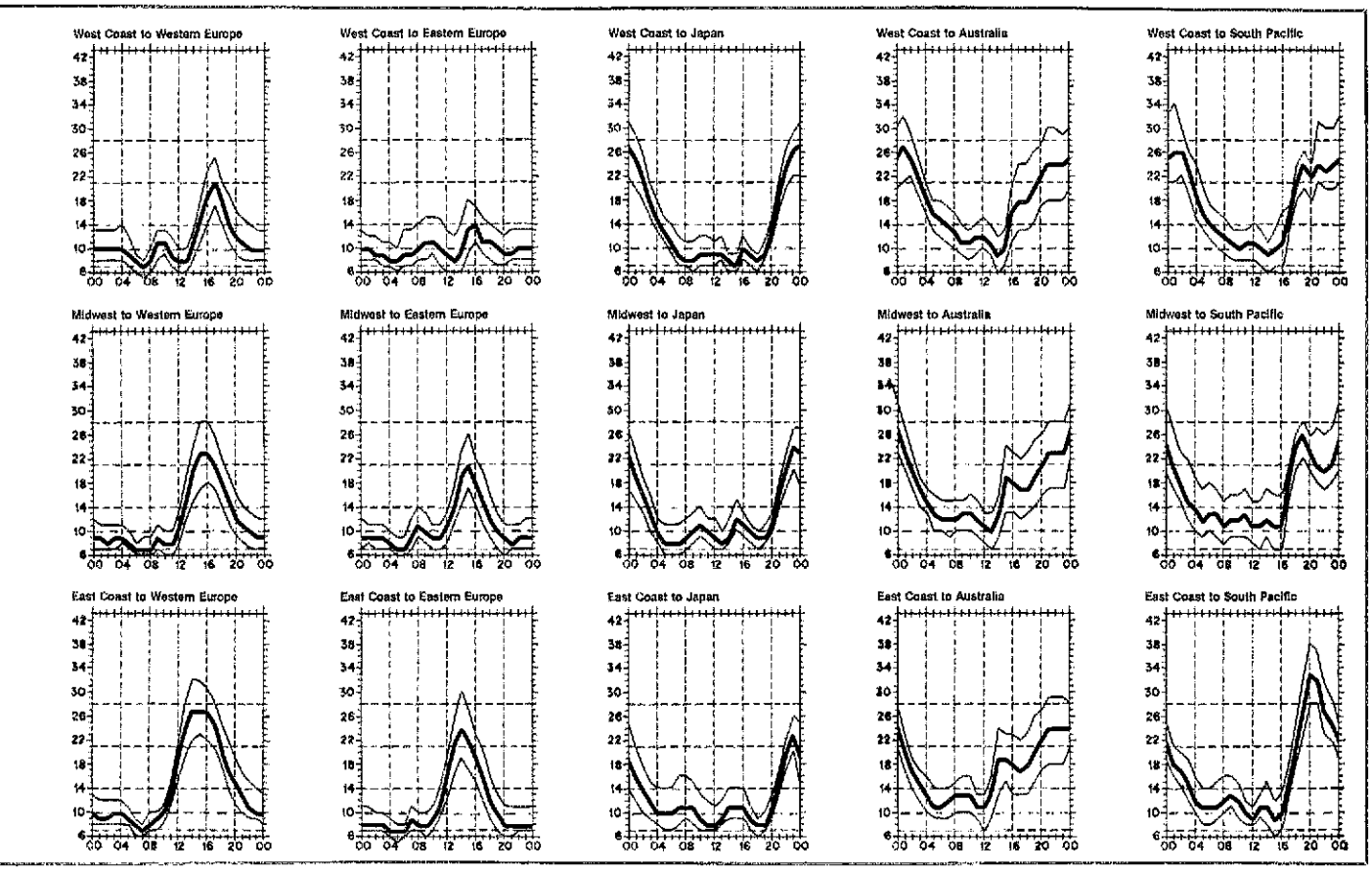
VY1 — ARRL QSL Bureau, W. L. Champagne, VY1AU, P.O. Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

And Finally . . .

Sept. 1982 QSL Corner, page 65, contains information on the operation of the ARRL-Membership Overseas QSL Service. For information on the bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.

Season's greetings from the QSL Bureau staff! QST



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 December 15, 1982, to January 15, 1983, assume a sunspot number of 83, which corresponds to a 2800-MHz solar flux of 132.

DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from August 1 through August 31, 1982. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

DF1CZ/110 HB9CIP/235 LA9VX/125 ZL1BCG/149 WA2SSH/117 W4HPE/103 N5HF/153 W6NVN/101 K9VMI/115
DF6AT/110 I2JIN/103 PT2BG/107 KA1ETQ/102 WB2GZC/106 W4MOI/102 W5JMM/SU/187 WA6GEM/102 N9CLM/110
DF6VE/110 JE1GBI/115 PY6FH/152 KA1TZ/108 KD3A/123 WB4BBH/103 W5LFK/304 W7FG/273 WB9IRX/121
DJ6BF/161 JA3JN/182 SLØZG/158 N1ALR/224 W3ICM/232 WB4JEM/101 W5PWG/109 W7QR/118 WD9HOZ/100
DK4AU/157 JA4AFT/325 SM5KDM/148 W1HZH/123 W3MSN/100 WD4HDT/151 AA6EE/103 WB7UAN/110 WD9ITO/144
EA5KF/241 JR4QZH/102 SMØKRN/123 K2GXT/101 WA3IMY/108 KC5OP/211 AG6D/243 WB7UCU/102 NØAFW/205
EA7CAD/105 JH7NRE/108 SVØAU/110 KU2X/136 K4DHY/103 KK5D/102 KE6UJ/105 K8ICE/105 WØPWN/101
EA8ZS/200 JR7BCO/110 SVØAW/SV9/123 KV2Y/185 KC4MJ/105 N5BOO/100 N6ZU/102 KA8ETK/100 WA0UIR/242
G3XBY/249 JAØCOR/266 XE3FP/104 N2BJ/278 KY4X/102 N5DBK/108 W6BW/127 N8AFV/126 WA0VQR/103
GM4DJS/109 KP4FO/101 YB2BLI/133 WA2HLP/101 N4YG/107 N5DVY/100 W6LHY/116 WA8IGG/104 WBØWRU/156
HB9BPP/218 LA9GV/300 YU2TS/273 WA2RYE/107 K4GXQ/102

Radiotelephone

DJ6BF/133 G3XBY/231 PT7VBN/110 ZS2BS/166 W3ICM/217 KK5D/101 W6ABW/136 W7FG/172 KC9FI/122
DL5JK/127 G4KBX/100 PY6NX/107 N1AHY/210 W3IJT/100 KY5R/104 W6LLV/103 WB7UAN/109 W9KQD/310
FC6GSE/126 HB9CIP/194 PY6AAZ/136 WA1GNA/115 K4BFL/105 N5DBK/105 W6NXD/159 N8AFV/117 WA9UCH/139
EA3UL/102 JE1GBI/111 SLØZG/115 KA2FAJ/101 K4GDE/109 W5JMM/SU/177 WA6VOS/109 N8DBI/104 WB9IRX/109
EA5KF/241 JH1EDB/272 VE1JL/102 KV2Y/185 KC4MJ/103 WA5NFC/109 WB6ANU/108 WD8IDZ/101 WD9ITO/144
EA7HG/118 JA3JN/175 VE3AEN/111 N2BZK/128 W4BLB/100 K6DMZ/121 KA7EXD/105 WD8IOC/110 KØTLM/228
EA8ZS/177 JH7NRE/105 YBØACL/142 WA2YNH/102 WA4CUU/133 KD6ZM/105 N7AHQ/100 K9VMI/115 NØAFW/203
G3HIH/104 JAØCOR/230 ZL1BCG/121 WB2TMD/105 KC5MF/100 KE6UJ/103

CW

DF7NW/105 G3EGG/103 HB9CGO/103 JAØCOR/192 SM5DAC/108 9Y4VU/110 W1FYT/101 N4AJZ/127 W6ABW/115
DJ1XP/245 G3NBZ/149 HK3DDD/136 OK1MG/274 VE1BEP/130 K1GW/117 W3GW/103 N4YG/107 AC8R/104
EA7ATE/117 HB9AYZ/100 JA5JGV/109 SLØZG/117 VK9NL/130 KA1BU/101 W3ICM/135 W4OYI/161 KCØD/110
FC6GSE/102 HB9BQB/109 JR7BCO/110 SM4JCE/105

5BDXCC

W4NL I3MAU EA7LQ 9Y4VU VE1BLX N5JR FP8AA LU3AJW K3ZUF
K3KG VK9NS W9DE DK3GK

Endorsements

Mixed

CT4YN/202 JA8AQ/302 VE3GCO/329 WB1BVQ/225 W3BH/151 N4NO/326 WA5WD/149 KN7N/188 W8YAH/277
DF9RW/251 JA8EAT/317 VE3JKZ/227 K2AIO/294 W3EE/177 N4QF/300 WB5LBJ/DU/286 N7BIJ/148 WA8CZS/205
DJ1QX/199 JA8HQI/305 VE3KOY/184 K2ENT/280 W3FG/164 N4UV/264 WB5MTV/125 W7BJ/311 WB8ZRL/284
DJ2MN/293 JA9AQE/300 YU1DZ/315 K2LQ/318 W3GOH/305 W4NL/335 WB5YPE/203 W7CG/355 WD8RNC/149
DJ5AI/319 LA4CW/199 YU2CQ/250 K2PK/252 W3UM/290 W4NTQ/229 WD5DQM/127 W7HPI/253 K9BGL/261
DJ6DU/271 LA4YW/213 YU2OM/251 KA2CLQ/151 WA3KCY/300 W4OGG/200 WD5HRX/258 W7HR/296 KØMFI/291
DJ8CR/325 LA8CJ/311 YV5CEZ/198 KA2GMT/175 WB3CQN/283 W4WKQ/174 K6AO/337 W7JKA/200 KD9E/307
DKØZR/225 OH2KP/252 ZL1AH/337 KB2RZ/266 WB3EVL/147 W4ZWE/286 K6LAE/330 WB7NFK/202 W9TX/265
DL7BC/155 OH2QV/346 ZS6BOK/229 N2AP/315 AA4US/250 WA4DAN/300 K6XN/290 AB8K/300 W9KBV/293
DL7HU/350 OK1MG/332 6Y5HN/125 N2BZK/128 K4AEB/313 WA4ICB/190 KM6K/263 AC8R/237 WA9NAY/151
DL8MAG/268 ON4SH/247 9Y4VU/282 N2DT/303 K4BWU/183 WB4ASV/276 N6VF/291 AJ8J/275 WD9AHJ/298
DL9TD/229 ON6IT/209 K1GW/207 W2HG/269 K4IKR/339 WB4PAB/305 N6VI/280 K8CMO/310 WD9GQV/217
EA7ATE/223 ON7EM/288 K1SA/305 W2SUA/330 K4LR/290 WB4UBD/290 NB6L/295 K8MR/159 WD9JKZ/125
F6DHB/301 OZ5CV/275 KA1HQ/251 W2TV/152 K4PR/203 AE5B/307 W6DOT/254 KA8ELW/138 KØARR/184
F6EYS/261 OZ7GI/273 KA1YQ/175 W2VYX/310 K4TO/324 AE5H/282 W6MUS/297 K8BLH/201 KØHQW/220
G3CXM/204 PY3CB/335 N1ACW/301 WB2AMU/125 K4TT/303 K5BZU/319 W8PN/331 KC8CK/156 KØHWL/290
HB9AUT/179 SM6AOU/341 N1AFM/163 AE3S/284 K4XH/320 K5KR/311 W6RQ/271 KN6R/281 KØTLM/233
I2KMG/341 SM6DHU/334 N1AKX/272 AI3Q/283 K4XQ/277 K5WE/306 W6VUN/224 N8AC/254 KB9WM/225
I2VGU/319 SM6HCJ/180 W1AA/354 AI3R/289 KR4F/266 KB5FU/290 W6ZID/249 N8AQV/284 KC9D/323
I3BLF/262 SM7EL/169 W1AOQ/180 K3AO/308 KA4AVO/225 KB5WQ/261 W6ZYC/324 N8II/292 NØJW/226
JA1JAT/152 SM7HCW/281 W1CYB/224 KA3CRC/183 KC4S/265 N5JR/302 WA8SIX/226 N8ZA/282 NØOA/327
JE1CYH/191 SLØAS/253 W1GHY/229 KA3CUF/165 KC4IT/286 NA5C/223 WB6FCR/260 W8ANM/214 WØANZ/194
JH1EDB/305 SMØMC/302 W1IKB/301 KA3CVD/177 KC4NJ/125 W5OG/251 WB6RIU/307 W8LZV/290 WØNS/303
JR1FYS/305 VE1AST/300 WA1AER/316 KA3FUU/139 KA4RPD/127 W5RKK/259 K7RS/231 W8RV/247 WAØSTV/139
JA7EHU/326 VE3CXL/219 WA1AYS/160 N3GB/293 N4JJ/311 W5ZPA/306 KJ7R/176 W8UVZ/305

Radiotelephone

DJ2YE/186 I3BLF/214 VE3GCO/327 W1LRR/206 W3EFA/288 K4XH/318 WB5ROW/229 N7AKQ/251 W8VSA/205
DKØZR/188 JE1CYH/178 YU2OM/238 W1SIX/162 WA3KCY/292 W4RGM/193 WB5YPE/203 W7BJ/309 WA8CZS/200
DL7QG/238 JA4AFT/318 YV4ACY/215 WA1AER/316 WB3EVL/144 WA4DAN/294 K6AO/311 W7HPI/231 WB8ZRL/279
DL8KS/313 JA7EHU/319 YV5CEZ/198 WA1AYS/159 K4AEB/313 WA4OEJ/285 K6XN/275 WA7COO/205 WD8RKT/245
DL8MAG/162 JR7ICN/126 YV5EF/144 WB1BVQ/224 K4CXY/291 WB4ASV/273 KB6BW/226 WB7FDE/202 K9BGL/184
DL9TD/127 JA8BAR/312 Z21BP/290 K2ENT/278 K4FJ/330 WB4UBD/290 KD6BE/200 WB7NFK/198 K9IKP/305
EA1IY/324 JA8HQI/305 ZL1AH/304 K2ZGC/175 K4RSB/302 WD4KXB/259 KM6K/261 K8CMO/307 K9MFI/268
EA1QF/297 KV4FZ/328 8P6QV/126 KA2CLQ/138 K4TO/309 AE5B/306 W6CN/290 KA8ELW/135 N9AXV/136
EA3XM/128 LA2TO/201 9Y4VU/229 KB2RZ/266 K4TT/261 AE5H/272 W6MUS/287 KA8IBO/175 W9TX/245
EA7HN/213 LA8CJ/301 K1GW/175 KC2Q/206 K4UAS/295 K5KR/309 W6QWJ/201 KB8LH/195 WB9VDX/287
EA7LQ/299 LA9GV/300 K1RAW/311 W2GBC/329 K4URK/276 K5LVZ/176 W6ZYC/319 KC8NY/255 WD9AHJ/290
OZ6EI/197 ON6IT/203 KA1HQ/251 W2SUA/328 K4XQ/272 K85FU/288 WA6RLE/278 KF8D/133 WD9FQE/250
EA8LD/301 PY2CYK/333 KA1YQ/169 WB2CVL/290 KB4CL/225 KC5UO/260 WB6FCR/254 KN8R/281 WD9GQV/216
F5JA/315 PY3CB/331 N1ACW/294 K3KA/305 KB4IY/176 N5JR/180 WB6JMA/195 N8AC/218 KØHQW/220
HB9AQO/316 PY4KL/347 N1AKX/250 K3LRI/200 KC4IT/281 W6RIU/307 N8AQV/270 KØRRY/204
HB9AUT/177 SM6DHU/307 N1ALR/224 K3LUE/226 N4EDT/225 W6LFK/277 AD7S/180 N8BBK/134 WØKXZ/184
HI8FCN/185 SM7HCW/269 W1AA/353 KA3BTH/133 N4NO/285 W6RKK/257 K7ICW/295 N8II/279 WØPPF/156
I1LNU/275 SMØGYX/154 W1CYB/224 KA3CRC/158 N4QF/296 W6UJO/200 K7IRO/311 W8ANM/214 WØYNZ/300
I2VGU/319 SMØMC/297 W1KSC/140 N3GB/270 NI4Y/214 WB5LBJ/DU/286 K7RS/225 W8UVZ/256 WB0CIW/298
I2XPD/279 VE2DZT/225

CW

DF3SV/252 JR1FYS/285 VE2CU/150 WA1AER/276 K4BWU/183 W4YDL/151 W6MUS/183 N8BM/249 K9MFI/253
DKØZR/139 JA8EAT/289 VE2FOU/201 K2PK/236 K4CXY/252 WA4DAN/273 W6ZID/234 N8II/256 KD9E/223
DL9TD/168 LA4YW/156 VO1CA/167 K3AO/150 K4YXJ/200 AE5H/218 WA5VJP/152 W8UVZ/291 W9TX/137
GM3YOR/218 LA8CJ/274 YU3TVQ/199 KI3L/200 KR4F/201 K5DYZ/177 W7EKM/230 WA8SXQ/256 WD9AHJ/280
I1YRL/225 ON4SH/182 K1BA/254 W3ODJ/253 N4NO/285 K5WE/211 AJ8J/247 W8ZRL/177 WØJIE/124
I3BLF/220 SLØAS/252 N1ACW/225 AA4AR/234 NI4Y/154 W5ZPA/267 N8AQV/159 K9BLY/135 WB0WRU/152
JH1EDB/264 SM7HCW/214 W1AOQ/150 K4AEB/139 W4NTO/155 K6XN/231

DXCC NOTES

DXCC Country Deletion: The ARRL Awards Committee has accepted the recomendations of the DX Advisory Committee to delete Serrana Bank, Roncador Cay (KP3, KS4, HKØ), Bajo Nuevo (HKØ) and the Saudi Arabia/Iraq Neutral Zone (8Z4), from the current DXCC List by virtue of undergoing a significant change in administration, thus no longer meeting the criteria for separate country status. These deletions will become effective with the December 1, 1982, DXCC Country List.

Any present and future operation from the Serrana Bank, Roncador Cay and Bajo Nuevo areas will count the same as San Andres and Providencia Islands for DXCC credit.

The Saudi Arabia/Iraq Neutral Zone no longer exists as a separate entity.

The current country count will be 315. The deleted country count will be 52.

Honor Roll Corrections: Mixed, K8MFO 312/331, K6OJO 313/326 W4GTS 313/332 Phone, W8GKM 314/330, W2FP 312/326

Honor Roll Reminder: Those wanting to up date their Honor Roll standing or make the Honor Roll must have their cards into HQ, no later than December 31, 1982. Cards arriving after December 31, 1982, will not be included in the Honor Roll listing.

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

13 CM — The Next Band Up

Over the last few years, the availability of commercial equipment for 1296 MHz has given rise to a surge of activity on that band. It is now possible to buy a complete station, including preamps, transverters, power amps and antennas, for use on 1296 MHz.

Much the same also can be said of 10-GHz wideband equipment. Of the bands between these two, at 2.3, 3.4 and 5.6 GHz, the 2.3-GHz (or 13-cm) band seems to be starting to move forward in activity. I believe there is even a commercial receive converter available now. The 13-cm band shows promise for a number of reasons. It is probably the highest amateur frequency on which it is possible for the average ham to generate reasonably high power levels. The 2C39/7289 series of tubes still performs quite well and is capable of putting out in excess of 30 W. High-gain antennas can be physically quite small, and reasonable-size parabolic dishes start to become very effective antennas at this frequency. Low-cost GaAs FETs can produce noise figures in the 1-dB region. Perhaps now is a good time to look at the existing technology for getting on the band.

The 13-cm band extends from 2300 to 2450 MHz, with a satellite allocation from 2400 to 2450 MHz. Narrowband work in the U.S. is concentrated near 2304 MHz, since this is a multiple of the common microwave driver frequency of 1152 MHz ($\times$ 2 = 2304, $\times$ 3 = 3456, $\times$ 5 = 5760 and $\times$ 9 = 10368). In Europe, the narrowband frequency is 2320 MHz, since some countries there have lost the use of the low end of the band.

The first piece of equipment that a station trying to get on the band would need is a receive converter. The lowest i-f recommended is 50 MHz, with 144 MHz probably being preferred. There are not too many converter designs published but, luckily, there are a few good ones. The by-now-classic interdigital converter, published for many years in the ARRL *Radio Amateur's Handbook*, is an excellent start. It does require a fair amount of metalwork, but has proved to be a very reliable design. The interdigital section not only acts as a mixer, but also as a local oscillator multiplier and filter, and as a front-end image-rejection filter.

Although the original design calls for a local oscillator injection frequency of 540 MHz (for use with a 144-MHz i-f) a number of people have used a 360-MHz LO with success. In the former case, the LO is multiplied by 4, and in the latter by 6 to give the desired 2160-MHz injection to the mixer diode. If a clean LO source at 2160 MHz is available, then one of the balanced mixer designs listed later can be used. They are simpler to construct than the interdigital mixer, but do require the higher LO input frequency. No barefoot mixer will give a noise figure much better than 6 or 7 dB, because of the conversion loss of the mixer diode. Inexpensive preamplifiers can be built to give noise figures in the 1- to 2-dB range with currently available devices. With a couple of preamps ahead of it, the mixer noise figure will no longer affect the system sensitivity significantly.

Antennas for 2304 MHz are usually one of two kinds: Yagis or parabolic dishes. A well-designed long Yagi (or loop Yagi) of 40 elements or so would be expected to show a gain of around 20 dB. This is about the same gain as would be shown by a 2-foot-diameter dish. Stacking Yagis at 2304-MHz would be quite tricky because of the accuracy with which the feed lines must be cut to feed all the antennas in phase. It is difficult to realize the theoretical stacking gain of Yagis even at lower frequencies, so four long-loop Yagis would probably show a gain of around 24-25 dB. A 4-foot dish should show about 26-dB gain, and so would probably be the better choice for a high-gain antenna. Such a dish would show a 3-dB beamwidth of 8° and so would need care in pointing.

Transmitters for this frequency fall into two types: linear mixer converters and multipliers. Linear mixers using both microstrip and interdigital techniques have successfully been constructed by amateurs, but details are few in the American literature. These schemes usually involve a low-level mixer with an LO input of 2160 MHz and an i-f input of 144 MHz to produce a milliwatt or so of rf power at 2304 MHz. This is followed by a string of solid-state linear amplifiers to bring up the power level.

Alternatively, multiplier chains, usually based on the sequence 384-1152-2304, can be used to generate power. The advantage of this route is that the final power doubling can be done in a tube at a level of several watts. This means that the work of generating rf power can be done at lower frequencies, where it is somewhat easier. Incidentally, the common 1N914 computer switching diode can be used as an 1152-2304 MHz multiplier at low power levels. Power amplifiers with an output of 30 W and a gain of around 6 dB can be built using tubes of the 2C39 series. Solid-state high power is still hard to come by for amateurs. At the recent Mid-Atlantic States VHF Conference (Pack Rats), WA3JUF and W3HQT demonstrated a solid-state power amplifier capable of over 10-W rf out, but device cost and availability put such amplifiers outside the each of most amateurs at this time. As time goes by, the price of these devices will surely drop, as have GaAs FET prices over the last few years.

It is evident that a number of people are working quite seriously on 2304 MHz at the present time, but little seems to have been published recently. If any readers have techniques they think might be useful to others, I would be glad to include them in this column. Meanwhile, here is a brief bibliography of 2304-MHz articles.

Atkins, B. "2304-MHz Preamplifier." The New Frontier, Aug. 1981, p. 65.

Atkins, B. "Loop Yagi for 2304 MHz." *QST*, The New Frontier, Sept. 1981, p. 76.

Evans, D. S. and G. R. Jessop, eds. "A Simple 13 CM Doubler." *RSGB VHF/UHF Manual*, 3rd ed., p. 5.71 (uses a 1N914 diode).

Fisher, R. "Interdigital Converters for 1296 and 2304 MHz." *QST*, Jan. 1974, p. 11 (also in ARRL *Handbook* and *VHF Manual*).

Foot, N. J. "Power Amplifier for 2304 MHz." *Ham Radio*, Feb. 1975, p. 8.

Foot, N. J. "1152 to 2304 MHz Power Doubler." *Ham Radio*, Dec. 1975, p. 40.

May, L. and B. Lowe. "A Simple and Efficient Mixer for 2304 MHz." *QST*, April 1974, p. 15.

Wade, P. "High Performance Balanced Mixer for 2304 MHz." *Ham Radio*, Oct. 1975, p. 58.

A number of different dish feeds for 2304 MHz are also described in the *RSGB VHF/UHF Manual*.

2304-MHz NEWS

There seems to have been more activity than usual last month on 2304 MHz. Paul Wilson, W4HHK, has written with details of one-way contacts with WB5LUA and W8YIO. During a good 2-meter opening from Texas to Tennessee on September 28/29, W4HHK fired up his 2304-MHz EME system (1 kW and an 18-foot dish) and was received at about 20 dB above noise by WB5LUA at a distance of 425 miles. WB5LUA was using a 5-foot dish with a "coffee can" feed and a GaAs FET preamp. His 10-W signal could not be heard at W4HHK, but Paul notes that he only has a barefoot mixer in the front end of his receiver. On the following night, transmissions were made from W4HHK to W8YIO in Michigan, a distance of about 600 miles. Signals were weak but could be copied. No attempt at a two-way contact was made, since W8YIO had only about 40 W available. An experiment was tried in which the W4HHK dish was elevated above the horizon. Signals received in Michigan were strongest at 0 and 1° elevation angles and all but absent at 3°, as might be expected on a long-haul troposcatter path. Signals should be strongest with antennas at both ends pointing at the horizon. W4HHK invites tropo and EME skeds with interested stations. His address is Paul Wilson, P.O. Box 73, Collierville, TN 38017.

Mike Agsten, WA8TXT, has written with information on more 2304 MHz activity. He reports recent contacts between W8YIO and VE3LNX (295 miles), and between himself and VE3LNX (273 miles). Mike is using a 384-1152-2304 multiplier chain and a 7289 power amplifier delivering about 25 W to a 48-el loop Yagi at 35 feet.

From Europe, I have a report of a 2304-MHz contact between G4LRT and SM6HYG, a distance of 1021 km (634 miles), which may be a new European record.

OTHER MICROWAVE NEWS

What may be the smallest dish yet used on EME was part DL7YC's station when he worked SM6CKU on 1296 MHz. DL7YC was running 400 W to a 2-meter (79-inch) dish, and SM6CKU was using an 8-meter dish with 125 W. "O" reports were exchanged (on EME this indicates that full call signs and reports were copied by both stations without too much difficulty).

Again in Europe, SM6ESG worked LA3FV/P on 5.7 GHz over a 243-km path. Equipment used was 10 W to a 1.6-meter dish at one end and "a few milliwatts to a smaller dish" at the other (I don't have information on which station had which set of equipment).

Another indication of European involvement in microwaves is a report in the RSGB microwave newsletter from G3LQR, who, on July 7/8, copied no less than five different 10-GHz narrowband beacons, two in England, two in Holland and one in Belgium!

*103 Division Ave., Millington, NJ 07946

The World Above 50 MHz

Conducted By William A. Tynan,* W3XO

Our Support Is Needed

Most readers of this column are probably League members, already, or they wouldn't be seeing *QST*. Thus, it should be unnecessary for me to tout the ARRL and all the good it accomplishes in the interest of Amateur Radio. It would be like preaching to the choir! There are, however, several organizations that do a lot of good in our particular niche of Amateur Radio, the world above 50 MHz, and hence deserve our support. Three such organizations come to mind in particular: AMSAT, SMIRK and SWOT.

There is no need to list AMSAT's contributions in furnishing satellites available for use by any amateur in the world while, at the same time, providing graphic proof that Amateur Radio is still in the forefront of technological development. With the launch of the Phase 111B spacecraft, scheduled for early next year, AMSAT's worth to our hobby will be even more apparent. Amateurs will be presented with a valuable communication facility previously unmatched. Non-amateurs, many in influential positions in their governments, will again be shown unmistakable evidence of what hams can accomplish. The extent to which knowledge of our worth has aided the Amateur Radio Service in its efforts for frequency allocations and other matters is not known precisely, but certainly it can only help our cause.

Most 6-meter operators have heard of SMIRK, which stands for the Six Meter International Radio Klub. One can hardly operate the band without hearing SMIRK numbers being exchanged. But there is much more to SMIRK than giving out numbers. The organization sponsors 6-meter contests and provides a number of awards, including a very nice certificate for showing proof of contacts with 50 countries on the band. It is also very active in providing equipment to DX hams in places where 6-meter activity can help swell country totals for all of us. Anyone who has seen the *SMIRK Newsletter* can testify that it is chock-full of interesting 6-meter news. The organization has also been very active in urging a solution to the RFI problem encountered in so many home-entertainment devices. For those interested in 50 MHz, SMIRK certainly deserves support.

The Sidewinders on Two, or SWOT, group is the youngest of the three, but it has done much to promote the popularity of ssb and cw on 144 MHz. SWOT sponsors weekly nets in many areas and an annual contest, and publishes the fine monthly *Bulletin* crammed with 2-meter news. For the 2-meter ssb/cw operator, SWOT is for you.

This is not intended so much as a sales pitch to recruit new members for these fine and deserving organizations, although all three certainly are looking for new members. Rather it is aimed at reminding those who have joined in the past that continued support is necessary in order for them to continue to function and provide services. Unless you have a life membership (as far as I know, AMSAT is the only one of the three that offers life membership), you must renew in order to remain current. These organizations cannot survive on a small one-time fee any more than any of us can live for the rest of our lives on our first paycheck. Originally, SMIRK charged a one-time fee of $6 and requested a s.a.s.e for each *Newsletter*. This was found to be impractical several years ago, so a change was made to annual dues of $3. Apparently, members have not gotten the word, as the renewal percentage has been quite low. K5ZMS says that SMIRK may have to suspend operation if things don't improve soon. The last *Newsletter*, which was a big one, almost bankrupted the "klub." To renew your membership, send $3 to SMIRK, 7158 Stone Fence Dr., San Antonio, TX 78227. Please include your name, address, call and SMIRK number.

I don't know if SWOT's fiscal situation is as desperate as that of SMIRK, but I am sure that the 2-meter group, like most of us, can stand more money in the bank. SWOT dues are $10 per year, which includes the *Bulletin*. The address is George Bretz, KB5SV, Treasurer, 3530 Livingston, Fort Worth, TX 76110.

Let's not forget AMSAT. The loss of the Phase IIIA satellite two-and-a-half years ago almost finished the the organization financially, as well as emotionally. But, thanks to support from members, ARRL and industry, the Phase IIIB spacecraft has been completed and is ready for a ride into space. Nevertheless, despite all of the contributions, building of this satellite has just about exhausted the organization's financial resources. New memberships and renewals are very much in order right now. Dues are $16 per year, and go to AMSAT, P.O. Box 27, Washington, DC 20044.

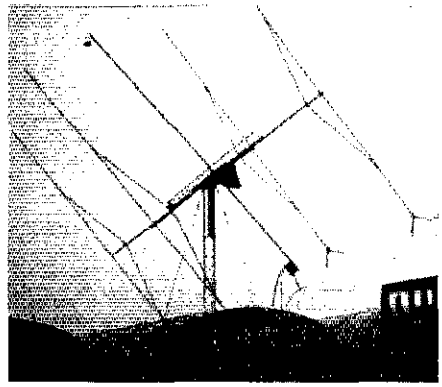
ON THE BANDS

6 Meters — As this is being written in mid-October, the fall F_2 season is beginning to take shape. It is too soon to tell just how good it will be, but early indications are that it will produce some interesting DX for those who are watchful enough to be there at the right times. The southern U.S. has been experiencing almost daily afternoon and evening openings to Argentina, Peru and several other South American countries. And, around 1900Z on Saturday, October 16, father and son team OA8V and OA8CW, as well as OA4PQ, were worked as far north as central Virginia by WE4N, (ex-WD4IUS). The evening before saw a several-hour E_s opening from the northeast to the southern states, enabling a number of Northerners to work into South America via an E_s to TE linkup. YS1ECB, by virtue of the a-m rig sent by SMIRK, has been handing out a new country to many South Americans. Region 1 has also been having what is hoped to be signs of things to come in the form of crossband contacts between Europe and South Africa. Also, a few South American stations, including the PY7THF beacon, have been heard in the U.K. Around 1300Z on the 17th, several WIs reported hearing ZS beacons. At about the same time, ZB2BL worked a number of G and EI stations, apparently via E_s. A few hours later, WA5IYX San Antonio reported hearing the 41.25-MHz French TV sound while K2MUB was receiving the 45-MHz BBC video. About 1800Z, G5KW reported reception of the PY2AA beacon. Incidentally, Ken's QTH this fall is at Land's End, where the famous Marconi transatlantic experiments took place about 80 years ago.

Out in the Pacific, the W6JKV DXpedition to the Caroline Islands is in progress. It is understood that KC6YE has worked a raft of JAs, as well as KH6IAA, but no information on contacts with the Continental U.S. is available at this time. A more complete report on Jim's latest exploit next month. Speaking of DXpeditions, that one to St. Peter and Paul Rocks around October 1 did get off some 6-meter operating, providing a new and rare country to PY2XB, as well as LUs 3EX, 7DZ and 8YYO. During the single 45-minute opening that PYØSP/PYØSJ caught, they also worked some 45 JAs. Equipment consisted of a 3-W rig to a 4-element beam.

KH6IAA says that things have been looking up for him. The number of South Americans appearing nightly has been on the increase since the end of September, and Al reports his first JA opening of the season October 3.

With all of the aurora present during the last days of summer and early fall, the occurrence of auroral-induced E_s is always a possibility, although it appears more likely in July and August. Michigan station K8WKZ reports such an instance during the month of September. Dave says that, in conjunction with an aurora on the 22nd, he worked VE5JQ, VE8BY, VY1AU and KL7NO between 0300 and 0400Z. Signals ran 5 × 5 to 20 dB over S9.



The array of four 16-element F9FTs at French 2-meter EME station F6DTE. An 8877 provides the power. *(photo via F1DPU)*

2 and 1-1/4 Meters — Tropo is usually the principal news for late summer and early fall. Although this year did not produce a massive, long-lasting opening like the one that occurred in September 1979, it did nevertheless provide some thrills as well as new states, especially for the newcomers. Particularly on 1-1/4 meters, state totals for many have been climbing markedly. VE3EMS is one who has been concentrating on that band. Using a combination of tropo, m.s. and EME, Peter has now worked a total of 37 states. The tropo session of September 5 netted him two new ones, WD4DGF Tennessee (10 W) and

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

2-Meter Standings

For WAS holders, listing is WAS number, call, state and call areas worked. For others, call, state, U.S. states worked and call areas worked. Call areas are the 10 U.S. call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. Compiled October 16, 1982. *Indicates that one or more contacts were made via EME. †Indicates WAC. – Indicates information not provided.

WAS Holders

1	KØMQS*	IA	12
2	K5CM*	OK	12
3	NØJA*	MO	12
4	K9HMB*	IL	12
5	K1WHS*†	ME	12
6	WA4MVI*†	NC	12
7	K5JL*	OK	12
8	WA9DOT*	WI	12
9	WBØZXU*	IA	12
10	K9CA*	IA	12
11	WØSD*	SD	23
12	K5BMG*	LA	12
13	K5GW*	TX	12
14	WB5LUA*†	TX	23
15	K4GL*	SC	23
16	WØVB*	MN	14
17	WB5LBT*	LA	20
18	K4PKV*	NC	12
19	WØRWH*	MO	23
20	WBIDU*	MI	23
21	K1MNS*	NH	12
22	WB9VEM*	IL	12
23	K5FF*	NM	16
24	W5FF*	NM	16
25	W7FN*	WA	12
26	W1JR*	MA	12
27	WBØQMN*	CO	12
28	WB4EXW*	NC	18
29	K9KFR*	IN	12
30	K3VGX*	PA	12
31	SM7BAE*		21
32	WA7BJU*	OR	12
33	VE7BQH*		35
34	W6PO*	CA	12
35	WA3VSJ*	PA	27
36	WAØLPK/KL7*	AK	20
37	WBØYSG*	NE	12
38	N7NW*	WA	12
39	W5LUU*	TX	12
40	W4HJQ*	KY	12

K1FO*	CT	49	18
AA1A*	MA	47	20
K1GVM*	MA	44	15
K1BKK*	VT	40	14
W1YTW	ME	36	12

WA1OUB	NH	36	9
K1PXE	CT	35	13
N1AIS	MA	34	12
WB1FVS	CT	34	11
W1JSM	NH	33	5
W1GXT	MA	30	11
K1FWF	MA	29	11
W1AIM	VT	28	9
K1SF	MA	27	11
W1FJH	MA	26	8
WA1JOF	MA	25	11
KA1DHO	MA	24	9
W1HDQ	CT	24	7

W2CNS*	NY	47	18
W2PGC*	NY	47	15
W2AV*	NY	44	14
K2OS*	NY	44	14
W2GSX	NY	41	16
W2AZL*	NJ	41	10
W2BLV	NJ	37	12
W2ORI	NY	37	10
W2CRS	NY	37	8
W2RS	NJ	36	13
WA2TIF	NY	36	11
K2OVS	NY	35	12
WB2WIK	NJ	35	12
K2QR	NY	35	11
WB2CUT	NJ	34	12
WA2PMW	NY	34	11
WA2FGK	NJ	34	8
K2DNR	NY	32	8
WA2SLY	NY	31	12
WA2PVV*	NY	27	10
W2MPK	NY	27	8
K2BWR	NJ	27	7
W2DWJ	NJ	26	7
WA2ABN	NY	25	10
K2YCO	NY	25	10
N2BMN	NJ	22	10
WA2YWP	NY	22	7

WA3USC*	MD	47	18
AB3D	DE	45	14
W3OZ*	MD	38	12
K3WHC	PA	37	9
K3QCQ*	PA	37	8

W3XO	MD	37	10
W3BDP	DE	37	9
W3IWI	MD	36	12
WB3JHP*	MD	36	9
W3RUE	PA	36	11
W3KWH	PA	35	10
AE3T	PA	35	8
W3CLQ	PA	33	10
K3MWV	PA	32	10
WA3WUL	DE	32	10
WA3DMF	MD	32	9
W3ZZ	MD	31	11
WB3LJK	MD	30	—
K1GSR/3	MD	29	11
K3HCE	MD	29	11
W3LNA	PA	28	8
N3AHI	PA	25	8
W3OTC	MD	23	9

WA4CQG*	AL	49	—
WA4LYS*	FL	48	29
WD4IIS*	GA	42	12
WB4LHD	TN	40	11
WA4PCS	KY	40	10
W4GJO	GA	39	11
N4CD	VA	38	12
W4HHK	TN	38	9
K4CAW	NC	38	9
WB4NMA	GA	38	9
WD4MUQ	VA	37	9
K4KAE	SC	36	13
W4MKJ	KY	36	12
K4QIF	VA	36	9
W4LNG	GA	36	8
W4ZD	FL	35	12
WD4CXU	VA	35	8
KØRI/4	VA	34	11
W4ISS	GA	34	8
W4FJ	VA	34	8
WA4DKH	KY	32	9
W3IY/4	VA	32	8
WA4SBC	VA	31	12
W4SMU	KY	30	9
K4CKS	GA	29	—
K1FJM/4	FL	26	9
NA4I	GA	24	10
N4QH	GA	23	8

W5JTL*	MS	49	13
WD5CRK*	OK	49	12
N5KW*	OK	49	12
WØRRY/5*	OK	47	11
K5MWH*	AR	47	10
W5RCI	MS	46	10
K5SW	OK	45	10
W5HN	TX	39	12
W5HFV	OK	38	10
WA5HNK	TX	35	12
WB5JAR	AR	34	10
WA5EID*	AR	32	13
W5UWB*	TX	32	9
N4JS/5	MS	31	8
WB5JVR	TX	26	10
WA5YOU	LA	26	8
K5VVV	TX	25	8
WA5TBE	TX	25	8
K5ONM	OK	24	9
WA5IYX	TX	19	9

W6XJ*		29	12
WB6NMT*		26	13
K6JYO		19	5
K6PVS*		17	—
K6HMS		11	5
K6GAO		8	6
K6QXY		8	4
N6CA		8	3

WA1JXN/7*†	MT	49	40
W7HAH*	MT	46	23
W7CI*	AZ	48	17
WA7JUO*	NV	45	16
W7JF*	MT	44	14
K7NII*	AZ	41	12
WA7ADK	UT	24	6
N7BHC*	UT	21	6
K7ICW	NV	21	9
WA7JTM	AZ	17	6
WB7EPA*	AZ	16	6
N7ART	WA	15	5
N7AKB	NV	12	4
WB7QBC	WY	12	3
WA7EPU	AZ	9	6

W8WN*	MI	48	14

WA8HTL	MI	40	9
WA8MIL	MI	39	9
WB8IGY	OH	39	5
K8RZB	OH	39	10
K8WKZ	MI	38	12
K8AXU	OH	38	11
W7EKI/8	OH	38	8
WB2DIN/8	WV	36	9
WA8NLC	MI	35	9
KJ8S	MI	34	10
WB8PAT	OH	34	9
WD8BRE	MI	33	10
W8LCY	OH	32	8
WB8FEZ	MI	30	8
N8AXA	OH	26	9
KB8SG	MI	25	8
W8TN*	WV	24	11

K9XY*	WI	48	18
W9UD	IL	45	13
K9SGD	IL	45	12
K9EFX*	IN	44	13
KB9NM	WI	43	14
W9AAG	IL	42	9
W9WZB	IN	41	13
N9SS	IL	41	9
W3EP/9	IN	40	13
W9NLP	WI	40	10
W9IP	IL	40	9
K9UNM	IN	38	8
K9SM	IL	36	9
W9VWY	IL	35	9
WB9QBU	IL	34	—
WA9UHB	IL	33	9
AA9D	IL	31	10
WB9TPV	IL	31	9

WBØTEM*	IA	49	22
WØRWG*	MO	48	15
KØALL*	ND	48	15
WBØVYV*	IA	48	11
WØEMS	NE	48	11
KØCJ	MN	46	12
WØLER	MN	46	10
WAØLSH*	CO	45	15
WØOHU	MN	45	12

KØDAS*	IA	45	12
KØSE*	MN	45	10
WØRLI	MN	45	9
NØLL	KS	44	10
WØPN	MN	40	11
KØAOD	MO	38	11
WBØDGF	NE	38	9
WBØIUT	NE	37	10
WØRAP	IA	37	10
WBØSIL	MO	36	13
WBØUFQ	MO	36	9
WØPW	CO	35	9
WBØWFY	MO	35	8
KØAOD	MO	34	11
KØTLM	MO	34	10
KØUDZ	SD	33	10
WBØZKG	IA	32	8
KCØQR	NE	32	10
KAØAYN	MN	28	10

VE1UT	NS	26	8
VE1ASJ	NB	18	6
VE2DFO*		48	30
VE3EMS		38	11
VE3FN		37	11
VE3DSS		37	10
VE3ASO*		35	12
VE3UH		35	11
VE3FKX		34	10
VE3DTQ		29	—
VE3AIB		29	10
VE3AQG		28	8
VE4MA		14	9
VE4UX		7	3

G5CSZ*		26	30
I4EAT*		12	64
G4DZU*		11	8
XE2BC*		9	5
VK5MC*		7	7
SM6CKU*		5	4
VK3ATN*		4	4
ZL1AZR*		2	2

KC4EG Kentucky. Also worked on 1-1/4 that evening was K9MRI with S-9 plus 20-dB signals over the 380-mile path. On another good tropo session, September 28, VE3EMS worked WB5LUA near Dallas (1181 miles) and K5SW Oklahoma, along with state number 37, WD5CAP Arkansas. State number 36 was added September 19 via an EME contact with WØPW Colorado.

WB5LUA also sends a report on the September 28 tropo session. On 1-1/4 meters, A1 lists contacts, in addition to VE3EMS, with K4EJQ Tennessee (850 miles), K9HMB and W9IP Illinois, and WA9KGQ Wisconsin. On 2 meters, he hooked up with Illinois stations K9HMB and N9AQ, along with WA8FTA in Michigan.

Perhaps some of the gang will remember K4MSG, who held forth from southern Virginia a few years ago. Paul is back on 2 meters, this time from the Virginia suburbs of Washington. He feels that his new location will work out quite well. Despite running only 10 W, he got off to a good start with 12 states in only a few weeks, thanks to the tropo and aurora of late September. More power will be on line soon.

As if not satisfied with his already outstanding performance on 2-meter EME, VE7BQH has added reflectors to his collinear, bringing the total number of elements to 224. Lionel says he has to keep up with the "big guns."

VE2VQ passes along word of several new beacons operating in the Ottawa area. They are operated by the Department of Communications, and use the call VE3DRC. Frequencies are 144.935, 433.935, 861.5125 and 1296.000 MHz. The 2-meter and 70-cm beacons have 10 W, the 23-cm one has 1.5 W into a 16-dB directional antenna, and the 861-MHz beacon uses 60 W and a 7.5-dB omnidirectional antenna. The 2-meter antenna is a 3-dB omni, and the 70-cm radiator is also omnidirectional with a gain of 6 dB. Modulation is fm voice on all.

Not too many reports are turned in on 2-meter TE of late, but it is still around. JA1VOK reports that about 1000Z on October 3 he worked VK4IR on 144.1 ssb. The VK was 5 × 5, and Hatsuo received a 5 × 2 report. The following evening, at about the same time, JAØIXX also QSOed the VK.

70 Cm and Down — The aurora of September 27 provided some interesting results on 70 cm. VE3FN Ottawa says that signals were stronger than he had ever heard on the band via this mode. Using about 200 W to a single 19-element RIW, Ray worked WB3ESS and K3QCQ Pennsylvania, W3IP Maryland, K1PXE Connecticut, W2VC New Jersey and W2CRS New York over a 45-minute period beginning about 0025Z. On several stations worked, a pronounced upward frequency shift of about 3 kHz was noted. K2RIW turns in a similar observation on an aurora that occurred September 6. While listening to K3QCQ and K4QIF, Dick was experimenting with his array of 16 19-element RIW Yagis. He got the expected 6-dB increase in signal strength when he went from a single stack of four to all 16, indicating a point source. Using the array of 16, which provides a beamwidth of about 5.5° in each plane, he peaked the signals at 308°. Rotating the antenna 8° clockwise to 316°, as expected, the signal got weaker; however, the frequency went up about 1 kHz. Rotating a similar amount in the opposite direction produced a like reduction in frequency. The following evening, W9ZIH near Chicago was worked, also on aurora, and Dick found the same kind of frequency shift as the antenna was moved back and forth plus and minus 8°. From these observations, K2RIW concludes that the reflecting medium to the right of the strongest signal point was moving toward him at about 750 miles per hour, while the other side was moving away at a like velocity. He also points out that 70-cm aurora is not a distributed-reflection medium, but rather a "hot spot" phenomenon, which means antenna gain does pay off, if the beam can be properly aimed.

The tropo encountered during September gave W3RUE a chance to work 70-cm state number 30 in the form of W5RCI Mississippi. W4GJO also found things to his liking. From his northwest Georgia location, Grid completed a 70-cm QSO with K2RIW at 1542Z September 6, and W2DRZ at 1701Z on the 17th. Note that these are mid-day contacts. The month also produced tropo openings to the Dallas, Houston and San Antonio areas of Texas, as well as Arkansas, Oklahoma, Iowa, Michigan and Wisconsin.

The tropo is also making itself felt on the higher bands. W4HHK near Memphis has been running tests on 2304 MHz using his 1-kW input Klystron rig feeding an 18-foot dish. He was heard about 20 dB above noise by WB5LUA over a 425-mile path on September 29 and the following evening by W8YIO at a distance of 600 miles. So far these tests have been one-way because of low power on the other end and lack of a receiver preamp at W4HHK. Paul's receiver deficiency will be remedied soon.

In other 13-cm news, WA8TXT Sandusky, Ohio says that, on the evening of October 3, he contacted VE3LNX, a distance of 273 miles. Mike adds that just prior to his QSO, VE3LNX worked W8YIO. That represented a hop of 295 miles. WA8TXT's setup consists of 25 W to a 48-element loop Yagi at 35 feet. Receiving is handled by an MGF-1402 preamp feeding a W2CQH-type interdigital converter.

In the 70-cm EME department, K3QCQ has been adding to his state total with moon-assisted contacts with WØMDL Minnesota and KL7WE. The latter contact, occurring October 10, brings Bill's count to 34. WBØTEM hasn't been idle, either.

The East Coast 70-cm Net continues to meet every Wednesday evening beginning at 2100 local time on 432.090. Aided by two well-equipped net-control stations — WA4ZIA near Charlotte and K4CAW Greensboro — the net regularly attracts check-ins from a dozen or more states from New York to Florida. In its almost three years of existence, some 102 stations in 15 states have participated. Generally, the procedure calls for the NCS to begin the net looking south, working around to the northeast in about 45 minutes to an hour. So, if you are in that direction and don't hear anything at the appointed net time, be patient. Checking in provides a good chance to test equipment and determine band conditions. The net also serves as a good stimulator of activity.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

N1AEX, Eugene B. Herman, Norwalk, CT
W1AUB, Milton L. Hirsch, Stamford, CT
W1AYA, Philip C. Jacobs, Newtonville, MA
KA1BEA, Warren L. Thorpe, East Dennis, MA
W1GTH, Fred W. Saunders, Plantsville, CT
W1IWR, Fred A. Copp, Atkinson, NH
K1KHC, Bowman Graton, Key Largo, FL
W1KI, Louis A. Jaques, Union, ME
W1LMW, Raymond J. Dufour, Shrewsbury, MA
W1NBQ, James J. Craven, Jr., Chebeague Island, ME
W1OMD, Joseph R. Altieri, Springfield, VT
WA1QIW, Frank B. Husted, Hopkinton, MA
K1RKL, Winthrop A. Welch, II, South Windsor, CT
W1SHK, William H. Foley, Torrington, CT
W1TIX, George R. Nixon, Tavares, FL
K1TVE, Dennis Borovy, Torrington, CT
W1UH, Alfred J. Sevigny, Waban, MA
WA1UHD, Alfred A. Bugbee, Presque Isle, ME
K1VLS, Charles W. Post, Worcester, MA
W1WOW, Arthur Laubi, Jr., Plainville, MA
WA1YFD, Walter J. Stieg, Fairfield, CT
K1YZ, William L. Pultz, Wayland, MA
WA2CQB, Nathan Israel, Albany, NY
W2DSS, Charles F. Smith, Oneida, NY
W2EPZ, Martin M. Schwartz, Floral Park, NY
WA2FEM, Ray L. Perkins, Endicott, NY
WB2GHS, George W. Omdal, Cedar Grove, NJ
K2HAM, Moe Swedgal, Forest Hills, NY
W2HL, Bernhard H. Stahl, New Milford, NJ
W2IJK, Max Reznik, Hicksville, NY
W2IXA, Robert R. Halligan, West Sand Lake, NY
WB2JOV, John Cinquemani, Brooklyn, NY
KA2LJZ, Jacob J. Harinsky, Uniondale, NY
ex-W2LWE, Henry Kohrn, East Setauket, L.I., NY
W2OI, Norman W. Criqui, Kenmore, NY
W2OPM, Arthur D. North, Franklin Sq., NY
WB2OXV, Stanley T. Gazda, Binghamton, NY
WB2QVK, Milton R. Meteyer, Henrietta, NY
W2RN, Raymond D. Nichols, Cattaraugus, NY
W2TVD, Frank P. Saia, Corning, NY
*WB2WOU, Herbert Rugoff, Toms River, NJ
WA2YQW, Christopher DiPasqua, Bronx, NY
K2YVL, Roy E. Smith, Nanuet, NY
K3ANT, George H. Becker, Jr., Jim Thorpe, PA
W3CRV, Stephen N. Reynolds, Springcreek, PA
W3DUG, Max M. Jacobson, Silver Spring, MD
W3EXF, Walter A. Wickland, Upper Darby, PA
WA3FSH, James R. Hill, McKeesport, PA
W3GEN, Audrey J. Springer, Pittsburgh, PA
K3HOG, Franklin H. Stubbs, Takoma Park, MD
W3IJG, Charles E. Nobles, Crownsville, MD
WA3KEK, Harry L. Pierce, Baltimore, MD
W3LVX, John S. Milkovich, Industry, PA
W3LZN, Roscoe B. Smith, Wilmington, DE
KB3MH, Elmer S. Forwood, Mount Joy, PA
W3NWA, Robert E. Young, Conshohocken, PA
K3NZI, Glenn W. Hull, Sr., Pennsburg, PA
WA3TDK, Robert L. Folweiler, Pottsville, PA
WA3VUI, Wayland C. Marlow, Granville, OH
N4ADG, Paul S. Means, Rockledge, FL
WA4AEB, William T. Roff, Jr., Tryon, NC
W4AYV, Nathan H. Stinnette, Tavares, FL
N4BMF, James L. Blair, Charlotte, NC
W4BU, Capt. James H. Nicholson, Sarasota, FL
W4CLO, Guy N. Holland, Dyersburg, TN
WB4DEM, Archer R. Overby, Jr., Colonial Heights, VA
KA4ELA, Janyce E. Reece, Pinellas Park, FL
W4FQU, Karl G. Rau, Clearwater, FL
*KA4GLD, Duayne T. McNeil, Brandenton, FL
K4GQ, Herbert W. Muller, Pompano Beach, FL
W4HPL, William T. Thompson, Cookville, TN
WA4IHW, Lawrence E. Heath, Mechanicsville, VA
K4IWI, Cyril U. Smith, Birmingham, AL
K4KLG, Harold E. Lyons, St. Petersburg, FL
W4LFY, Donald G. Crawford, Venice, FL
K4MKO, Harry E. Welsh, Goode, VA
WA4MLE, Fr. Leo Brown, South Hill, VA
K4NJY, Samuel W. Henderson, Camp Hill, AL
WB4OYQ, Donald W. Parsons, Roanoke, VA
W4PEI, Carl G. Schaal, Tavares, FL
W4PNO, Milford W. McMillan, Decatur, AL
WD4RHY, John R. "Buck" Banks, Ninety Six, SC
W4UOQ, Flournoy C. Walker, North Charleston, SC
KA4VVS, Walter S. Telep, Arlington, VA
WB4WAC, Richard A. Shepp, Fairhope, AL
W4WOT, Norman V. Schneider, Atlanta, GA
WD5AIW, Roger K. Speas, Sr., Garland, TX
W5CCK, Ila M. Steed, Enid, OK
W5DES, Weldon M. Vogt, Galveston, TX
W5DSU, Arthur E. Lippert, Stillwater, OK
ex-K5EGS, Charles Hoggatt, Ada, OK
W5FHF, Emory L. Dell, Vivian, LA
W5FND, Willard J. Carmack, San Antonio, TX
WA5FSN, Leonard R. Hollar, Kingfisher, OK
W5GAL, Albert "Buddy" Switzer, Baton Rouge, LA
*WB5JLB, John J. Carter, Farmington, NM
W5JMP, James R. Mossman, Wichita Falls, TX
WA5JPW, Charles E. Nowlin, LaMarque, TX
WA5KDO, Duane W. Stephens, Dallas, TX
W5LJC, Robert I. Hancock, Dallas, TX
W5NGA, Euel C. Fortenberry, Lacombe, LA
W5PXQ, Howard J. Pick, Houston, TX
W5RBV, Peter Clement, Eastland, TX
W5TQ, Jesse W. Copeland, Austin, TX
W5TVK, Dudley D. Harrison, Sequin, TX
K5UUS, Merle C. Patrick, Wichita Falls, TX
KR5V, Hugh L. Fuller, Houston, TX
W6AAE, Clarence E. Vendley, Los Altos, CA
KA6ATZ, Charles W. Johnson, Pebble Beach, CA
W6AV, George S. Evans, Auburn, CA
WB6BCC, Daniel C. Steen, Alameda, CA
W6BFS, Norbert T. Cormier, Arleta, CA
K6BGE, Donald C. Johnson, Lancaster, CA
W6CJ, Harry M. Lindgren, Fort Jones, CA
K6EVB, Winfield H. Brown, Pasadena, CA
W6FDO, Raymond I. McHolland, Apple Valley, CA
K6GCU, Clarence L. Frank, Studio City, CA
KA6GVR, Norman C. Goodwin, Modesto, CA
W6HKG, Lawrence H. Bixby, Jr., Grass Valley, CA
W6HWW, Ernest P. Hammer, Lockwood, CA
N6JO, John W. Brown, Fair Oaks, CA
W6JWO, George H. Rufener, Los Angeles, CA
KA6KDC, George R. Harris, Long Beach, CA
WA6KFF, William C. Allison, Los Angeles, CA
WB6LZP, Richard I. Mills, Oakland, CA
W6MMB, Alvin R. Montgomery, Hollywood, CA
W6NRP, Frazer E. Leslie, Redwood City, CA
W6PEB, William R. Triplett, Fountain Valley, CA
K6PF, Glenn H. Wolfe, Novato, CA
W6QER, Aubrey M. Jackson, Turlock, CA
W6QET, Harold C. Williams, Los Angeles, CA
W6QHA, Charles Dowler, Modesto, CA
WB6QZV, Richard L. Cochran, Pine Grove, CA
WA6SCV, Richard C. Wagner, Oceanside, CA
W6SRI, Harold A. Lloyd, Santa Barbara, CA
W6SVR, Edward C. Brackin, San Diego, CA
WA6TGC, Carle C. Conway, Covina, CA
W6TMF, Max J. Jamison, San Francisco, CA
WA6TMQ, Ralph E. Cozad, Oxnard, CA
W6UPW, Lloyd V. Reynolds, Sun Valley, CA
W6WMA, Chauncey E. Howland, Pacific Grove, CA
K6YGN, Fr. George Williamson, Anaheim, CA
WA6YKO, Robert S. Webb, Chula Vista, CA
W6ZRT, Joseph F. Sodaro, Los Angeles, CA
W7AGV, Kenneth Sullivan, Seattle, WA
N7ARH, David D. Daniels, Jr., Pocatello, ID
K7AY, Ivan E. Hollingworth, East Wenatchee, WA
W7BWC, William L. Burris, Belmont, CA
KA7CKC, Ernest T. Kreft, Salem, OR
N7CRK, Donald F. Nesser, Apache Junction, AZ
W7CTK, Dale B. Dorothy, Las Vegas, NV
K7ECF, Robert E. Wright, Dillon, MT
WA7GHX, Glen W. Henderson, Lathrop Wells, NV
*W7HLU, Lyle W. Parsons, Tacoma, WA
W7IF, Eugene S. Stadden, Albany, OR
W7ISE, Miles H. Lusher, Sun City, AZ
K7LHU, Walter A. Nash, Seattle, WA
W7LLC, John F. Wojtkiewicz, Sun City, AZ
WB7OPY, Maxene H. London, Sedro Woolley, WA
W7PF, William T. Gill, Rathdrum, ID
WB7PID, Harry A. Barnett, Portland, OR
W7PWP, Julian J. "Jim" Dewaele, Morton, WA
K7RZS, Clifford N. Bartley, Ellensburg, WA
W8ABB, Fred C. Voltmer, Cincinnati, OH
W8ATT, Virda L. Hiles, Dayton, OH
W8BC, Harry B. Caskey, Cleveland, OH
W8BVB, Earl V. Falconer, Lansing, MI
W8DCQ, Fred W. Gall, St. Louis, MI
W8PMK, H. Gordon Douglas, Luther, MI
W8SM, Ian O. Ebert, E. Lansing, MI
WB8SWU, Alphonse F. Van Havermaat, Lexington, MI
W8TCD, John W. Wilson, Marquette, MI
K8WEP, Louis G. Grabill, Madison Heights, MI
W8ZIF, Edward E. Eggleston, Lima, OH
WB9ACI, Richard H. Dayton, Winamac, IN
W9BKE, Ira Prahl, Odin, IL
K9BUC, Joseph P. Gettys, Indianapolis, IN
WB9BVT, Robert L. Scott, Oak Park, IL
K9CLS, Arthur W. Drill, Greendale, WI
W9CVW, Edmond A. Smith, Manteno, IL
W9CXL, David L. Bell, Indianapolis, IN
KA9FVU, Richard M. Lewis, Genoa, IL
*W9HQB, James A. Andrisen, Downers Grove, IL
WA9HXR, Francis "Bud" Regan, DeSoto, WI
W9IIR, Clarence P. Docken, Monona, WI
WD9JMA, Robert Pinkerton, Elkhart, IN
W9NIJ, Henry M. Battcher, Malta, IL
W9PFH, Wilfred T. Simonsen, Eagle River, WI
K9RFY, Raymond S. Morgan, Carthage, IN
W9SQH, David G. Sublette, Putnamville, IN
W9VKM, Elmer A. Heimerl, Beaver Dam, WI
WD0BEV, Phil E. Rush, Cedar Hill, MO
W0BK, Arthur A. Jablonsky, St. Louis, MO
W0BYV, Henry D. Baker, Scott City, KS
KB0CM, Denver F. Bennett, Albuquerque, NM
W0CWK, Elmer F. Batchelor, Excelsior Springs, MO
KA0DCP, Charles E. Voss, Sr., DeSoto, MO
W0EXN, Harold L. Martin, Cedar Rapids, IA
KA0FPR, Jimmie D. Alfson, Hot Springs, SD
W0GBX, Clare G. Schisler, Colorado Springs, CO
K0GII, Wayne W. Bare, Wichita, KS
K0GNI, John W. Oksa, Hot Springs, SD
KA0HOD, Marc S. Dixon, Beaver Crossing, NE
WA0IXK, James H. Thompson, Sterling, KS
*W0KMJ, Ernest A. Sivesind, Decorah, IA
W0MZJ, Charles W. Gilley, Brookings, SD
KA0NSL, James M. McLellan, Hannibal, MO
WB0NTT, Elmer T. Hobbs, Lincoln, NE
WB0RAO, Clarence G. Hammond, Jefferson City, MO
K0WKE, Benjamin Adams, Jr., Kansas City, MO
W0YOZ, Roy M. Krick, Schaller, IA
W0ZAL, Joseph C. Paulsen, Harlingen, TX
KV4AA, Richard C. Spenceley, Charlotte Amalie, VI
KH6FFR, George C. Thomas, Kailua-Kona, HI
KH6HJM, Bert G. Vickers, Ewa Beach, HI
VE1AAW, Wilton K. Bonnell, Minto, NB
VE1ACG, Ronald C. Reeves, Port Hawkesbury, NS
VE1AGK, William S. Vaughan, Fredericton, NB
VE1BI, James L. Boyd, Fredericton, NB
VE1BTN, Philip McLaughlin, Canterbury, NB
VO1JS, Chesley R. Windsor, St. Johns, NF
VE1NZ, Thomas W. "Wimpy" Mills, Truro, NS
*VE1RC, Howard F. Mann, Rothosay, NB
VE3CDL, Hermann L. Eberts, Mississauga, ON
VE3CLH, Harold Sharpe, Kingston, ON
VE3DXR, David J. Russell, London, ON
VE3EBH, Stanley A. Goddard, Scarborough, ON
VE3MF, Eric John Kernohan, Cambridge, ON
VE3XN, Clare Hobbs Langford, London, ON
VE4FW, Harold A. Donogh, Brandon, MB
VE4GL, Victor Glen Clark, Winnipeg, MB
VE4HX, William H. Tomlinson, Winnipeg, MB
VE6BNK, J. Kramers, Edmonton, AB
VE7DWO, Donald M. Jenkins, Ganges, BC
VE7PQ, John L. Janssen, Winfield, BC
VE7XC, Frank Ashley, Vancouver, BC
DL3HG, Herbert Stotz, Gruenwald, West Germany
G6DN, Charles M. Denny, Lancashire, England
SM5CO, Holger Alexandersson, Johanneshov, Sweden
XE1AK, Guillermo D. Azcona, Guadalajara, Mexico

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

Club Corner

Conducted By Sally O'Dell,* KB1O

IS YOUR CLUB ONE OF THESE?

It's that time of year again — the time when we recognize those 92 affiliated clubs that have the enviable record of 100% ARRL membership. These clubs are recognized in *QST* for this achievement and will receive a certificate of appreciation for their unanimous support of ARRL.

We salute you.

The clubs that qualify for this certificate are: A.M.T. ARC, Stanford, California; Alamo DX Amigos, Helotes, Texas; Alaska DX Association, Anchorage, Alaska; Albuquerque DX Association, Corrales, New Mexico; Alexandria Radio Club, Inc., Alexandria, Virginia; Arizona DX Club, Scottsdale, Arizona; Arkansas DX Assn., No. Little Rock, Arkansas; Associated Radio Amateurs of Southern New England, E. Providence, Rhode Island; Bald Knob Brass Pounders, Beaver Dam, Kentucky; BASH-HAL-NE-AE, Scottsdale, Arizona; Cape Kennedy Area ARC, Kennedy Space Center, Florida; Central Arkansas DX Club, N. Little Rock, Arkansas; Central Florida DX Assn., Casselberry, Florida; Central Kansas ARC, Inc., Salina, Kansas; Central Missouri Radio Assn., Columbia, Missouri; Central Pennsylvania DX Club, Harrisburg, Pennsylvania; Central Virginia Contest Club, Richmond, Virginia; Charles E. Newton Radio Club, Griffin, Georgia; Chicago Radio Traffic Assn., Chicago, Illinois; Chippewa Hills ARC, Weidman, Michigan; Cincinnati Buckeye Neters, Cincinnati, Ohio; Cleveland Wireless Assn., Westlake, Ohio; Colorado County ARC, Columbus, Texas; Conneaut ARES, Conneaut, Ohio; Connecticut Wireless Assn., Burlington, Connecticut; Cranford ARS, Cranford, New Jersey; Deep East Texas ARC, Lufkin, Texas; Delta DX Assn., Gretna, Louisiana; Dunsmuir ARC, Dunsmuir, California; Eastern Mennonite College ARC, Harrisonburg, Virginia; Eastern Iowa DX Assn., Cedar Falls, Iowa; Elkhart Red Cross ARC, Elkhart, Indiana; FDR VA ARC, Montrose, New York; Flambeau ARC, Phillips, Wisconsin; Florence ARC, Florence, South Carolina; Fort Wayne DX Assn., Fort Wayne, Indiana; Geauga ARA, Novelty, Ohio; Greater Lansing DX Group, Lansing, Michigan; Greater Pee Dee Radio Society, Marion, South Carolina; Grundy Ground Waves, Grundy, Virginia; Hilltop Seekers ARC, Bridgewater, New Jersey; Kaw Valley Radio Club, Topeka, Kansas; Lake Superior DX Assn., Duluth, Minnesota; Long Island DX Assn., Brooklyn, New York; Louisville Gas & Electric Co. ARC, Louisville, Kentucky; Marquardt ARC, Arleta, California; Mason County Radio Club, Ludington, Michigan; Megahertz Manor Maniacs, Cambridge, Iowa; Memphis DX Society, Memphis, Tennessee; Mid-Missouri ARC, Jefferson City, Missouri; Mid-South DX Assn., Germantown, Tennessee; Mountain State Transmitters, Inc., Parson, West Virginia; Norfolk County Radio Assn., Walpole, Massachusetts; North Alabama DX Club, Huntsville, Alabama; North Augusta-Belvedere ARC, Aiken, South Carolina; Northern Illinois DX Assn., Elmhurst, Illinois; OBP ARC, Kirkwood, Missouri; Orange County Contest Society, Westminster, California; Paul Bunyan Wireless Assn., Mearifield, Minnesota; Philadelphia Electric Employees Assn., Inc., Philadelphia, Pennsylvania; Pickens ARC, Jasper, Georgia; Point Radio Operating Society, Pittsburgh, Pennsylvania; Potomac Area VHF Society, Damascus, Maryland; Prairie Dog ARC, Yankton, South Dakota; Raritan Bay Radio Amateurs, Inc., Sayreville, New Jersey; Raritan Valley Radio Club, Neshanic Station, New Jersey; River City Contesters, Carmichael, California; Rochester DX Assn., Rochester, New York; San Diego DX Club, Carlsbad, California; Selma ARC, Inc., Selma, Alabama; Sheboygan County DX Assn., Sheboygan, Wisconsin; Signal Propagators ARC, Etowah, Tennessee; Skokie Six Meter Indians, Skokie, Illinois; South Florida DX Assn., Cooper City, Florida; Southeastern Louisiana University ARC, Hammond, Louisiana; Southern California Contest Club, Simi Valley, California; Southern Nevada ARC, Inc., of Boulder City, Boulder City, Nevada; Southwest Radio Society, Dallas, Texas; Springbrook Operating & Transmitting Society, Nashville, Tennessee; Texas DX Society, Houston, Texas; Tioga Amateur Repeater, Inc., Owego, New York; Tri-City ARA, Woodbine, New Jersey; Vermillion ARC, Ely, Minnesota; Virginia Century Club, Norfolk, Virginia; W. Tresper Clarke High School ARC, Westbury, New York; Wabasha Area ARC, Wabasha, Minnesota; WENS, Philadelphia, Pennsylvania; Westside ARC, New Orleans, Louisiana; Wichita ARC, Wichita, Kansas; Wildcat ARS, Fresno, California; Winnipeg DX Club, Winnipeg, Manitoba, Canada; Wisconsin Nets Assn., Wisconsin Rapids, Wisconsin.

*Club Program Manager, ARRL

ENCON Amateur Radio Society (EARS), of Albany New York, a club recently affiliated with ARRL, has 50 members after only two years of organization. Here, Gail Slocum, N2BAH, operates the club station equipment. *(photo by Richard Clauss)*

At the 50th anniversary banquet of the York (Pennsylvania) ARC, Atlantic Division Director W3ABC bestowed life membership in the club upon four members in appreciation of their loyal and dedicated service. Left to right are W3LUD, K3BWB, W3AQN and W3AMQ. *(photo courtesy York Sunday News)*

50 Years Ago

December 1932

☐ We can breathe a sigh of relief at word from Secretary Warner attending the international radio conference in Madrid — it appears we will retain the same frequency bands hard won in 1927.

☐ The table model "gothic" cabinet broadcast set is in ample supply, and W1BVS has revamped one (superhet version) for all-wave reception, including a beat oscillator for c.w. purposes.

☐ Ross Hull describes his design of an all-purpose 5-meter (no, not 6) station, with a unity-coupled push-pull circuit using '31 tubes. Batteries can be used for field operation. Reports in this issue of West Coast mountaintop expeditions by W6ZF, W6CAL and others should spark special interest in Ross's article.

☐ Despite its greater expense and lower communications effectiveness, the personal pleasure of 'phone operation is causing a considerable increase in use of that mode, and W3LW analyzes the pros and cons of grid, screen-grid and plate modulation systems.

☐ Having absorbed the 17-year-old Radio Division of the Department of Commerce, the Federal Radio Commission has reorganized the nine districts, identical to the call areas, into 20 inspection offices that will give operator exams. Call areas will remain the same, but station license applications must now go to Washington rather than the local office. Sadly, no more picking your own call letters from the card file in the district office.

☐ W1AVE has built an oscillator for 500-1500 kc., and provides a listing of various harmonics from fundamentals in that range, which will beat with WWV at 5 Mc. and furnish a number of band-edge points for ham use.

☐ Some 30 amateur volunteers are listed as sending code practice on 160 meters to help prospective hams acquire the skill for their license test. Hq. station W1MK continues its heavy schedule of practice transmissions on 80 and 40.

25 Years Ago

December 1957

☐ Amateurs provided extensive first tracking data after the surprise launching of Sputnik in early October, a performance much appreciated by Project Vanguard and the Naval Research Lab. The Russian ham-oriented journal *Radio* had, earlier in the year, published planned orbital parameters and frequency info; some Washington agencies flew messengers to Hartford to copy essentials from Hq.'s IARU files.

☐ Sputnik's 40-Mc. signal is less affected by ionospheric vagaries than that at 20, despite the ease of receiving the latter on "all-band" sets. Thus W1DF shows us a crystal-controlled converter for the higher frequency, feeding a ham receiver at 7 Mc.

☐ As U.S. satellites will employ 108 Mc. for some tracking purposes, W1VLH provides a converter circuit more economical than earlier designs by substituting a 6AJ4 for the expensive 417A. And W1HDQ suggests several antenna fashups to cover that channel, the simplest of which is trimming ends off TV beam elements.

☐ Continuing the satellite theme, W6VZA describes a sophisticated 108-Mc. receiving technique using a phase lock loop for effective tracking and recording of telemetered info. The San Gabriel Valley R.C. built the unit.

☐ Coming back to earth, we find a 3-band Novice rig using an xtal-controlled 6DQ6A, designed by W1ICP. Special attention is paid to keying quality.

☐ Manufacturers have produced several band-switching mobile rigs, but the fractional wavelength of a whip antenna on 75 and 40 meters makes it almost a single-frequency device. W1DX gives us a symposium on current methods for "automatic" tuning.

☐ Transistors aren't yet much use at ham levels for high r.f. output, but W8PYQ makes them perform nicely in a 10-watt modulator designed for his mobile rig.

☐ DXpeditions are in the news, the latest being a trip to isolated Navassa Island in the Caribbean by W2IWC and W2HQL (now K6SSS and W1JR). They obtained necessary permission from the Coast Guard, a procedure not followed by some later rare-country providers. — *W1RW.*

In Training

Conducted By Steve Pink,* KF1Y

UPGRADING: GENERAL TO ADVANCED

Now that you or your students have had the enjoyment of high-frequency phone privileges, you will no doubt want to expand that enjoyment. The elusive DX station that won't quite listen up to the General phone band; the net you've always wanted to join that operates at 21,280 kHz; the contest that you know you could win if only you had those extra 75 kHz on 20 meters: These are just some of the reasons to pick up the books again and get that Advanced ticket.

The step up from General to Advanced class requires no new code test, but the written exam is considered to be quite formidable. Let's look at the FCC's Study Guide for the Element 4(A) examination and review some of its main points.

The rules and regulations portion of the Advanced class Study Guide is devoted, for the most part, to stations in repeater operation, and the remote and auxiliary control of those stations. The FCC believes that it is the experienced ham — the Advanced or Extra Class licensee — who will want to put up a repeater. So, the rules governing repeater operation are stressed at this step on the upgrading ladder. These rules can be rather complicated, and one should be prepared to answer in any Advanced test a fair number of questions on proper repeater operation. Specific topics include the rules on repeater identification, logging, remote and auxiliary control, height limitations for antenna structures, control links and system network diagrams. Only a thorough understanding of the relevant section of Part 97 of the Commission's Rules will prepare the student for the test. Fortunately, the FCC Study Guide cites the proper sections of Part 97 for the student, so studying is a simple matter of learning the contents of each section. Nothing could be easier!

All FCC Study Guides for Amateur licenses contain topics dealing with operating procedures. The Advanced class Study Guide lists slow-scan television and facsimile operating procedures because, up to now, most high-frequency slow-scan and facsimile frequency privileges have been in the subbands reserved for Advanced and Extra Class licensees. Although the Commission, within the last year, extended slow-scan and facsimile privileges to General class subbands, these two topics remain on the syllabus. Familiarize yourself with the various standard procedures for operating A4, F4, A5 and F5 emissions, and you should be able to answer questions on these subjects with ease.

The current (78th edition) *ARRL Radio Amateur's License Manual* contains basic instructional material on operating with these two modes. The *ARRL Operating Manual* covers operating procedures more deeply. The League's *Radio Amateur's Handbook* thoroughly covers the technical aspects of slow-scan and facsimile. After you master the fundamentals, you may be interested enough to try slow-scan or fax yourself!

The reputed difficulty of the Advanced class exam most likely stems from its questions on electrical theory. The syllabus emphasizes the mathematical aspect of ac circuit theory. One should know how to apply formulas for resonance, Q and bandwidth, among others, including some trigonometric formulas for calculating phase angles. Many students have great difficulty with these topics, not because the *concepts* of resonance and bandwidth, for example, are too difficult to understand, but because some of us are a bit rusty with our math after so many years out of school.

This is when an instructor's ingenuity can help a student over an obstacle. A math refresher session for students who need it, offered at an additional class hour not ordinarily scheduled for the course, could really help many General class hams get those Advanced privileges. In this special help session, an instructor should review basic arithmetic, including calculation of square roots. These days, almost everyone has access to an electronic calculator. Since this instrument is invaluable during the test, students should be encouraged to work out their practice calculations on a calculator so they will waste no time during the actual exam figuring out how the machine works. The most advanced kind of mathematics found in Amateur exams is algebra, and it would be well worth the instructor's time to review the fundamentals of solving simple algebraic equations. A good practice session might involve deriving, for example, the capacitance needed to resonate a circuit at a given frequency from the formula for the frequency of a resonant circuit. This gives the student familiarity with manipulating algebraic expressions — a skill needed even more for the Extra Class written exam.

An extremely difficult area for many students of the Advanced syllabus is the calculation of voltages, currents and impedances in bipolar transistor amplifier circuits. The formulas and procedures for determining these parameters are given in the Advanced Class chapter of the *License Manual*. Simply memorizing the formulas is not enough for answering the questions on the test. Some problems will involve applying a series of formulas to calculate output and input voltages and impedances, so an instructor must teach his or her students "a plan of attack"; a way of simplifying the problem down to basic steps so the right formulas can be applied. This type of strategy can only be attained through practice, and, to this end, the instructor should assign practice problems. Some excellent practice problems are found among the study questions in the Advanced Class chapter of the *License Manual*.

As with studying for the General ticket, the League's *Handbook* is invaluable for preparing for the Advanced exam. For the study of bipolar transistors, we also recommend *Solid State Basics* and *Solid State Design for the Radio Amateur*, both ARRL publications. These books will introduce the student to the workings of basic solid-state devices and to the use of circuits that appear on the Advanced test. Practice makes perfect, and soon you or your students will have those new ht phone privileges! QST

*ARRL Training Program Manager

Special Events

Conducted By Mark J. Wilson,* AA2Z

Fairbanks, Alaska: Borealis ARC members will operate *throughout December*, from 0400 to 0900Z each day, enabling amateurs to qualify for the Worked All North Pole certificate. Operation 30 kHz up from lower General and Novice band edges. Three QSOs required for award. For information and certificates, contact: BARC, W. Keller, SR Box 80343, Fairbanks, AK 99701.

London, England: To celebrate the 50th anniversary of the BBC's Empire Service, the following stations will be active *throughout December*: GB2BBC, GB3BBC, G3BBC, GB4BBC and GB8BBC. Operation mainly in 80-10 meter phone bands. Special QSL available; details will be given on the air.

Thompson, Ohio: KA8IXT will be active from 1330 to 0130Z *Dec. 4-5* to call attention to Charles M. Hall, inventor of the electrolytic method of making aluminum. Frequencies: phone — 7.230 14.280; Novice — 7.125. Certificate available for s.a.s.e. (2 units First Class postage) and QSL to: P. Burn, 6215 Clay St., Thompson, OH 44086.

Flamingo, Florida: Everglades ARC will operate W4SVI from 1300Z *Dec. 4* until 2200Z *Dec. 5* in celebration of the 35th anniversary of the dedication of Everglades National Park. Frequencies: 10 kHz up from lower 40-10 meter General phone-band edges and 146.52. Certificate for QSL and large s.a.s.e. to: D. Dowst, 14511 S.W. 287th St., Leisure City, FL 33033.

Chicago, Illinois: Argonne ARC will operate W9QVE from 1500Z *Dec. 4* until 2400Z *Dec. 5* to commemorate the 40th anniversary of the first controlled nuclear chain-reaction experiment conducted at Alonzo Stagg Field on the University of Chicago campus. Frequencies: phone — 20 kHz from lower General 80-10 meter band edges and 145.19/144.59 146.52 147.42; cw — 20 kHz from lower General 80-10 meter band edges; Novice — 40 kHz from lower band edges; RTTY — 14.090 146.70. Certificate for large s.a.s.e. to: AARC, P.O. Box 275, Argonne, IL 60439.

San Antonio, Texas: Pearl Harbor Survivors Net will operate W5SC from 1100Z *Dec. 7* until 0400Z *Dec. 8*, during the annual Pearl Harbor Survivors Assn. convention. Operation on phone — 7.283 14.283 21.363 MHz. Certificate available; details will be given on the air.

Bethlehem, West Virginia: Triple States ARC will operate WD8DDL/8 on *Dec. 9-12*, from to 1400 to 2300Z each day. Frequencies: phone — 7.275 14.325 21.425 28.550; cw — 7.110 14.075 21.110 28.110. Holiday certificate for large s.a.s.e. to: TSRAC, 26 Maple La., Bethlehem, Wheeling, WV 26003.

Bethlehem, Indiana: Clark Co. ARC will operate W9WWI/9 from 1700Z *Dec. 11* until 1700Z *Dec. 12*. Frequencies: phone — 3.905 7.240 14.290 21.365 146.25/85. Certificate with special Bethlehem postal hand stamp for large s.a.s.e. to: CCARC, P.O. Box 532, Jeffersonville, IN 47130.

Eugene, Oregon: Valley RC will operate W7PXL from 1800Z *Dec. 11* until 0600Z *Dec. 12* to celebrate 50 years of ARRL affiliation. Frequencies: phone — 3.980 7.280 14.280 21.380 28.680. Certificate for QSL and large s.a.s.e. to: W7PXL, 150 E. 18 Ave., Eugene, OR 97401.

Torrington, Connecticut: CQ Radio Club will operate K1BCI *Dec. 11-19* to honor the 35th anniversary of Christmas Village. Operation on 80-10 meters. Certificate available; for details, contact WA1YZA or WB1DVC.

Jerusalem, Ohio: Switzerland of Ohio ARES will operate N8DLJ on *Dec. 17-19*, from 1600 to 2200Z each day. Operation in the first 10 kHz of General class hf phone bands; some Novice operation. Certificate available; details will be given on the air.

Santa Claus, Indiana: Pike Co. ARC will operate W9CZH from 1700Z *Dec. 18* until 1700Z *Dec. 19*. Frequencies: phone — 3.925 7.265 14.305 21.395; cw — 7.133; RTTY — 14.093. Certificate for QSL and large s.a.s.e. to: Santa Claus, P.O. Box 111, Ireland, IN 47545.

Farmington, Maine: Sandy River ARC will operate KA1CNG from 1500Z *Dec. 18* until 2100Z *Dec. 19* and 1400-2100Z *Dec. 21* in celebration of Chester Greenwood Day. Frequencies: about 10 kHz from lower General-band edges and 3.940. Certificate for QSL and two First Class stamps to: KA1CNG, 5 Franklin Ave., Farmington, ME 04938.

Christmas, Florida: Coronado Wireless Assn. will operate K4HML from 1400 to 2200Z each day *Dec. 18-19*. Frequencies: 7.282 14.282 21.382. Special QSL for s.a.s.e. to: K4HML, P.O. Box 1, Edgewater, FL 32032.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding publication date. For example, your information would have to reach Hq. by Jan. 15 to make the March issue. QST

*Assistant Communications Manager, ARRL

Hamfest Calendar

[Note: Sponsors of large gatherings should check with League Headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.]

Indiana: South Bend Swap & Shop, Jan. 2, at the Century Center downtown, on U.S. 33, *oneway* north between St. Joseph Bank Bldg. and river. Half-acre on carpeted floor. Industrial history museum in same building. Four-lane highways to door from all directions. Talk-in on 52. Sponsored by Repeater Valley Hamfest Committee. Contact: Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, tel. 219-233-5307.

†ARRL Hamfest

†**Michigan:** The Oak Park Swap & Shop, sponsored by the Oak Park ARC, will take place at Oak Park High School, Coolidge and Oak Park Blvd., Oak Park, on Jan. 9, from 8 A.M. to 3 P.M. Admission is $2. Electronic swap and shop, FCC table, prizes, food and lots of parking. Talk-in on 52. Further information from Jay Schwartz, c/o Oak Park ARC, 14300 Oak Park Blvd., Oak Park, MI 48237.

Virginia: Richmond Frostfest '83, the annual winter ham radio and computer show, will be held Sunday, Jan. 16, at the State Fairgrounds, Richmond. General admission is $4. All flea market and commercial exhibit spaces indoors in 30,000-ft^2 building. Prizes. Sponsor: Richmond Amateur Telecommunications Society, P.O. Box 1070, Richmond, VA 23208. — *Marjorie C. Tenney, WB1FSN, Convention/Travel Coordinator, ARRL*

Coming Conventions

February 5-6, 1983
Southeastern Division, Miami, Florida

February 26-27, 1983
Ohio State, Sharonville (Cincinnati)

March 26-27, 1983
Georgia State, Columbus

ARRL NATIONAL CONVENTIONS

October 7-9, 1983
Houston, Texas

July 20-22, 1984
New York, New York

September 27-29, 1985
Louisville, Kentucky

Strays

Senator Barry Goldwater (R-Arizona), K7UGA, signs the visiting-amateur register at the Experimental Aircraft Association Convention, held last summer at Wittman Field in Oshkosh, Wisconsin. Looking on is Oshkosh ARC member Steve Polishinski, WB9YSD, who invited K7UGA to visit the club station on the grounds. *(K9ZZ photo)*

WHY I?

☐ I tried unsuccessfully to find out why "*I*" stands for current in all the ARRL books. After I challenged a chief electrical engineer to find the answer (he didn't know either), he came up with this reference in the *Principles of Electrical Engineering:* "The symbol *I* is used for current under an international agreement which insures having the same symbols used in electrical work the world over. . . . The letter *I* is taken from the French word for current, 'intensité.'" *John H. Sanders, WB4ANX, Kingsport, Tennessee*

IF YOU THINK HAMS HAVE IT ROUGH NOW. . .

☐ "Orders for a temporary suspension of radio broadcasting by amateurs because of interference to regular radio service was announced by the Commerce Department. Radio broadcasting, the department explained, is a new wireless service which has developed rapidly during the last three months and embraces the sending out of everything from market quotations and crop estimates, health talks, weather forecasts, high-class entertainment, to lectures, sermons, music and announcements of stolen automobiles. The result has been to fill the air with radio to the detriment of commercial and necessary service." — *Spokane Chronicle, February 6, 1922 (courtesy H. L. Hughes, Spokane, Washington)*

NO OAFS HERE

☐ KA9OAD (Ann), KA9OAE (Garrie), KA9OAG (John), KA9OAH (Lee) and KA9OAI (William) are all members of the Scott family of Osgood, Indiana. Why aren't their calls consecutive? Apparently, FCC doesn't want anyone to be an OAF!

I would like to get in touch with . . .

☐ anyone with information on ZX-81 applications, especially for RTTY, ASCII and cw, Niel Skousen, WA7SSA, 695 W. 1400 S., Provo, UT 84601.

☐ any hams who were members of the 656th, the 574th or any other Signal Aircraft Warning battalions during WW II. Angel M. Zaragoza, W6ZPR, 1571 9th St., San Bernardino, CA 92411.

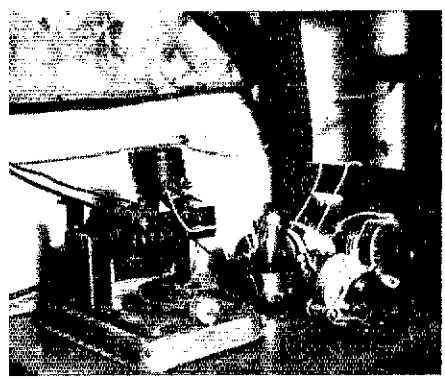
☐ any hams who are involved professionally in the humane protection or control of animals. Bill Early, WA9AEA, 1813 N. Cleveland Ave., Chicago, IL 60614.

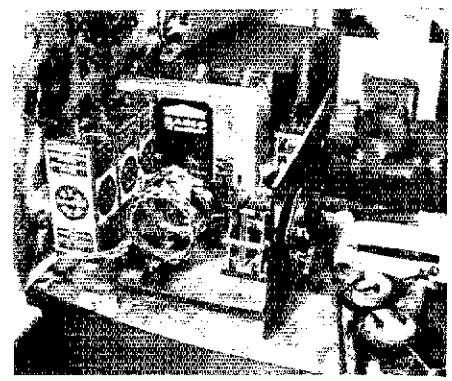
WINGS OF LIFE

☐ They didn't do much sightseeing. On August 1, Don Muir and Andre Daemen, VE2EWI, left Montreal in their specially equipped Cessna 210, *Wings of Life,* to establish a new around-the-world speed record for single-engine light aircraft and, through corporate and individual sponsorship, raise money for cancer research.

Wings of Life touched down at St. John's, Shannon, Cairo, Madras, Singapore, Guam, Honolulu, San Francisco and eight other points along a carefully prepared route. Amateur Radio was used to coordinate the entire flight. Using the call VE2WOL and 20-meter ssb, the pilots maintained contact with flight organizers in Montreal. The flight had been well-publicized beforehand on W1AW and the OBS systems, and throughout the flight amateurs around the world were able to contact the pilots and "go along for the ride."

When *Wings of Life* returned to Montreal on August 7, it had set a new record: six days, seven and one-half hours. $175,000 had been pledged to the Canadian Cancer Society, and new pledges were coming in. Many were from amateurs. A lot more could be said about this outstanding achievement. We'll try to assemble the details and give a more complete story in an upcoming *QST.* — *Harry MacLean, VE3GRO*





While rummaging through his memorabilia, Vic Gomes, W4DN, of Sarasota, Florida, came across this perfect example of what is meant by the term "breadboard." W4DN's first "tube" transmitter actually was built on a breadboard that was bought from a 5&10 store about 1925. The rig, left, believed to be a Hartley oscillator, fed a Zepp antenna on the roof of W4DN's Brooklyn, New York apartment building. Note the steampipe "ground" and the rebuilt battery charger, the transformer of which was rewound for about 300 V ac. No filter, of course. The receiver, right, used the then-very-popular Reinartz coils and Eveready® and Red Seal batteries. How's that for nostalgia? *(photo courtesy W4DN)*

YL News and Views

Conducted By Jean Peacor,* K1IJV

YLRL's 44th Year

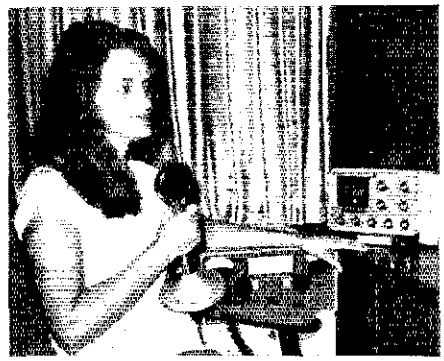
The election results for next year's officers of the Young Ladies Radio League (YLRL) have been announced. All will take office on January 1, 1983.

Sandra Mae Heyn, WA6WZN, of Costa Mesa, California, is the newly elected president. Sandi became WN6WZN in 1973 and now holds an Extra Class license. She is married to Fried, WA6WZO. They have a daughter, Margret, KA6DGA, currently in college. Fried is section communications manager of the Orange Section; Sandi works with him as assistant section communications manager.

Sandi comes to this office with a long list of credentials. She is a life member of ARRL; has held various ARRL appointments; is currently vice president of YLRL; has held the offices of secretary, disbursing treasurer and sixth district chairman for YLRL; is a past president of the Young Ladies Radio Club of Los Angeles; and has actively served in the Orange County ARC, the Southern California Amateur Radio Computer Club and the Los Angeles Area Council of ARCs. Sandi was YL committee chairman of the 1979 Southwestern Division ARRL Convention; she is a member of the YLISSB executive council. Employed as a senior electronics technician for Rockwell, in her spare time she enjoys skiing, sailing, golf and computers. Under the leadership of someone with Sandi's enthusiasm, YLRL has another exciting year to look forward to.

Officers who will serve with Sandi are: Vice President, Rose Ellen Bills, N2RE; Secretary, Marilyn Backys, WB9TDR; Disbursing Treasurer, Jackie van de Kamp, W6YKU; Receiving Treasurer (Districts 1, 2, 3, 4), Barbara Robinson, WB1ACA; (Districts 5, 6, 7), Violet Barrett, W6CBA; (Districts 8, 9, 10, KH6, KL7, VE), Becky Skinner, KA9GWE; District Chairmen — (1) Diane Haigh, N1YL; (2) Cecilia Zwack, WA2NFY; (3) Jeanne Doncaster, KA3CEO; (4) Jeannette Ellis, KB4XO; (5) Esther Smith, WD5EMZ; (6) Jo Anne Dowe, WA6ZGM; (7) Phyllis Douglas, K7SEC; (8) Doris Smith, WD8IKC; (9) Adah Elliott, W9RTH; (10) Marjorie Tiritilli, KBØZC; (KL7) Cynthia Henry, AL7BO; (KH6) Val Alvarez, KH6QI; (VE) Elizabeth Anderson, VE7BIP.

All licensed YLs are welcome to join the Young Ladies Radio League. Members receive *YL Harmonics*, the YLRL newsletter. Dues for U.S. YLs are $6 per year, due March 1. Dues for DX YLs are $6 plus $2.50 additional for surface mail, or $6.25 additional for Air Mail. Family membership is $1.25. Nonmembers pay $6 per year. For new and reinstating U.S. members joining after August 31 each year, dues may be prorated by half the annual dues for the fiscal year. Dues are payable to the receiving treasurer for your district. Current membership numbers 1343.



Sandi Heyn, WA6WZN.

When first licensed, Marilyn Backys, WB9TDR, thought Amateur Radio would provide fine communication for talking with her OM, K9UQN. It took but one DX contact as a Novice, a QSO with VE3ABE, to convince her that there was far more here than meets the eye. Marilyn upgraded to Technician, General and later to Advanced class licenses. She now has her DXCC pin plus a sticker for 125 countries confirmed, with 12 countries to go for her next sticker. Look for her operating on 20, 15 and 10-meter ssb. Marilyn is YLRL's newly elected secretary for 1983. *(photo courtesy W1YL/4)*

YLS OF THE ISLANDS

QSL Managers see to it that QSL cards are distributed to all those deserving. Two managers have also made it possible to bring you news of two YLs of the islands — FM7CF of Martinique, and ZD9YL of Tristan da Cunha.

Martinique

Aurore Morduan, FM7CF, and her OM, FM7WO, live in Fort De France, on the island of Martinique. Aurore has been licensed as FM7CF for two years. Originally, she lived on the island of Reunion in the Indian Ocean.

Aurore and her OM both enjoy cw and operate RTTY from time to time. Listen for them between 2000 and 0030 UTC around 21.030 or 14.030 MHz. I just did as this was being written, and, lo and behold, the first station I heard and worked was FM7WO on 21.030 MHz. Dave Pisco, WB3AKI, who kindly submitted this news, is QSL Manager for Aurore only.

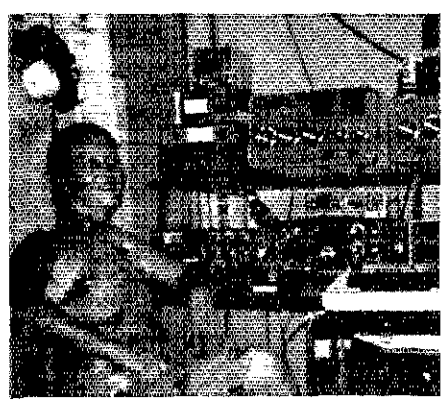
Tristan da Cunha

In May 1982, the first YL operator from Tristan da Cunha, Lorna Lavorella, made her debut in Amateur Radio as ZD9YL. Lorna's QSL Manager, John Parrott, W4FRU, arranged for Lorna's first on-the-air contact to be with another YL, Stella McPherson, WA4WPN. Stella, in turn, kindly shared the story.

Since that first contact, Lorna's worldwide contacts have provided many hams the opportunity to work a YL for the first time ever from this rare island, Tristan da Cunha, a tiny isolated spot in the South Atlantic, recently celebrated its 166th anniversary.

Lorna, 18 years old and a school teacher on the island, became interested in Amateur Radio when her boyfriend, Andy, ZD9BV, received his license. She would sit, knit and listen to Andy contact the world's many hams, including his QSL manager, W4FRU, daily. Andy and his QSL manager encouraged her to take the exam and become the island's first YL operator. It was a happy day for all when she passed the exam and received the special call reserved for YLs.

Very shy at first, Lorna now efficiently handles the pileups that go with the rarity of her station. Andy and Lorna have spring wedding plans, and deserve congratulations on that score as well as on their addition to Amateur Radio history. QST



Aurore Morduan, FM7CF.

Lorna Lavorella, ZD9YL.

*Country Club Dr., Monson, MA 01057

Rules, January VHF Sweepstakes

The ARRL Ad Hoc Committee for VHF/UHF Contesting has fine-tuned the rules for the January VHF Sweepstakes in keeping with their program of improving the ARRL VHF contests. These changes may be found under sections (4) Exchange, (6) FM Restrictions and (9) Awards.

On a trial basis, the exchange for the January contest has been shortened in recognition of the generally poor propagation conditions existing in January. The consecutive serial number is no longer required. All stations must, however, exchange and log both the signal report and the ARRL section for each valid QSO. Please let us know what you think of the shortened exchange.

Although not new to ARRL vhf contests, the revised FM Restrictions that were tried in the June and September 1982 ARRL VHF QSO Parties are new to the January contest. These rules prohibit all contest activity on 146.52 MHz, protecting the national calling frequency from contest monopolization and leaving it open for emergency and other communications. At the same time, the four-hour time limit on the use of 223.50 MHz has been lifted totally, thus encouraging further fm activity on that band. Please read section 6 carefully before starting the contest.

The other change is in the wording of the multioperator awards system. Three or more entries are no longer required before we will issue an award to the top multioperator entry in each section. The only requirement now is that exceptional effort or competition be displayed.

Official entry forms are available from Hq. for a business-size s.a.s.e. with one unit of First Class postage. These forms will make our job easier and also will help ensure that you are listed properly in *QST*.

Remember that ARRL-affiliated clubs compete in the January contest. Check with your radio club secretary to see if your club is going to make an aggregate entry. Three logs are all it takes to make the club listings, and the top-scoring single-operator station in each club earns a certificate. If your club is not affiliated, contact the Club and Training Department at ARRL Hq. to find out how to join the ranks. Club secretaries take note: Be sure to read the rules governing affiliated-club competition in January 1983 *QST*. Each club wishing to enter the club competition must submit a current club roster showing the calls of *all* club members eligible to submit their scores for the club.

Good luck!

Rules

1) **Object:** To work as many amateur stations in as many ARRL sections and countries as possible using authorized amateur frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2) **Contest Period:** Begins 1800 UTC Saturday, January 15 and ends at 0400 UTC Monday, January 17.

3) **Categories:**

(A) **Single Operator:** One person performs all transmitting, receiving, spotting and logging functions.

(B) **Multioperator:** Those obtaining any form of assistance, such as the use of relief operators, loggers or spotting nets.

4) **Exchange:** W/VE amateurs exchange signal report and ARRL section. Foreign stations give country name instead of ARRL section (U.S. Caribbean possessions are in the West Indies section; Hawaii and U.S. Pacific possessions are in the Pacific section).

5) **Scoring:**

(A) QSO points: Count two points for complete two-way QSOs on 50/144 MHz; four points on 220/430 MHz; eight points on 1215 MHz; and 16 points on 2.3 GHz or higher.

(B) Multiplier: Total ARRL sections plus VE8/VY1, plus foreign countries *worked during the contest*, plus 10 — *not* sections per band.

(C) Final score: Multiply QSO points by multiplier total. See scoring example.

Scoring Example

Band (MHz)	*QSOs*	*QSO points*
50	25(× 2)	50
144	40(× 2)	80
220	10(× 4)	40
432	15(× 4)	60
1215	5(× 8)	40
2300+	1(×16)	16
Totals	96 QSOs	286

Final score = (QSO points) × (ARRL sections + 10).

6) **FM Restrictions:**

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted.

(B) Only these recognized simplex frequencies may be used: 144.90 to 145.10; 146.49, .55 and .58 and 147.42, .45, .48, .51, .54 and .57 MHz. This restriction prohibits use of all repeater frequencies, including 146.76 and .94. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(C) Use of the national calling frequency, 146.52 MHz, is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting contest QSOs. The intent of this rule is to protect the national calling frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

7) **Miscellaneous:**

(A) The same station may be worked on different bands or in different sections for QSO credit.

(B) Crossband QSOs are not permitted.

(C) Only one signal per band (50, 144, 220 etc.) is permitted at any given time; single-operator stations are allowed only one transmitted signal at any given time.

(D) Multioperator stations must locate all transmitters and receivers within a 500-meter diameter circle, excluding directly connected antennas.

(E) While no minimum distance is specified, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile).

(F) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest (except for family stations where more than one call is assigned to one location by FCC/DOC — and then for family members only).

(G) Multioperator stations may not count QSOs with their own operators except on 2.3 GHz and up, and a complete different transmitter, receiver and antenna must exist for each QSO under these conditions.

(H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g. laser) and employing at least one stage of electronic detection on receive.

8) **Reporting:**

(A) Entries must be postmarked no later than 30 days after the end of the contest. Use ARRL VHF SS forms or a reasonable facsimile.

(B) Logs must indicate time in UTC, bands, calls and complete exchanges. Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

9) **Awards:**

(A) Top single-operator stations in each ARRL section or foreign country.

(B) Top multioperator station in each ARRL section where exceptional effort or competition is evidenced.

10) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels — unlimited, medium and local clubs. Details will be listed in January 1983 *QST*.

11) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excess duplicates and callsign/exchange errors. See January 1983 *QST* for complete details.

Rules, 1983 ARRL International DX Contest

The rules for the 1983 ARRL International DX Contest contain a couple of changes you should be aware of. Under rule 2, *Object*, please note that in line with ARRL Board of Directors policy that there be no competitive activity on the 10-MHz band, it is specifically excluded from the contest. Contacts there will not count for credit.

Under rule 5, *Categories*, please note the revised categories of multioperator operation. Based on extensive membership input and on the results of a survey sent to more than 450 multioperator participants in the 1980, 1981 and 1982 DX contests, the ARRL Contest Advisory Committee recommended to the ARRL Awards Committee that the rules be changed. The Awards Committee accepted the following changes, effective with the 1983 contest.

The *Multioperator, Single Transmitter* class involves more than one operator using a single transmitter. In spirit, this class is an extension of the single-operator category, but with more than one operator/logger/duper. Stations in this class may use an additional receiver for spotting multipliers, or may participate in a spotting net if they choose, but they may not transmit more than one signal at any given time. Also, once a contact has been made on a given band, the station must remain on that band for at least 10 minutes before making contacts on another band.

The *Multioperator, Two Transmitter* class is essentially a miniversion of the traditional multi-multi class. As the name implies, stations in this class are limited to two transmitters on the air at any given time, and these transmitters must remain on a band for 10 minutes after a contact is made before changing to another band. This class differs from the multi-single class in effect during 1980-82 in that the second transmitter is not limited to working new multipliers only. Both transmitters may work any and all stations. This class is intended as an outlet for those stations desiring more than multi-single competition, but who are unable, for lack of hardware or operators, to support a full-blown competitive multi-multi effort.

The *Multioperator, Unlimited* class is the multi-multi category that we have had all along. Stations in this class may operate simultaneously on as many bands as they wish. The only restriction is that they not transmit more than one signal per band at any given time.

The CAC is anxious to know how you like the new multioperator setup. If you have any comments, please note them on your summary sheet, or send them to ARRL Hq. for distribution to the CAC. Also, you may wish to express your views directly to your CAC representative; his name and address appear on page 46 of October 1982 *QST*.

Logs and summary sheets are available from ARRL Hq. for an s.a.s.e. Please mail early for a set of the latest forms. The log deadline is April 5 for both modes, and logs postmarked after the deadline will be counted as checklogs. Be sure to complete your paperwork on time. Good DX!

Rules

1) **Eligibility:** Amateurs worldwide.
2) **Object:** W/VE amateurs work as many amateur stations in as many DXCC countries of the world as possible on 1.8 to 30 MHz, excluding the 10-MHz band. Foreign amateurs work as many W/VE stations in as many states and provinces as possible.
3) **Dates:**
(A) **CW** — Third full weekend in February (February 19-20, 1983).
(B) **Phone** — First full weekend in March (March 5-6, 1983).
4) **Contest Period:** 48 hours each mode (separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.
5) **Categories:**
(A) **Single Operator** — One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted. Single-operator stations are allowed only one transmitted signal at any given time.
(1) *All band.*
(2) *Single band* (one only). Single-band entrants who make contacts on other bands should submit logs for checking purposes.
(B) **Multioperator** — More than one person operates, checks for duplicates, keeps the log, etc.
(1) *Single transmitter.* One transmitted signal at any given time. Once the transmitter has made a contact on a given band, it must remain on that band for at least 10 minutes. Multioperator, single-transmitter stations must keep a single, chronological log for the entire contest period. Violation of the 10-minute rule or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).
(2) *Two transmitter.* A maximum of two transmitted signals at any given time, on different bands. Once either transmitter has made a contact on a given band, it must remain on that band for at least 10 minutes. Both transmitters may work any and all stations; the second transmitter is *not* limited to working new multipliers only. Each of the two transmitters must keep a separate, chronological log for the entire contest period. Violation of the 10-minute rule by either or both transmitters or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).
(3) *Unlimited.* A maximum of one transmitted signal per band at any given time. Unlimited multi-multi stations must keep a separate, chronological log for each band for the entire contest period.
(C) **QRP** — Single operator, all band only. QRP is defined as 10-W input or less (or 5-W output or less).
6) **Contest Exchange:**
(A) W/VE stations (includes 48 contiguous United States and does not include Canadian islands of St. Paul and Sable) send signal report and state or province.
(B) DX stations send signal report and power (three-digit number indicating approximate transmitter input power).
7) **Scoring:**
(A) **QSO Points** W/VE stations count three points per DX QSO. Foreign stations count three points per W/VE QSO.
(B) **Multiplier** — W/VE stations — sum of DXCC countries (except U.S. and Canada) worked per band. Foreign stations — sum of U.S. states (except KL7/KH6) and VE1-7, VO, VE8/VY1 worked per band. Maximum of 57 per band.
(C) **Final Score** — QSO points × multiplier = final score.
8) **Miscellaneous:**
(A) Call signs and exchange information must be received and logged by each station for a complete QSO.
(B) All operators must observe the limitations of their operator's licenses at all times.
(C) Your call sign must indicate your DXCC country (KH6XYZ/W1 in Maine; FG0AAA/FS on St. Martin, etc.).
(D) One operator may not use more than one call sign from any given location during the contest period.
(E) The same station may be worked only once per band — no crossmode, crossband or repeater contacts.
(F) Aeronautical and maritime mobile stations outside the U.S. and Canada may *not* be worked for QSO or multiplier credits by W/VE stations.
(G) All transmitters and receivers must be located within a 500-meter-diameter circle, excluding directly connected antennas. This prohibits the use of remote receiving installations. Exception: Multioperator stations may use spotting nets for multiplier hunting only.
9) **Reporting:**
(A) All entrants are encouraged to use official forms available from ARRL (s.a.s.e. or two IRCs) to report contest results.
(B) Logs must indicate times in UTC, bands, calls and complete exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs total must include cross-check sheets (dupe sheets).
(C) All operators of multioperator stations must be listed.
(D) Entries must be postmarked within 30 days of the last contest weekend (April 5, 1983). Logs not postmarked by the deadline will be classified as checklogs; no extensions, no exceptions. All stations are requested to send their entries as early as possible. Entries received after mid-July will not make *QST* listings.
10) **Awards:** Plaques will be awarded in the

following categories for both the cw and phone contests.

(A) Top W/VE scorer in each entry category — single operator-all band, single operator-single band (1.8-28 MHz), QRP, multi-operator-single transmitter and multioperator-multitransmitter.

(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, QRP, multi-single and multi-multi categories will receive plaques.

(C) Additional special plaques will be awarded as sponsored. See October 1982 *QST* for the current list and February 1983 *QST* for any additions.

(D) Certificates will be awarded to top single-operator, all-band entries from each country and ARRL section; top single-band entries in each U.S. call area and each country; top multioperator entries (both single and multi-transmitter) in each country, U.S. call area and in Canada. Additional single-band and multioperator certificates will be awarded if significant effort or competition is displayed. DX entrants making more than 500 QSOs on either mode will receive certificates.

11) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium and local clubs. Details will be listed in January 1983 *QST*.

12) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, by regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualification: An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made of unconfirmed QSOs or multipliers, duplicate QSOs or other scoring discrepancies. An entry *will* be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, a penalty of three additional QSOs will be deleted. The penalty will not be considered as part of the two-percent disqualification criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the *QST* contest results.

Strays

Jim Rafferty, N6RJ, of Anaheim, California, leaves no room for doubt in the minds of fellow travelers as to what his call sign is. He spells it out for them on his license plate! *(W1YL photo)*

W1AW COMPUTERIZED

☐ Since the first of June 1981, all W1AW code practice and cw, RTTY and ASCII bulletin transmissions have been computer generated. And therein lies a tale!

The donation by Heath of an H89 computer started the ball rolling. During the course of a visit to W1AW, Bob Anderson, K2BJG, volunteered to help with the software, and the results can now be heard on any of the scheduled W1AW transmissions. Bob is manager of field operations in the Avionics Division of ITT, and resides with his family in Oakland, New Jersey. He is very active on the air, particularly on vhf, and is a member of the Ramapo Mountain Radio Club. Our sincere thanks to Bob for the many hours of effort he donated to this project.

We now have two Heath H89 computers, each with an H77 disk drive. While one is being used on the air, the other is available for preparing future transmissions and as a backup in case of trouble. Briefly, the various programs and the bulletin text, which is updated daily, are on a disk in the H89. Each code practice is on a separate disk, which is used in the remote drive. Once the proper program is selected, the computer turns on the rigs, runs the various speeds of code practice, sends the cw bulletin and then turns the rigs off again. Similarly, for a Teletype/ASCII bulletin, the text is sent at 45.45-baud RTTY and then repeated at 110-baud ASCII.

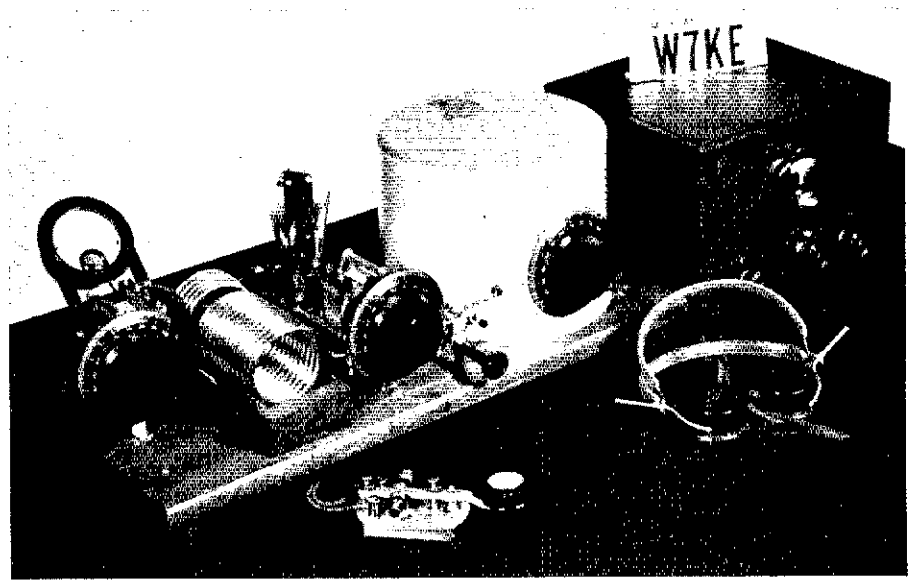
FIRST CALL SIGN ON THE MOON

☐ Before the first moon landing of July 1969, NASA arranged to photograph on microfilm all the signatures of those connected with the Apollo Project and send the film to the moon. When Walter Bickmeyer, of Deerfield Beach, Florida, signed his name he added his call, K4NI. A check of all the signatures showed that he was the only ham on the list who had also signed his call. Walt now claims he is the only Amateur Radio operator with his call on the moon. — *Spark Gap Times, Dec. 1972/Jan. 1973*

I would like to get in touch with . . .

☐ anyone who has information on the Bendix Aviation Corp. aircraft ac-dc generator, type NEA-5, J. Fred Burhenn, W3NWY, 1262 Brinkerton Rd., Greensburg, PA 15601.

☐ someone to help a disabled ham maintain his station. Stan Obritski, Jr., WB2TTY, RD 1, Box 458A, Jackson, NJ 08527.



Clarence Filley, W7KE, of Hamilton, Montana, sent us this photo of his MOPA transmitter constructed from a September 1928 *QST* article. The gear is still in use, as he explains: "Operators in QSO often ask, 'what is a MOPA and SW-3?' Old-timers immediately recognize . . . " They will also recognize the 210 tube in Hi-C Hartley oscillator (in shield can) driving a DeForest-type 410 tube in the PA. They'll also spot the 1933 National SW-3 receiver, "Baldie" phones and Bunnell key.

Results, Fifth Annual ARRL UHF Contest

By Mark J. Wilson,* AA2Z

The 1982 ARRL UHF Contest, held the weekend of August 7-8, played host to a rather radical departure from the traditional scoring system. The system used this year rewards QSOs made over greater distances with greater QSO-point values and is sometimes called RANGE scoring. This idea, implemented at the direction of the ARRL Ad Hoc Committee on VHF/UHF Contesting, was introduced into the UHF Contest on a trial basis. Based on the results of the August contest, the Committee will be able to assess the merits of using a RANGE scoring system in future uhf contests, as well as in other ARRL-sponsored vhf/uhf operating activities. The RANGE scoring concept was introduced by the Ramapo Mountain ARC in their Spring VHF/UHF QSO Party, held last March.

Table 1 shows the top five overall scores, both for single-operator and multioperator stations, for the 1982 contest. For comparison, we've also calculated what the scores of these stations would have been using last year's scoring method. The results are interesting; the order of the top five stations in each class changes, with stations farther away from the population centers benefiting from the new system.

Although the total number of logs received this year was down from last year (128 vs. 156), overall activity was up, as witnessed by increased QSO and multiplier totals. A peek at Table 2 shows that the average number of multipliers worked on each band was up significantly from last year.

WA3RMX of the K7AUO group passed along a description of the system he designed for their 48-GHz QSO. We thought it might be of interest, so here goes:

> A major accomplishment this year was our first activity on the 48-50 GHz (6-mm) band. The transmitter is a 10-GHz surplus radar Gunn oscillator tuned down to 9.74 GHz with about 35-mW out, which drives a tuned waveguide multiplier, which multiplies by five to get 48.7 GHz at an estimated 1.5-mW out. A varactor was added to the Gunn oscillator for tuning, afc and FM modulation on transmit. For receive, the transmit system is used as the local oscillator, with the multiplier diode itself serving as the receive mixer. A dual-conversion i-f system with a threshold extension phase-locked demodulator and afc was specially designed to make the most of weak signals. W7ADV and WB7UNU spent much

Table 1

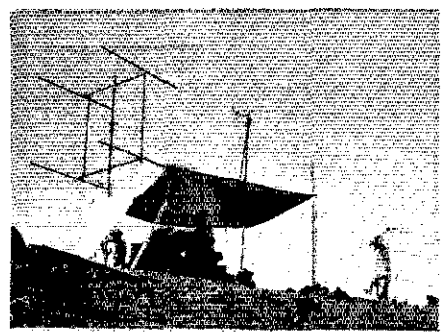
Comparison of Top Scores Using Old Method and New Method

Call	Old Method Score	New Method Score
Single Operator		
K8WW	26,910	126,477
K2UYH	28,728	98,847
WA8TXT	22,500	93,960
WB8BKC	21,735	93,366
K1PXE	27,180	79,740
Multioperator		
W2SZ/1	117,000	392,250
W3GNR/3	15,642	94,050
WA2SNA	31,320	89,100
VE3LNX	17,877	66,729
W1VD	15,840	46,656

Table 2

Multiplier Leaders

220 MHz		*432 MHz*		*1296 MHz*		W1JR	3	*10 GHz*	
W2SZ/1*	34	K8WW	51	*W2SZ/1**	21	W6OAL*	2	W2SZ/1*	9
VE3LNX*	26	W2SZ/1*	46	K8WW	17	K7UUH*	2	K7AUO*	5
WB8BKC	23	K2UYH	43	K2UYH	16			W1TKZ*	3
W6OAL*	22	WA2WVL	36	W2VC	14	*3400 MHz*			
VE3CRU	21	W3GNR/3*	35	WA8TXT	14	W2SZ/1*	7	*24 GHz*	
WA2SNA*	21	WB8BKC	35	K1PXE	12	K7AUO*	6	WA3RMX/7	1
W3GNR/3*	21	W3OZ	33	WA2WVL	11	K7UUH*	2	K7AUO*	1
W1VD*	20	W2VC	30	WA2SNA*	11	WA3RMX/7	1		
K1PXE	19	WB9SNR	30	W3IY/4	11	W7TYR*	1	*48 GHz*	
WA8TXT	19	K1PXE	29	W3GNR/3*	10			WA3RMX/7	1
WD8ISK	18	W3IP	29			*5700 MHz*		K7AUO*	1
K9KFR	17	WA2SNA*	28	*2300 MHz*		K7AUO*	6		
		W3IY/4	28	W2SZ/1*	8	WA3RMX/7	1	*multioperator stations	
				K7AUO*	6	K7UUH*	1		



WA6VNN, WB6HOZ, WB6OUZ and WA6MBZ of the Santa Barbara ARC (K6TZ) again set up operations on the top of Diablo Peak on Santa Cruz Island. The entire operation utilized solar power.

*Assistant Communications Manager, ARRL

time carefully duplicating these critical i-f systems from the prototype. Special thanks to W7TYR for his work scrounging up the surplus waveguide parts and other parts needed for this project.

This is the first time a group on the West Coast has submitted a 48-GHz QSO on their logs. The first 48-GHz contest QSO in our records was made during the June 1982 ARRL VHF QSO Party by the W2SZ/1 group.

Very few entrants bothered to note their best DX in miles, so it's pointless to put together our usual "Best DX" list. Also, the change in the scoring structure makes the listing of new Division records meaningless.

A few adminstrative notes: The scoring system for this contest is a bit more complicated than for other contests. More than half of the entrants did not use the official ARRL summary sheet with their logs, in many cases making our job more difficult by leaving out vital information. All it takes to get the right forms is an s.a.s.e. to ARRL Hq. Also, some people had trouble figuring out the scoring. If you ever have any questions on scoring procedures, give the Contest Branch at ARRL Hq. a call, or drop us a line. We're always happy to help get you on the right track — it just makes our job easier in the end.

If you have any suggestions or comments on vhf/uhf contest rules, drop the Ad Hoc Committee a line via Hq. They're always looking for ideas. Certificates will be in the mail around December 15. Until next year. . .

SOAPBOX

10 watts + 10 elements = 10 grid blocks on 432! Somebody must be feeding strange compounds to their preamps (WA3YON). The big news this year is the 48-GHz (6-mm) band operation WA3RMX/K7AUO). The distance possible with low power and poor antennas on 432 is unbelievable (K7CW/5). Not enough activity to the east on 220. Surprised that my 10 W on 432 worked out so well. Got pretty excited when I worked W2PQC on 1296. I with only 1.2 W at the transmitter and about 300 mW at the antenna (K8MD). This contest would have been a real drag without the grid squares and points system (KJ8J). The distance points sure added a nice twist to the contest. Lots of new stations that were not on last year showed up in the log. Wish that the maximum point limit was about 15, to include all minor enhancements on the bands. The 1 × 1 degree grids make great multipliers (WØOHU). Again this year I made the trek to the forests, hills and mountains of eastern Oregon. Over 600 miles of jeep trails, cow paths, and even some two-lane blacktop, allowed me to operate from five grids. The trip was not uneventful, requiring two stops to clear fallen trees, and another to fill in a mud hole, and yet another to herd range cattle off the road. Band conditions were not as good as in years past, but most contacts were completed. Better coordination helped speed things up, while improved equipment should help make things bigger and better next year. All in all, the DXpedition for the 'AUO group and other stations in the northwest was deemed a success (K7RUN/K7AUO). Lost my antennas to ice two weeks before the contest. Guess I didn't do too badly with my temporary antennas. This RANGE scoring isn't as easy as it looks. The first three times I calculated my score, I got three different answers (WA5VJB). The new point system for contacts is much more equitable than the old system. Equal band multipliers for 220 and 432 is probably a mistake, as it tends to keep people on 220 (W3OZ). With all those new 220-MHz rigs around, there should have been more activity (W7AZU). I know that I could have made lots more contacts on 1296 if I had a rotor on the dish (WB8BKC). We gained about 5 dB of TX power on 1296 by mast mounting the transverter and single 2C39 amplifier. The difference was quite noticeable. We used a stripline 2C39 amp, as the cavity amp proved to be too unstable with temperature changes. . .The new RANGE scoring system sure produces some BIG scores. It will be interesting to see how scores from different geographic locations compare (W3GNR/3). I totally enjoyed the relaxed quality of this contest. . .My only reservation is the scoring system. I don't expect to become more than a casual observer of these events if the rules require this level of numerical bookkeeping and computation for every QSO. I can't help thinking that the next logical (?) step will be to divide the country into circles as soon as someone discovers that the NE, SW, etc. path is longer than the N, E, S and W paths in a square system. Vhf contests should be a test of operator skill, equipment and conditions, not an arcade game of big scores. Pseudo-methods of making the operator think that he accomplished more than he really has will not sustain activity on the vhf bands as much as improved equipment and operator skill (WA3NUF). I rather like the new scoring system. Glad to see distance worked finally counts for something (WB9SNR). Finally broke the 9-QSO barrier on 1296 after five contest tries (VE3CRU).

Scores List:

Call sign, total score, QSOs, multipliers, bands operated (C = 220 MHz, D = 432 MHz, E = 1296 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.7 GHz, I = 10 GHz, J = 24 GHz, K = 48 GHz, L = light) and ARRL section. Example: VE3CRU had a total score of 60,390 with 25 QSOs and 21 multipliers on 220 MHz, 41 QSOs and 26 multipliers on 432 MHz, and 12 QSOs and 8 multipliers on 1296 MHz. He is located in the Ontario Section.

Canadian Division

VE3CRU 60,390-25-21-C-ON
·41-26-D
·12- 8-E
VE3LNX (+VE3ADJ) 66,729-32-26-C-ON
·39-23-D
·13- 9-E
· 1- 1-F

Atlantic Division

W3IP 46,800-20-14-C-MDC
·67-29-D
· 9- 7-E
WA2WVL 36,918-46-36-D-WNY
·12-11-E
W3OZ 27,720-75-33-D-MDC
WA3NZL 24,990- 6- 2-C-MDC
·47-24-D
·11- 9-E
W2EIF 19,992-32-12-C-SNJ
·39-17-D
· 7- 5-E
W3CXU/2 14,496-16-12-C-SNJ
·14-12-D
·11- 8-E
WB2RVX 12,615-17-10-C-SNJ
·36-17-D
· 2- 2-E
W3ZZ 10,872-47-24-D-MDC
WB3LJK 6840-33-20-D-MDC
WA3YON 5820-12-10-C-EPA
·15-10-D
N3BHS 4860-15- 6-C-EPA
·24-12-D
K4CHE/3 4788-16- 9-C-DE
·22-12-D
WA2ABN 3906-23-14-D-WNY
W3ETB 3552-16- 9-C-EPA
·14- 7-D
W3CL 2700-16- 5-C-EPA
·16-10-D
KS2T 2604-24-14-D-SNJ
WA3NUF 1872- 6- 4-C-EPA
·17- 9-D
WA2OMY (AA2Z, opr.) 9- 1- 1-D-EPA
W3GNR/3 (+K3PS,KA3DWR, W3GNR,WA3s FFC,JBV) 94,050-27-21-C-WPA
·53-35-D
·13-10-E

Central Division

WB9SNR 52,479-17-13-C-IL
·42-30-D
· 6- 6-E
K9KFR 34,866-25-17-C-IN
·27-16-D
·11- 6-E
N9BWB 2562-23- 9-C-IN
· 8- 4-D
· 1- 1-E
WD9EME 1368- 9- 6-C-IN
· 7- 6-D
KB9NM 567- 2- 2-C-WI
· 5- 5-D
WB9NTL 483- 6- 3-C-IN
· 7- 3-D
· 1- 1-E
K9XY 255- 2- 2-C-WI
· 6- 3-D

Dakota Division

WØOHU 3648-21-16-D-MN
WØSD 348- 5- 4-C-SD
WØVB (+WØRGU) 2745- 7- 6-C-MN
·13- 9-D
KCØP (+KAØCRO) 6- 1- 1-C-MN

Delta Division

AA4ZZ 6732-20- 6-C-TN
·18-16-D
WA4QYK 1584- 5- 5-C-TN
· 9- 7-D
W5UKQ 1008-12- 6-D-LA
K5MWH 690- 6- 3-D-AR
· 3- 2-E
W5UCY 81- 3- 3-D-MS
WD4DGF 63- 4- 3-D-TN

Great Lakes Division

K8WW 126,477- 1- 1-C-OH
·77-51-D
·26-17-E
WA8TXT 93,960-25-19-C-OH
·46-26-D
·25-14-E
· 1- 1-F
WB8BKC 93,366-38-23-C-MI
·56-36-D
·12- 5-E
W8DJY 38,880-24-16-C-OH
·44-27-D
· 6- 5-E
WA8VPD 25,080-18-14-C-MI
·29-17-D
·11- 7-E
KC4EG 11,340-10- 7-C-KY
·31-21-D
K8DIO 11,040-42-23-D-OH
K8MD 9315-16-10-C-MI
·18- 8-D
· 8- 5-E
WA8IAU 7800-32-20-D-OH
KD8Z 6954-29-19-D-OH
· 6- 5-E
K8DW 6237-11- 9-C-OH
·17-12-D
WA8ZCO 5049-12- 7-C-MI
·15- 7-D
· 9- 5-E
WA8EUU 3318- 8- 7-C-MI
·14- 4-D
· 8- 4-E
WB8KAY 2046-20-11-D-MI
WB8TGY 342- 7- 6-C-MI
WD8ISK (+WA8LXJ) 22,002-30-18-C-OH
·39-20-D

Hudson Division

K2UYH 98,847- 6- 4-C-NNJ
102-43-D
·22-16-E
W2VC 40,260-71-30-D-NNJ
·19-14-E
WB2WIH 9144-24-11-C-NNJ
·35-13-D
K2OVS 3330-28-15-D-NLI
WA2TIF 3216-29-16-D-ENY
K2ULR 1023- 6- 5-C-NNJ
·11- 6-D
KB2AH 756-15- 9-D-NNJ
WA2SNA (K2BJG,WA2s JSW,UPK, WB2RFB, oprs.) 89,100-63-21-C-NNJ
·77-28-D
·17-11-E
N2BOW (+KA2MKD,N2CEI) 6489-22- 9-C-NNJ
·30-11-D
· 3- 1-I

Midwest Division

WBØTEM 819- 3- 3-C-IA
· 5- 4-D
KBØKM 432- 7- 6-D-MO
WØRT 345- 3- 2-C-KS
· 5- 3-D

New England Division

K1PXE 79,740-37-19-C-CT
·80-29-D
·17-12-E
WB1CJT 32,103-27-16-C-NH
·48-22-D
· 5- 3-E
K2LNS/1 27,063-16-10-C-ME
·34-16-D
·14- 5-E
W1JR 15,042-25-14-C-EMA
·48-22-D
·10- 6-E
· 3- 3-F
· 1- 1-I
K1VYU 5457-39-17-D-CT
WA1WXV 4914- 6- 5-C-CT
·24-15-D
· 1- 1-E
W1AIM/1 4674-15- 8-C-VT
·20-11-D
WA1UQC 4294-20-10-C-CT
·16- 9-D
W1FAJ 2784-12- 7-C-CT
·15- 9-D
W1GXT 1170-16-10-C-EM
N1BC 648-14- 8-D-EM
K8UR/1 399-11- 7-D-EM
KL7WE/1 135- 5- 3-D-ME
W2SZ/1 (AG1M,WA1WTC,WB1CBH, AG2X,K2MM,W2ARQ,WA2s AAU, GFP,SPL,WB2s PKO,QCJ,WA8USA, oprs.) 392,250-72-34-C-WM
118-46-D
·27-21-E
· 5- 8-F
· 3- 7-G
· 9- 9-I
W1VD (+K1JX,K1ZZ,WA1STO) 46,656-41-20-C-CT
·57-26-D
· 3- 2-I
W1TKZ (K1s TK,UR,WA1PQY, oprs.) 30,186-15-11-C-VT
·45-25-D
· 3- 3-I

Northwestern Division

W7TYR 5265-19-13-C-OR
·15- 9-D
· 4- 3-E
· 1- 1-F
· 1- 1-G
K7HSJ 2499-17- 6-C-OR
·16- 9-D
· 2- 2-E
K7KOT 864- 6- 4-C-WA
· 8- 5-D
WA3RMX/7 525- 1- 1-C-OR
· 1- 1-F
· 1- 1-G
· 1- 1-H
· 1- 1-I
· 1- 1-J
· 1- 1-K
KK7B 414- 2- 1-C-WA
· 9- 4-D
· 1- 1-E
W7AZU 6- 2- 1-C-WA
K7AUO (WA3RMX,W7s ADV, UDM,WB7CDQ, oprs.) 28,779-26-12-C-OR
·21-11-D
· 6- 5-E
· 6- 6-F
· 6- 6-G
· 6- 6-H
· 5- 5-I
· 1- 1-J
· 1- 1-K

Pacific Division

K6UQH 2190-15- 4-D-SCV
·11- 5-E
· 1- 1-F
WD6CHL 1512-19- 5-D-EB
· 7- 4-E
AJ6T 372-19- 4-D-SCV

Roanoke Division

W3IY/4 72,105-27-16-C-VA
·69-28-D
·12-11-E
K4QIF 22,848-38-21-D-VA
·10- 7-E
K4CAW 12,900-40-25-D-NC
K4LHB 12,600-19-11-C-VA
·22-13-D
KØRI/4 3621-16-11-C-VA
· 6- 6-D
N4CD 2592-17-12-D-VA
WA4LDU 1110-11-10-D-SC
KJ8J 735-10- 7-D-WV
WA4WZQ/4 (Multiop) 5985-10- 6-C-NC
·22-13-D

Rocky Mountain Division

N7BHC 18- 4- 3-C-UT

Southeastern Division

WA4NJP 8136-11- 9-C-GA
·20-14-D
· 1- 1-E
W4ISS 2196-17-12-D-GA
W4ODW 1230- 7- 2-C-NFL
· 9- 7-D
· 1- 1-E
WD4MBK 720-10- 8-D-GA
WA4CGG 450- 5- 4-C-AL
· 2- 2-D

Southwestern Division

AC6C 6360-32- 8-C-LAX
·17- 9-D
· 3- 3-E
N6OBA 1242-38- 6-C-LAX
K2DNR/7 480- 8- 4-D-AZ
· 3- 1-E
K1VOW 300- 3- 3-D-AZ
· 1- 2-I
W6OAL (+K6HXW,WB6YQN) 36,660-59-22-C-SBAR
·27-18-D
· 8- 7-E
· 2- 2-F
· 2- 2-I
· 1- 1-L
K6TZ (WA6s MBZ,VNN,WB6s HOZ,OUZ, oprs.) 14,250-72-11-C-SBAR
·26-11-D
· 1- 1-E
· 2- 2-I
KD6R (+WB6OKK) 924- 8- 6-C-SDGO
·10- 6-D
· 2- 2-E

West Gulf Division

WA5VJB 2808-28- 6-C-NTX
· 8- 3-D
· 3- 3-E
· 1- 1-I
N5EM 1755-12- 3-D-STX
·10- 6-E
KR5F 1512-10- 5-D-STX
· 9- 4-E
W5UWB 1026- 6- 3-D-STX
· 7- 3-E
WB5AFY 405- 5- 3-D-NTX
K7CW/5 288- 8- 6-D-OK
W5NZS 108- 4- 3-D-OK
WB5LUA (+WA5TKU) 29,502-12- 7-C-NTX
·32-18-D
·14- 7-E
· 1- 1-F

DXpeditions

K7UUH (+WB7UNU) (5 Locations) 3432- 7- 4-C-OR/WA
· 4- 2-D
· 2- 1-E
· 2- 2-F
· 2- 2-G
· 1- 1-H
· 1- 1-I
K7RUN (5 Locations) 1890-10- 8-C-OR
·14-10-D

Checklogs

WA3JUF,K4EJQ,WA6OYS

Public Service

Conducted By Robert J. Halprin,* K1XA

Manitoba Marathon 1982

The 1982 Manitoba Marathon was held on June 20, in support of the Canadian Association for the Mentally Retarded. This year, pledges raised over $300,000, for group homes and other projects. There were 3400 runners entered.

It is well known that the Manitoba Marathon is among the best in North America for its facilities along the course. We have the largest medical- and aid-station setup anywhere. Runners are encouraged to run their own distance, be it four miles or all 26. There are official exit stations every two miles after mile 4. An efficient bus system returns runners and volunteers to the stadium. There are several ambulances and other medical vehicles at the ready. We also have a very effective communications system linking all critical points along the route.

This year, the Marathon started and finished at the University of Manitoba, following the same course as last year. The race started at 0700 with the first runner crossing the finish line at 0920. The last runner came in at 1530. The weather was good, cool with light winds and cloudy. The humidity, however, was high.

Recruiting for the Marathon began in early January. All amateurs who participated in the 1981 Marathon were contacted first; then a call went out for additional volunteers. Most "old-timers" couldn't wait to help again, since they have so much fun. Everyone was placed in the same location as in previous years for the sake of continuity. This year, as in previous years, turnout was 100%. Many potential volunteers did not have the necessary portable equipment for our radio frequencies. This was overcome through the generosity of other local radio amateurs and commercial businesses. They donated the necessary equipment, antennas and connecting cables to enable new volunteers to take part.

An information package was prepared before the Marathon for each operator. This package identified the operators' assigned location and starting time. It also contained message forms, the names of checkpoint captains, vehicle identification cards and a communications sign. Each operator also received an identification T-shirt.

The day before the Marathon, a briefing session was held for all operators. The operator package was issued and any questions were answered.

A mobile home supplied by VE4JP served as our communications center. It was positioned Saturday evening in the same location as last year — at the University of Manitoba Stadium. Setting up took about an hour. We used a Ringo Ranger on a 10-foot mast about 40 feet from the van. By setting the antenna up well away from the vehicle, we were able to cut down on intermodulation, a form of interaction between radio frequencies that is undesirable. This occurs when another frequency is used at the same time as our main communication frequency.

Forty-one amateurs participated in the Marathon Communications Network. We had people at all critical locations, including the Race Director. The Communications Network utilized several frequencies to relieve the severe overcrowding experienced in the past. All administrative traffic, including logistics, medical-aid requests, etc., were carried on the main repeater, VE4WPG. VE4MAN, an additional repeater with city-wide coverage, was used for a time, since VE4WPG was experiencing interference problems. Race times were transmitted on the VE4CNR repeater, with 147.33 MHz as a simplex backup frequency. Inside the stadium, communications were on 146.52 MHz. Bus coordination was on the VE4RAG repeater.

This frequency choice worked out well for us, aside from the jamming on VE4WPG. At this point, we are uncertain if the interference was intentional or was caused by intermodulation with another repeater (intermodulation of this sort has been experienced with this repeater in the past). Traffic was still very heavy on VE4WPG, but other frequencies had few problems.

The Manitoba Marathon Net opened at 0530, using VE4BB, the club call of the Winnipeg Amateur Radio Club, Inc. It was a closed, directed net. Medical vehicles checked in shortly after 0530, as well as other stations as they reached their positions.

At 0615, I contacted the Public Weather Office for an official forecast for 7 A.M., 8 A.M. and 9 A.M. I then relayed these to the starter. Several time checks from WWV, the worldwide time and frequency standard located in Colorado, were transmitted to all stations to allow synchronization of watches. The autopatch facility of VE4WPG was used several times to contact the truck dispatcher and to ensure that all supplies would arrive at their aid stations on time. At 0655, all stations were instructed to stand by until after the start of the Marathon. VE4AY, at the start line, transmitted the firing of the starting pistol so that all race clocks could start simultaneously. From 0700 until 1230 the net was very busy. As the aid and medical stations started closing down, it became much quieter. The net was closed down and the repeater returned to normal use at 1530.

The Marathon was uneventful from a communications point of view. All operators were in position on time, and their equipment worked perfectly. All aid and medical stations were well stocked with all required supplies, with few exceptions. Virtually everything proceeded smoothly. We were able to solve some minor problems, such as parked cars enroute and a large number of people along Lyndale Drive, by contacting city police on the autopatch. They cleared up both problems very quickly.

One of our vehicles acted as a trail vehicle, following an 81-year-old man from mile 16 to the stadium. This enabled the aid stations enroute to close down at a reasonable time, since this gentleman was well behind everyone else. Incidentally, when he reached the finish line, he received an escort from all the medical and military personnel at the stadium.

This year, leader times created no problem. One of my amateurs ran his own net on a separate frequency. His team and members of the media received the necessary information almost immediately, which represents a huge improvement over last year.

In speaking with many runners after the race, I was assured that each was impressed with our level of organization. They were especially complimentary of our excellent aid/exit system. All members of the Technical Committee should be proud of an exemplary effort.

The 1982 Marathon was a source of personal pride for me. We were able to overcome the problems of past years. The new problems we encountered can be cured readily. Our communications team did a good job of keeping everyone informed. Minor mistakes were

Duties of Amateur Radio Personnel

- To provide an accurate time signal before the race in order to synchronize all clocks along the course.
- To provide an accurate forecast from the Public Weather Office and relay it to the Starter.
- To contact the truck dispatcher via autopatch to ensure that all vehicles were enroute to their locations on time.
- To check the gates and the footbridge post at Assiniboine Park before the start of the Marathon and ensure they are removed to permit free passage of runners.
- To transmit and receive all administrative traffic to and from aid and medical statons (logistics, requests for medical aid, missing supplies).
- To accompany medical and corporate clothing vehicles.
- To accompany the Race Director and Chief Medical Doctor.
- To relay times for leaders in the Marathon for the news media.
- To control and dispatch buses.
- To assist the ambulance dispatcher.
- To provide amateurs in various locations where required.
- To spot runners showing difficulty and relay their numbers and descriptions to the next checkpoint.
- To spot numbers of runners entering the stadium and to relay them to the press box.
- To advise as each checkpoint opened and shut down.
- To sweep the course to the next checkpoint to ensure that no disabled runners were on the course.
- To provide the start-of-race signal for groups of timing personnel at various locations on the course.

*Deputy Communications Manager, ARRL

made, but they had no effect on the race. This Marathon rates a grade A.

A special thanks goes out to all the radio amateurs who gave of their time freely and participated in the communications effort. A thank you also goes to the following deserving clubs: the Winnipeg Amateur Radio Club, Inc., the Winnipeg Repeater Society, Inc., and the University of Manitoba Amateur Radio Society. — *Dick Maguire, VE4HK, SEC Manitoba*

HAMS MAINTAIN COMMUNICATIONS AFTER TRAIN DERAILMENT

One of the finest examples of cooperation and service through Amateur Radio was demonstrated recently by the Baton Rouge Amateur Radio Club (BRARC), the Livingston Amateur Radio Society (LARS) and unaffiliated hams who responded to the call for assistance from the American Red Cross chapter office in Baton Rouge, Louisiana.

On September 28, an unprecedented derailment of 43 tank cars containing flammable solvents and hazardous chemicals occurred at Livingston, Louisiana. Fire and further potential explosions necessitated the evacuation of the entire community, and by the following day the Red Cross had set up a command post near the state police command post on the periphery of the evacuated area. KA5GEN, emergency representative for the LARS, and the club president, KZ5Q, were reporting to each other on 2 meters concerning the accident when KA5LEB of the BRARC picked up the QSO and invited them to join him on the 29th in a meeting with Red Cross officials. Shortly after the afternoon meeting, the Red Cross executive director requested amateur assistance in setting up a communications link between Livingston and the Baton Rouge chapter office.

The speed with which hams deal with a problem became immediately evident. KA5GEN, on his way back to Livingston, described the problem to NA5H, who took 2-meter equipment to the command post and established contact with KA5LEB through the LARS repeater, WB5SCY/R. KA5LEB then began to relay traffic by phone to Red Cross. By 5 P.M., WD5GZO and N5ADF had set up a station at the Baton Rouge Red Cross office, temporarily utilizing an old CB antenna on the site until KA5CMX provided a 3-element, 2-meter beam, which was installed with the generous help of a Gulf States Utilities Company bucket crane.

On September 30 another tank car exploded unexpectedly, destroying more dwellings. By that time, the outlook for a quick cleanup was abandoned. The emergency was then open-ended. Around-the-clock vigil by hams and authorities continued feeding and supplying the cleanup, safety and enforcement crews. Ham services were narrowed to a 15-hour, then an 11-hour, day.

Both clubs continued their communications service until the end of the second week, October 12, when the all-clear was given and the evacuees were permitted to return to their homes. — *Russ Allor, N5ADF, ARRL Emergency Coordinator, East Baton Rouge Parish*

COMMUNICATIONS SERVICE OF THE MONTH

❑ For the past several years, the Hurricane Watch Net has met on 14.325 MHz to assist people affected by tropical storms and hurricanes in the Caribbean and the Atlantic. This year, when Hurricane Alberto came and went off the coast of Florida, shore-based radar stations kept watchful eyes on the storm to provide needed information to those in the weather system's expected path. Tropical Storm Debby, however, proved to be an entirely different situation.

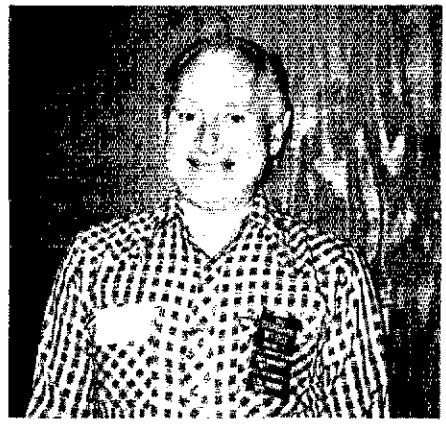
From the time it was a tropical wave near the African coast, Debby was monitored closely and plans made for possible net activation. KØIND/4 activated the net on September 15, when the storm increased intensity to hurricane level near the Bahamas enroute to Bermuda. K4RHL and N3EA both copied advisories and bulletins on Teletype directly from the hurricane center in Miami, while KØIND/4 and K8YUW maintained direct landline contacts with the National Weather Service. All of the information gathered from these sources was aired and discussed with stations in Bermuda, and with stations in the area.

The net continued throughout the night as Hurricane Debby closely skirted Bermuda, causing gale-force winds but not quite hurricane conditions on the island. Net-control duties were shared by several stations to provide broad coverage and rest for weary operators.

Once the hurricane passed Bermuda and headed out to sea, the net secured on the morning of September 16.

Special thanks go to assistant net managers K4RHL and KØIND/4, and liaison stations N3EA, K4MM, WA4GLE and N7YL. Also, thanks to the many stations who monitored the frequency without transmitting, but were available to assist if needed. *(Gerald E. Murphy, K8YUW, Net Manager, Hurricane Watch Net)*

Here are some of the active hams on the Texas Traffic Net. From left, W5TUK, KA5AZK, WA5RVT, KC5GO and N5BT. *(WD5GKH photo)*



Vic Seeberger, W7VSE, manager of RN/7c4, was obviously pleased to attend the WIMU Hamfest (combined Northwestern/Rocky Mountain Division Convention). *(W1YL photo)*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

❑ For September, 48 SEC reports were received, denoting a total ARES membership of 25,259. Sections reporting were: AL, AK, AB, AZ, AR, CO, CT, DE, ENY, IL, IN, IA, KS, KY, ME, MI, MN, MS, MO, NE, NH, NLI, NC, NFL, NTX, OH, OK, ON, ORG, PAC, RI, SV, SDG, SJV, SK, SC, SD, SFL, STX, TN, UT, VA, WA, WV, WMA, WNY, WPA and WI.

REPEATER LOG

According to reports received between September 21 and October 21, the following repeaters were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Fire	Search and Rescue	Public Safety Events	Drills/Alerts	Power Failures	Total
W1ALE			1		4	1		1	1	9
WA1KGQ					1					1
W1XJ					2				4	6
WR2ADJ					3			1		4
WR2AGH								1		1
KC2GY			1		6				2	9
WA2PAV				3					5	8
K2QIJ							1	3	5	9
W2VL			2	1	25	3				31
WB2ZII								2	3	5
N3AIA					1					1
N3BFL					1				4	5
WB3JVX				2	7		1	2	5	17
W3MIE									1	1
W3UER					1	1		1		3
W3VRZ					1					1
K4NLX								1		1
NN4N					2				1	3
W4PLB								1		1
WB4OES					21	3				24
W6GIX					7					7
W6RVT						2				2
K6SVD					1				1	2
W6ASH				1	9	1			1	2 14
WD6AWP					5	2				7
W6CX					1	1		3	1	6
WD6FGX			1		4					5
WB6FUB									1	1
W6GNS					2					2
WC7AAT	1			1	1	1		3		7
WR7ABX					1					1
K7CC					3				4	7
K7CTS					1					1
KC7FA			1		5			1	4	11
KC7JC					1					1
WA7OQI					1					1
K8DDG								7	4	11
W8EWD								1		1
W8MVE	7			2	2			1	1	13
W9VCF								1		1
WRØAFT	1									1
WDØBQM						1		1		2
WBØCMC			1	1	3				1	6
WBØHAC			2		1					3
WBØSBH	1									1
WØVQR					1			1		2
Total	10		9	11	124	16	2	32	49	3 256

NATIONAL TRAFFIC SYSTEM

The SET is now history. Hope everyone had a good time.

Certificates: 2RN/c2 — KA2FFC W2TZO K2VX WB2ZJF; TEN/c2 — KAØRP; 2RN/c4 — KA2FFC KA2JMH WA2ARC KB2HM WA2HEB WB2TQC W3TB (first annual), KV2U WB2IQJ (third annual), W2CQB (fifth annual).

September Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	1049	35.0	.737	89.4	
CAN	30	791	26.3	.539	100.0	
PAN*	60	907	15.1	.475	98.3	
Region Nets						
1RN	56	325	5.8	.271	81.0	100.0
2RN	60	401	6.7	.295	94.0	100.0
3RN	30	210	7.0	.400	97.0	100.0
4RN						100.0
RN5	30	416	13.8	.381	98.3	100.0
RN6	60	606	10.1	.351	82.0	98.3
RN7	90	978	10.9	.799	73.5	96.7
8RN	55	301	5.5	.269	76.1	90.3
9RN	60	419	6.9	.433	100.0	100.0
TEN	30	307	10.2	.300	81.5	100.0
ECN						43.3
TWN	60	317	5.3	.332	75.0	100.0
TCC						
TCC Eastern	103[1]	690				
TCC Central	75[1]	343				
TCC Pacific	102[1]	615				
Cycle Four						
Area Nets						
EAN	30	1791	59.7	1.302	96.7	
CAN	30	1029	34.3	1.000	100.0	
PAN	29	1408	48.6	1.043	96.7	
Region Nets						
1RN						96.7
2RN	90	751	8.3	.519	97.3	93.3
3RN	60	387	6.5	.509	97.7	100.0
4RN						100.0
RN5	60	731	12.2	.570	96.5	100.0
RN6	60	876	14.6	.562	96.4	96.7

RN7	60	878	14.6	.892	94.0	96.7
8RN	58	402	6.9	.413	89.0	93.3
9RN	60	479	7.9	.445	96.0	100.0
TEN						100.0
ECN	60	158	2.6	.314	75.6	96.7
TWN	60	541	9.0	.381	91.3	96.7
TCC						
TCC Eastern	133[1]	779				
TCC Central	55[1]	522				
TCC Pacific	104[1]	984				
Sections[2]	6721	32,692	4.9			
Summary	8029	53,073	6.6			
Record	8955	51,307	15.2			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (240): APSN ATN (AB), AENB AEND AENH AENI AENN AENR AENY AENZ ATNM ECAN (AL), ATEN TEN (AZ), BCEN (BC), PARC SCN/V (CA), CN CPN NVTN RTN WCN (CT), DEPN DTN NCC2MN SEN (DE), AIN FAST FMSN FMTN FPON FPTN GN LCEN MCEN NFPN PBTN PRVAN QFN QFNS SBEN SEFTN SERA SPARC SVTN SWFTN TPTN (FL), GCN GSN GSSBN GTN (GA), I75PN ICN ITEN TLCN (IA), ILN (IL), ICN ITN QIN (IN), CSTN KPN KSBN KWN QKS QKS-SS (KS), 4ARES 11ARES BARES CARN CCEN KEN KNTN KPON KRN KSN KTN KYN LCARES MKPN PAEWTN PAWN SEKEN TSTMN WTEN (KY), LAN (LA), MDD (MD/DE), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MN RITN (MA/RI), MEPN MMN MTN WRIN (MB), CMEN MPSN ORACES PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MNWX MSN MSPN MSSN (MN), CFARS CMN JFKN M2MEN PCTN RARS THEN (NC), CN CSN (NC/SC), MNARES NCHN NE40 NE75 NMPN NSN PARC2MN PV2MN SBARES WNN (NE), GSFM GSPN NHN (NH), JSARS MCSJVN NJN NJPN NJSN NJVN OBTTN SOCTN TCETN (NJ), NSN (NV), CDN CNYTN EPN HVN NLI NLIPN NYPON NYS NYS/M OCTEN SCVN SDN STAR WDN (NY), BARF BN BRTN COARES HCAN MCTN NEON OSN OSSBN OSSN TATN (OH), OFON OLZ OTWN STN (OK), KTN LN OLN OPN OSN OSN2 OSND (ON), BSN ORARES OSN PTTN WCN (OR), D3ARES D5ESN D6ESN EPA EPEPTN LCARES PFN PTTN WARCVTN (PA), WQVUARES (PQ), GPD2MN SCNTN SCSSBN YC2MN (SC), SDEN SDMN SDN SDNN (SD), PWN RARA SATN (SK), TNCW TNPN TNVN TSRN (TN), BARCEN TEX TSN TTN (TX), BUN DCAN UCN (UT), STARES SVEN VLN VN VNTN VRN VSBN VSN (VA), VTN (VT), EWTN NTN NWSSB PSTS SCARES WARTS WSN (WA), WVARN WVFN WVN (WV), OWT2MN (WY).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Independent Nets (August 1982)

1	2	3	4
Amateur Radio Telegraph Society	30	711	278
Central Gulf Coast Hurricane	30	176	2379
Clearing House	30	65	182
Early Bird	30	788	356
Empire Slow Speed	30	52	339
Golden Bear	30	123	1644
Hit and Bounce Slow	30	98	311
Hit and Bounce Traffic	30	246	617
IMRA	26	560	1216
Mission Trail	30	131	1145
North American SSB	26	121	258
Southwest SSB	30	91	1270
West Coast Slow Speed	30	131	383
20-Meter ISSB	26	805	527
7290 Traffic	46	663	3051

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Transcontinental Corps

TCC-Pacific/c2 certificates have been issued by WØHXB to the following amateurs: WØEJD KM6I W7TGU WA7GYQ W7GHT N7RG NØACW VE6CHK KU6D KJØG KV5U WA7WQE KN6C KBØMB WB7TQF KF7R WB7WOW K6DWA N6GIW NØCXI K6HAP K6WYK W7AK WDØAIT KT6A KØDJ KA5DDW W7DZX WB6EIG WBØFFV W5JOV WBØLFR WBØMTA K6OE WØRE W7VSE.

1	2	3	4	5
Cycle Two				
TCC Eastern	122	84.4	1385	690
TCC Central	90	83.3	686	343
TCC Pacific	120	85.0	1228	615
Summary	332	84.2	3299	1648
Cycle Four				
TCC Eastern	150	94.0	1545	779
TCC Central	60	91.7	998	522
TCC Pacific	120	86.7	1911	984
Summary	330	90.8	4454	2285

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (September) *Cycle Two* — Eastern Area (N2YL, Director) — K1s CE EIC, N1BHH, W1s QYY XX, WB1HIH, AH2M, K2KIR, KB2HM, KF2T, KO2H, N2s CER YL, W2s CS XD ZOJ, WB2s IQJ MCO, K3JSZ, WB3GZU, WA4s CCK LJI, WB4PNY, AF8V, W8PMJ, WB8YDZ, VE1WF, VE3s GOL HTL. Central Area (W9JUJ, Director) — KA4MZY, W4OGG, WD4HIF, W5s CTZ KLV TFB URN, N5AMK, WB5YDD, K5s BNH KJN, W9s JUJ NXG, WB9WGD. Pacific Area (WØHXB, *Director*) — *KV5U, W5JOV, K6s HAP OWA UYK, KM6I,* KN6C, KT6A, KU6D, N6GIW, NI6A, KF7R, KM7Z, KN7B, KA7FKT, N7CSP, W7s DZX GHT TGU VSE, WB7s TQF WOW, W9OBV, WØEJD, KØDJ, KBØMB, NØs ACW CZI, WAØOYI. *Cycle Four* — Eastern Area (W2CS, Director) — W1s EFW QYY TM, WA1TBY, N1NH, WB1CPF, W2s CS FR GKZ XD ZOJ, WA2SPL, N2YL, AH2M, KF2T, W3s ATQ FAF PQ, WB3GZU, W4UQ, K4s GCN ZN, N4KB, WA4CCK, WB4s PNY UHC, AB4V, W8PMJ, K8JQ, WB8MTD, AF8V, N8XX, WB9IHH, VE1WF, VE3GOL. Central Area (W5GHP, Director) — W4s WXH ZJY, K5s GM TL, N5TC, W5s RB TFB, KB5W, AE5L, W9CXY, WB9UYU, KØEZ, WØs AM HI. Pacific Area (KØDJ, Director) — W6s EOT VZT, KT6A, K7s HLR KSA, KN7B, W7s AK DZX EP GHT LCF LYA VSE, WA7GYQ, WB7NHR, KØs BN DJ, KCØD, WØs HXB OGH, WDØAIT, VE7ZK.

Public Service Honor Roll September 1982

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, max. 5. This listing is available to Novices and Technicians who achieve a total of 40 or more points.

1905
N4EDQ
234
K7VW
175
WB7WOW
163
WD4COL
160
WB2MCO
149
KB5EK
137
K2ZM
136
WD8LRT
WB3GZU
135
W2AHV
132
NG4J
131
W1IDK
K5CXP
128
KA3CDQ
125
WD4HIF
WB1GXZ
KA7ELI
124
WB7TQF
123
K8KQJ
122
KM9B
121
KA1GBS
119
W9YVC
117
WB2IQJ
KT6D
KA1ON
W7VSE
116
WA1TBY
115
W5DTR
WB2EAG
KV7F
KA5KRI
114
WA4QXT
113
K7GXZ
AG2R
112
NI6A
WA2SPL
KV5X
111
WØOYH
110
WD8MIO
AF8V
109
WB1HIH
WA4JDH
W9DM
108
WD4ALY
WA4PFK
WA3EHD
N7AKX
K4SCL
107
W9JUJ
W4WXH
KA1T
K4ZK
K4JST
106
KC9GJ
KA8CPS
K8OZ
105
WA2HEB
104
KB3XO
W2AET
KA1GID
N2CNR
103
WD9ESZ
WD4AWN
WD4CNQ
KB5W
KB2HM
AK1W
102
W1EOF
N5TC
N2BOP
KT7X
KA3DLY
101
WA4CCK
KT6A
KK5B
100
WA2FJJ
W6VOM
W4NFK
W4ANK
W4CKS
W2XD
N7DNG
99
N5AMK
KC5NN
KA4GFU
98
W5JOV
KB3LF
97
W5CTZ
W1TN
N9DIH
W2BIW
N8DSW
KA5HDT
KA4SAA
96
WA7LGN
WA3WIY
W7LNE
W2MTA
N8EES
N6AWH
95
WB2PKG
WAØTFC
94
N8AUH
N5EFG
K3CR
93
WB8WKQ
N2XJ
KAØJQG
K6YD
K4VWK
92
W4GPL
91
VE3WM
N8DSU
KA4AUR
WB2ZJF
KS7I
90
WA4EIC
W9NXG
89
N2AKZ
K2VX
88
WB2TQC
WB1ABQ
WA5RVT
VE3DPO
N8BQK
KD5P
KA9HPQ
KAØCUF
87
WB8MTD
VE3GT
NN4I
KA1AVU
KA9IKR
K6UYK
AG9G
86
WA7GQO
W8GGX
WØKJZ
VE3GOL
KB4OZ
KA5CXW
K3JL
85
WB6QBZ
W2ZOJ
K2ZVI
N9BYK
N1BJW
KE4DA
KA4ASZ
K4EV
AC3N
84
WB4WII
KC5SF
83
WD8RHU
N9ATP
81
WA8HGH
WA4YPQ
W5WZ
KF8J
KF4GZ
KA8GJV
KA1DB
K1JHC
80
WA2ARC
W1KK
N6GIW
N1ARI
NØBDG
KB3UD
79
KY4U
N2CER
K7NTG
KØSI
78
WB7OEX
W5KLV
W4OGG
NW4O
KC3DW
KBØMB
KA8BNW
77
WA4EYU
WA1VRL
KF4HA
KA8GHF
K9MX
76
N4PL
75
WB3FKP
WA4LXP
N3BKU
KA3GJT
AI6E
74
WD4HBP
WB5MMI
WB4TZR
WB2IDS
W7EP
N1BGW
KC2QQ
KA3DTE
KA4MTX
KA3EJG
73
WB2OWO
W6ASH
N8DTZ
KTØU
KD4TY
KB4LB
72
N7CSP
N2BIR
71
WB5CIC
W8KKK
WØLAE
N5BT
AK2E
KA4BSG
K1OSM
70
N7BGW
69
WA6QCA
W6CPB
W3DKX
WA2YBM
KA2GSX
KA1BBU
68
WD5GKH
WB5LBR
WA8GMT
67
W2TZO
KC2SW
KA4BCM
K5OAF
KØDJ
66
WB8YTD
WB8YDZ
W3VA
W1RWG
NT4U
65
WD9FRI
WB9IHH
K4ZN
W4LXB
KA5AZK
64
WD8KBW
WD4BSC
N3CJP
KG9B
KF4U
K5TL
K5TF
63
WB4UHC
WB3KUZ
W4HON
N1AJJ
KS2G
KK9N
KE1L
KAØARP
62
WBØHOX
WA8DHB
W9UMH
KC5FX
KCØOO
KA2NMA
KØJCF
61
WB4NTW
WA4JTE
WA2KOJ
KE3U
W6RNL
KE6ZA
KA4ERP
60
WBØGOB
WA6OCM
KA2JMH
56
KA8GGZ/T
50
KA2GTE/T
48
WB2QMP/T
N5EZM/T
47
N2CPX/T
45
KA8NCR/N
44
N2DPV/T
43
N5FDL/T
N2CSX/T
42
KA9GBG/N
K1LCQ/T

Brass Pounders League September 1982

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: WB2MCO K6TWJ.

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
N4EDQ	518	2088	784	1822	5212
W3CUL	732	881	1274	69	2956
NØCQP	35	1339	233	753	2360
KA9CPA	123	1096	210	771	2200
WAØHJZ	27	742	27	508	1304
W7VSE	0	597	561	18	1174
WB7TQF	62	459	465	36	1022
WB7WOW	25	503	411	54	993
KN7B	114	357	458	59	988
W9JUJ	1	465	503	6	975
NI6A	82	406	429	14	931
WA2SPL	182	244	430	16	872
WØACH	29	402	430	1	862
N1BBT	174	196	265	181	816
KCØAS	4	679	114	17	804
WØACD	0	471	18	285	774
W5SHN	48	315	374	6	743
WA4JDH	0	355	345	8	708
KT6A	2	379	286	17	684
KBØMB	7	314	282	48	639
NG4J	12	259	321	32	634
W3VR	280	89	254	8	631
W7DZX	14	308	296	4	622
WD4HIF	8	264	281	29	582
WA7LGN	6	268	266	29	579
K4GCN	0	302	270	5	577
WA1TBY	7	270	275	15	567
KA7ELI	110	245	140	62	557
K6UYK	50	275	209	15	549
KT7X	9	211	275	44	539
WB5YDD	14	245	220	46	527
WB2EAG	4	271	237	14	526
WB3GZU	21	243	219	35	518
N7AKX	92	165	231	25	513
W1EOF	0	188	316	6	510
KA1DB	23	228	239	18	508
W5CTZ	0	241	259	8	508
NI6A (Aug.)	227	268	77	13	588
KBØMB (Aug.)	25	217	255	15	512
WB4PNY (Aug.)	3	248	254	2	507

BPL for 100 or more originations plus deliveries:

W4ZJY	162
KH6B	138
WØGRW	118
K7GV	109
KB5EK	108
WD4COL	104

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

LAUNCH OF A NEW COLUMN

Project OSCAR and the ARRL were the initial leaders of Amateur Radio space activities until AMSAT (The Radio Amateur Satellite Corporation) was formed. These three not-for-profit organizations joined in support of the Amateur Radio satellite program in 1979 by constructing satellites, raising funds and administering programs. They have established an impressive track record over the last 20 years. There is now a growing need for communicating news both within the satellite program and among those less directly involved. Those of us who support amateur satellites see an exciting future ahead, not only for the technical, educational and scientific aspects, but also for that supply of magnetic energy that attracts the nonamateurs to our ranks. We will try to report on that future with timely and informative news.

Recently, AMSAT and ARRL agreed to increase the flow of news of the satellite program in a joint effort. The ARRL has endorsed the AMSAT publication *Amateur Satellite Report* (ASR) as the special-interest newsletter serving the Amateur Radio satellite community. Though the editorial opinions expressed in *ASR* are not necessarily those of the ARRL, we will include excerpts from *ASR* in this column to make a more complete news reporting service available to you.

To provide space for this monthly column and to increase service to you, we will discontinue publishing the Amateur Radio Satellite reference orbit schedule. An expanded schedule, including each orbit of all operating satellites, will be available monthly to ARRL members who send their call sign and an s.a.s.e. to ARRL Hq. The schedule will be sent during the last week of the preceding month requested. This column will list some information each month for those with minimum satellite tracking experience.

Orbital information will be updated as before on the regularly scheduled bulletin transmissions from W1AW. AMSAT will publish orbital information in their *Orbit* and *ASR* publications, and Project OSCAR will sell annual predictions listing every orbit starting January 1, 1983.

Space Shuttle may have Amateur Radio Station

During a banquet dinner at the Houston COMVENTION '82 on October 2, NASA astronaut Dr. Tony England, W0ORE, announced that plans were in the final approval stages to carry an Amateur Radio Experiments Package aboard STS-9 Space Shuttle scheduled for an October 1983 launch. NASA Astronaut Owen Garriott, W5LFL, is scheduled to go on that mission and may become the first to operate an Amateur Radio station from space. Two weeks after the announcement in Houston, Roy Neal, K6DUE, released a news bulletin confirming that the Space Shuttle possibility did exist. Even though it is unlikely that NASA will be in a position to guarantee in advance that the amateur operation will come about, many key amateurs are planning assistance. Although NASA has worked with Amateur Radio endeavors on many occasions, our missions are not top priority and can be scrubbed at the last moment.

Amateurs involved in this project have asked ARRL to provide the necessary "black boxes" for the flight, and to organize the operating plan. If Owen Garriott is given permission to operate from space, those of us operating earth stations must maintain the highest order of operating discipline. The "seed of possibility" has been planted; it has 10 months to grow. Let's make the best use of the time we have to plan our operations. What we decide will have a profound effect on the image and growth of Amateur Radio.

*OSCAR Program Manager, ARRL

Phase IIIB Launch Status

The latest word from AMSAT is that the European Space Agency (ESA) may switch the scheduled payloads of L6 and L7 because of a critical launch window for the Exosat satellite. This would mean a likely April 1983 launch for the AMSAT Phase IIIB high-elliptical Amateur Radio satellite. AMSAT-DL has completed vibration testing, and by the time you read this, the spin balance, antenna, sun sensors and solar-array tests will have been completed. Lower-than-planned power output from the L-Band transponder is expected, which may require a few more decibels of receiving gain on 436 MHz. Phase IIIB, which will be shipped Air Freight to Kourou, French Guiana after final tests, is on schedule.

Landmark Meeting Convenes in Paris

Amateur satellite builders from several nations met in Paris from October 2-4. According to AMSAT President Dr. Tom Clark, W3IWI, "The meeting's main purpose was to explore avenues of mutual cooperation in future amateur space endeavors." Jon (Edmond) Gruau, F8ZS, of the French RACE amateur satellite organization, hosted the meeting. Arrangements for this important convocation have been quietly under way for nearly a year.

The meeting had, by prior agreement, been limited strictly to hardware constructors rather than including all the various amateur satellite organizational managers and administrators. This had a dual purpose of keeping the meeting small and manageable, while reducing the potential for political and diplomatic snafus often associated with international meetings. On the agenda were topics such as the growing national space capabilities of several nations, making best use of known launches, and joint spacecraft-construction projects. *(from* ASR *43/44, Oct. 11, 1982)*

W1AW to Transmit Bulletins via Satellite

During operations-planning meetings for AMSAT Phase III spacecraft use, ARRL and AMSAT decided to use the ARRL station, W1AW, as the primary bulletin station in IARU Region 2. The station has been equipped for satellite bulletin service since early 1980. The present band-plan for Phase IIIB calls for utilization of SSC (Special Service Channels) L2 for cw, RTTY and ASCII bulletins; Channel H1 will be used for voice bulletins. When the Phase IIIB satellite is in view of W1AW, the regularly scheduled bulletins will be sent (including code practice). It may be decided at a future date to expand this service to meet the needs of users.

Westlink News via Satellite

Presently, AMSAT has been transmitting the 10-minute tapes produced by Westlink News Service during the last AMSAT-OSCAR 8 orbit every Saturday UTC on 435.195-MHz lsb. The addition of W1AW bulletins is being considered. This service will be continued on an experimental basis until the launch of the Phase IIIB bulletin service. Other regional bulletin services are encouraged. Contact K1HTV at AMSAT Hq., Box 27, Washington, DC 20044. *(from* ASR *43/44, Oct. 11, 1982)*

UoSAT-OSCAR 9 Status Report

Since the recovery of the UO-9 command system, the University of Surrey group has found two problems with the spacecraft: (1) The readings from the radiation experiment on Channel 13 are half of the needed value for full detection. The experiment will still be of use, even at the lower values; and (2) the secondary computer memory has a problem that has not been fully analyzed; only about half of the memory will operate properly.

During a telephone conversation in late October, Dr. Martin Sweeting, G3YJO, indicated that the University of Surrey group was starting "de-spin" of the spacecraft. This is the final calibration, which will take a week to 10 days, after which a determination will be made to deploy the 50-foot magnetometer boom. If the de-spin is completed and the boom is deployed, it is possible that by the time you read this column the hf beacons will have been turned on.

Dr. Sweeting has been alternating the baud rates of the beacon telemetry information, and would like to hear what rates users prefer so a schedule may be made. The speech-synthesizer experiment, to be turned on at random times, will announce the various activities planned. Since this "orbiting bulletin board" can serve Amateur Radio in many ways, it is suggested you monitor the beacon on 145.825 MHz. UoSAT-OSCAR 9 passes will occur between 1 and 4 P.M. local time daily and will probably be the most popular. The late night or early morning passes between 1 and 4 A.M. will be available also. Users may use a timer to record passes while they are away from their stations.

NASA Reference Orbit Information

The most precise orbital information we have found is the NASA Orbital Predictions that contain all of the Keplerian elements. Anyone who has a need for the NASA publications may write to NASA Goddard Space Flight Center, Greenbelt, MD 20771. To obtain the bulletins, you must indicate the International Designator for the satellites you wish to track. AMSAT-OSCAR 8 is 1978-026B; UoSAT-OSCAR 9 is 1981-100B; RADIO-3 is 1981-120A; RADIO-4 is 1981-120D; RADIO-5 is 1981-120C; RADIO-6 is 1981-120F; RADIO-7 is 1981-120E; and RADIO-8 is 1981-120B. Ask for the Format Explanation with your request. These bulletins, sent about once a week, are a free service of the U.S. government to those who have a need for precise orbital information.

Satellite Listening Post

The time and date (Central North American time zone, not UTC) shown below are approximate weekend periods you can listen to amateur communication on the 10-meter downlinks between 29.300 and 29.500 MHz.

Dec. 4-5 — 3:14-4:30 A.M. and 1:40-2:30 P.M.
Dec. 11-12 — 2:40-4:10 A.M. and 1-2:40 P.M.
Dec. 18-19 — 1:20-2:30 A.M. and 12 A.M.-2 P.M.
Dec. 25-26 — 12 P.M.-2:25 A.M. and 10:40 A.M.-12:20 P.M.

You can listen 2 hours before the times listed for an East Coast overhead pass and 2 hours later for an overhead West Coast pass.

Monthly Listings

☐ *ASR* is available for $18 ($25 overseas) for 26 yearly issues from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

☐ Project OSCAR 1983 Orbital Predictions for each orbit of AMSAT-OSCAR-8 and Radios 5, 6, 7 and 8 are available for $10 postpaid in Canada, Mexico and the U.S. $12 elsewhere. Send to Project OSCAR Inc., P.O. Box 1136, Los Altos, CA 94022.

☐ ARRL Members only may send an s.a.s.e. with their call sign to ARRL Hq. Club and Training Department for a monthly orbit schedule listing each orbit for all operating amateur satellites.

☐ Further information on the radio amateur satellite program can be obtained free of charge from ARRL Hq. The OSCARlocator package is now available for $7 U.S., $8 elsewhere. QST

Strays

QST congratulates . . .

☐ Robert F. Nelson, Jr., K2PQN, of Burlington, New Jersey, on receiving the IBM Field Engineering Division All Star Award.

☐ Edward H. Shuler, K6DT, of Bakersfield, California, on being promoted to Group Vice President in charge of international exploration and production and minerals at the Getty Oil Co. in Los Angeles.

☐ Danny Maas, KA5NJP, of Santa Fe, New Mexico, on winning the Pike's Peak Marathon and setting the all-time record for 13-year-olds.

☐ Colonel J. Victor Stout, W3GEB, of Baltimore, Maryland, on being elected Director, Eastern Area, by the U.S. Metric Association, Inc.

I would like to get in touch with . . .

☐ anyone who can provide me with historical information on the American Legion Net, which operated in California circa 1924-1952. J. Phil Scherck, WA7AGY, 8987 Curbaril Ave., Atascadero, CA 93422.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark J. Wilson,* AA2Z

DECEMBER

4-5

ARRL 160-Meter Contest, Nov. *QST,* page 84.

Telephone Pioneers QSO Party, Nov. *QST,* page 100.

EA DX Contest, phone (this year's rules not received).

Connecticut QSO Party, sponsored by the Candlewood ARA, from 1100Z Dec. 4 until 1100Z Dec. 5. Work stations once per band and mode. Exchange serial number and QTH (county for CT stations; ARRL section for others). Suggested frequencies: cw — 40 kHz up from lower band edge; phone — 3.927 7.250 14.295 21.370 28.540; Novice — 25 kHz up from lower edge. CT stations multiply total QSOs by sum of ARRL sections worked; others multiply total QSOs by sum of CT counties worked (max. 8). DX QSOs count for QSO credit, but only one DX multiplier overall is allowed (CT stations only). Novice QSOs count 2 points, OSCAR QSOs count 3 points, and QSOs with club station W1QI count 5 points each. Mail logs by Jan. 2, 1983 (enclose large s.a.s.e. for results) to: Stephen Grouse, KA1ECL, 3 Queens Ct., Danbury, CT 06810.

9

W1AW Qualifying Run, 10-40 wpm, at 0300Z Dec. 10 (10 P.M. EST Dec. 9). Transmitted simultaneously on 1.818 3.58 7.08 14.070 21.08 28.08 50.08 147.555 MHz. 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 s.a.s.e. will help expedite your award/endorsement.

11-12

ARRL 10-Meter Contest, Nov. *QST,* page 84.

EA DX Contest, cw (this year's rules not received).

18-19

Canada Contest, sponsored by the Canadian AR Federation, from 0000 to 2400Z Dec. 19. Everybody works everybody. 160-2 meters, phone and cw. Entry classes: single op, all band; single op, single band; multiop, single transmitter (all band only); QRP. Work stations once per band and mode. No crossmode QSOs. Cw QSOs in cw bands only. Exchange signal report and serial number starting with 001. VE1 stations must also send their province. Count 10 points per VE QSO, 1 point for others. 10-point bonus for any CARF station using TCA or VCA suffic. Multiply by total VE provinces worked per band (VO1/VO2 VE1-PEI VE1-NB VE1-NS VE2 VE3 VE4 VE5 VE6 VE7 VE8 VY1). Suggested frequencies: phone — 3.770 3.900 7.070 7.230 14.150 14.300 21.200 21.400 28.500 50.1 146.52; cw — 1.810 3.525 7.025 14.025 21.025 28.025 50.1 144.1. Suggest phone on the even and cw on the odd hours UTC. Mail entry within 30 days (include s.a.s.e. or s.a.e./IRC for results) to: CARF, P.O. Box 2172, Stn. D, Ottawa, ON K1P 5W4, Canada.

26-31

QRP Winter Sports, see Feb. *QST,* page 88, for details.

28

W1AW Qualifying Run, 10-35 wpm, at 1400Z (9 A.M. EST). See Dec. 9 listing for more details.

JANUARY

Dec. 31 - Jan. 1

ARRL Straight Key Night, 24-hour period UTC (from 7 P.M. EST Dec. 31 until 7 P.M. EST Jan. 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation on 80, 40 and 20 meters are 60 to 80 kHz from the lower band edges and 10 kHz from the lower Novice-band edges. When participating, use SKN instead of RST preceding the three-digit report to clue in passersby. Following SKN, send a list of the calls of stations worked plus your vote for best fist heard (not necessarily one you've worked) during that period. This is not a contest; quick contest-like exchanges are discouraged. Vote, too, for most interesting QSO. Mail your report by Jan. 10 to ARRL Hq.

5

West Coast Qualifying Run, 10-35 wpm, at 0500Z Jan. 6 (9 P.M. PST Jan. 5). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. See Dec. 9 listing for more details.

8-9

ARRL QSO Party, cw and phone.

World 40-Meter and 80-Meter SSB Championships, sponsored by *73 Magazine,* from 0000 to 2400Z Jan. 8 (40-Meter contest) and 0000-2400Z Jan. 9 (80-Meter contest). The contests are separate. Stations may be worked once per band, phone only. No crossmode QSOs. Classes: single operator, single transmitter and multioperator, single transmitter. Single-operator stations operate a maximum of 16 hours; time-outs must be clearly indicated in the log and on the summary sheet, and must be at least 30 minutes each. Multiops may operate the entire 24-hour period. W/VE stations exchange signal report and state or province; DX stations, including KH6/KL7, exchange signal report and DX country. Count 1 point for W/VE QSOs or QSOs within your own country. Other QSOs count 2 points each. Multiplier is sum of U.S. states, Canadian provinces or territories (max. 13) and DX countries worked. Awards. Mail entry by Feb. 12 to: Billy E. Maddox, 468 Century Vista Dr., Arnold, MD 21012.

Zero District QSO Party, sponsored by the Mississippi Valley RC, from 2000Z Jan. 8 until 0200Z Jan. 10. Work stations once per band and mode. Work mobiles again as they change counties. Exchange signal report and ARRL section. Zero district stations also send county. Suggested frequencies: cw — 60 kHz up from low end; phone — 3.900 7.270 14.300 21.370 28.570; Novice — 25 kHz from low end. Count 1 point per QSO (non-zero district stations work zeros only) and multiply by total zero-district counties. Zero-district counties and DXCC countries worked. Awards. Mail entry by Feb. 15 (include large s.a.s.e. for results) to: W0SI, 3518 W. Columbia, Davenport, IA 52804.

14-MHz SSB Contest, sponsored by the International Short Wave League, from 0000-2400Z Jan. 9. Single operator, single transmitter only. Classes: licensed amateurs and short wave listeners. Suggested frequencies: 14.175 and 14.225. Count 1 point per station worked/heard, 5 points per ISWL transmitting member, and 10 points per ISWL officer. Multiply by number of continents worked/heard plus number of ISWL members worked/heard. Exchange signal report, serial number starting with 001, and ISWL membership number (if any). Mail entry by Feb. 20 to: Archie Brown, G2WQ, Oakwood, Lower Frankton, Oswestry SY11 4PB, England.

10

W1AW Qualifying Run, 35-10 wpm, at 0300Z Jan. 11 (10 P.M. EST Jan. 10). See Dec. 9 listing for more details.

15-16

ARRL VHF Sweepstakes, this issue, page 87.

World Communications Year Contest, Nov. *QST,* page 100.

HA DX Contest, sponsored by the Hungarian Radioamateur Society, from 2200Z Jan. 15 until 2200Z Jan. 16. Cw only. Entry classes: single op, single band; single op, multiband; multioperator, single transmitter. Exchange signal report and serial number starting from 001. HA stations also send two-letter code corresponding to their county. Possible counties are: BA BE BP BN BO CS FE GY HA HE KO NO PE SA SO SZ TO VA VE ZA. Count 6 points per HA QSO and 3 points per other QSO with any station outside your continent. Work stations once per band. Multiply by total HA counties worked per band. Awards. Mail logs within 6 weeks to: HRS, P.O. Box 214, Budapest 5, H-1368, Hungary.

Hunting Lions in the Air Contest, sponsored by Lions Clubs International, from 1200Z Jan. 15 until 1200Z Jan. 16. Open to Lions Club members and nonmembers. 80-10 meters, phone and cw. Phone and cw are counted separately. Classes: single operator; radio clubs and societies. Exchange signal report and serial number; Lions and Leo club members also exchange club name. Count 1 point for QSOs with own continent and 3 points for different continents. Count 1 bonus point for each Lion/Leo club member and 5 bonus points per QSO with members of the Rio de Janeiro Lions Club. No multiplier. Awards. Mail entry within 30 days to: Lions Club of Rio de Janeiro ARPOADOR, Rua Souza Lima no. 149 apt. 402, 22081 Rio de Janeiro RJ, Brazil.

QRP CW Contest, sponsored by the Michigan QRP Club, from 1500Z Jan. 15 until 1500Z Jan. 16. 160-10 meters, cw only. Categories: 1 W or less output; 5 W or less output; more than 5 W output. Exchange signal report, serial number, state/province/country and power output. Count 1 point per QSO and multiply by total states/provinces/countries worked per band. Multiply total by 1.5 if 100% battery or natural power. Mail logs within 6 weeks after contest (include large s.a.s.e. for results) to: Michigan QRP Club, 281 Crescent Dr., Portland, MI 48875.

World 160-Meter SSB Championship, sponsored by *73 Magazine,* from 0000Z Jan. 15 until 2400Z Jan. 16. Phone only. Single operator, single transmitter and multioperator, single-transmitter classes. Single ops operate no more than 30 hours; multiops may operate entire period. Work stations once only. Exchange signal report and QTH (state/province/territory for W/VE stations; DX country for others including KH6 and KL7). All stations are asked to observe the 1.825-1.830 MHz "DX window." Count 5 points per QSO; multiply by sum of U.S. states, Canadian provinces/territories (13 max.) and DX countries worked. Awards. Mail entry by Feb. 19 to: Billy E. Maddox, 468 Century Vista Dr., Arnold, MD 21012.

22-23

ARRL Midnight Special

Texas QSO Party

North Dakota QSO Party

25

W1AW Qualifying Run

29-Feb. 6

ARRL Novice Roundup

30-31

Classic Radio Exchange

FEBRUARY

19-20

ARRL International DX Contest, cw.

MARCH

5-6

ARRL International DX Contest, phone.

*Assistant Communications Manager, ARRL

Section Activities

Coordinated By Jim Clary, WB9IHH

A-1 OPR ➔ EC ➔ DXCC ➔ RCC ➔ WAS ➔ STM ➔ OES ➔ ORS ➔ NM ➔ SCM ➔ ARES ➔ OVS ➔ SEC ➔ OBS ➔ TCC ➔ OO ➔ NTS ➔ WAC ➔ CP

CANADIAN DIVISION

ALBERTA: SCM, E. Roy Ellis, VE6XC — SCM/SEC: VE6XC. ASCM: VE6AMM. STM, NM (ATN & APSN): VE6ABC. ECs: VE6AGH VE6AVV VE6AMM VE6AHC VE6FV VE6ABC VE6ASL VE6AFO. VE6AVV still struggling to sell ARES to hams and the municipality with little success. Most ECs would have given up long ago. All areas planning for SET with a govt dept involved. VE6AMM and his gang supplied radio communications for some unique games for the Alberta Senior Citizens Games, the only ones held in North America. Traffic: VE6CHK 117, VE6ABC 25, VE6VS 5, VE6XC 4.

BRITISH COLUMBIA: SCM: H. E. Savage, VE7FB — BCEN 3650 kHz at 0300Z — NM VE7CSI with new assistant NM and net recorder, VE7BNI. The reports are well up and net activity is doing well, with the net operating at ten wpm is bringing in many new amateurs. We need more from the north. B.C. Public Service Net 3755 kHz 0200Z QNI 3871, Low 79, High 163 avg 125. Warning — don't clean basements. VE7LV was and tripped over the pile. He looks like he did battle with a big cat. Your SCM and 7SH took off on their second honeymoon in April and visited W7VSE, our RN7 manager. Enough said there. Montana was snow, but being the day we went out for supper. May 25th west of Jasper heading home into a blizzard. Even a dust storm in Nevada, trailer was dust proof. We receive so little if any for report of activities in this Section. Traffic: VE7ZK 84, VE7FAZ 74, VE7BNI 62, VE7FB 12, VE7BZI 6. (Aug.) VE7ZK 103. (July) VE7ZK 62, VE7FB 15, VE7BNI 13, VE7BZI 7.

MANITOBA: SCM, Peter Guenther, VE4PG — ASCM: JP, SEC: HK. STM: RO. NMs: VJ TE ACX HW NM. A staff meeting held at Clear Lake on October 2nd and 3rd was very useful in planning and covering the biggest part of the province during SET. Most of the DECs and some ECs plus net managers were present. VE4AKL is now a regular QNI on the cw net. We can use all the help we can get. MEPN QNI 831, QTC 9, sess 30. MTN QNI 127, QTC 47, sess 25. MMN QNI 385, QTC 33, sess 30. CTN QNI 124, QTC 13, sess 27. WRIN QNI 256, QTC nil, sess 9. Traffic: VE4ACX 57, VE4PG 42, VE4AJE 40, VE4TE 30, VE4JA 22, VE4OO 17, VE4AAD 13, VE4NE 9, VE4LB 7, VE4ID 6, VE4GB 4, VE4TL 4, VE4ADS 3, VE4AED 3, VE4FK 3, VE4AFO 1, VE4JK 1, VE4NM 1, VE4XN 1.

MARITIME/NEWFOUNDLAND: SCM, D. R. Welling, VE1WF — ASCM: VO1FG. NMs: VO1JN VE1WF. SEC: VE1EI. STM: Open. Silent Keys: VE1EX VE1NG VE1JT. VE1CBU received UN plaque for services rendered to UN (Canadian) Forces in the Middle East. Amateurs in Halifax and Moncton areas provided communications for various sporting events during the summer. New rptr VE1SJR expected to be on line in Saint John very soon. Vhf activity is picking up with many new handhelds appearing. New exec. NSARA: VE1AMV, pres.; VE1BLO, 1st v.p.; VE1QD, 2nd v.p.; VE1FQ, secy./treas. LCARC: VE1RN, pres.; VE1BCI, v.p.; VE1BDA, secy.; VE1BRN, treas. Congrats to all. APN sess. 31, QNI 166, QTC 56, QTR 352. Traffic: VE1WF 300, VE1XF 51.

ONTARIO: SCM, Larry Thivierge, VE3GT — ASCM: VE3GOL. SEC: VE3GV. STM: VE3GFN. Congrats to the following: VE3AYL who was voted the CRRL Amateur of the Year and who has been the driving force behind CARTG, the RTTY group, for the past 15 years; VE3KK who was chosen the RSO's Amateur of the Year for his many accomplishments and achievements in Amateur Radio, especially in traffic handling; Niagara Peninsula ARC whose bulletin won the RSO's President Award. The editor is VE3HGJ. VE3IFS is operating portable 4X4 from Jerusalem where he is studying for the next year. He was chosen from 600 applicants for one of 48 positions there. Proud father is VE3LHS. Clubs and educational bodies teaching Amateur Radio training courses as well as active and competent amateurs of experience should provide more practical assistance to newcomers. Remember they have to learn the procedures, standards and the various gentlemen's agreements about matters such as band plans, correct rptr operating, etc. Thirty members of the NPARC were involved in public service communications during the Niagara Grapes and Wine Festival, while special event station VE3VM made 491 contacts operating from Montebello Park during the special week. New members of SORT are VE3s FWJ LDZ HXO. QCWA Southern Ontario Chapter 73 held a successful fall luncheon meeting where VE3LU received his 50-year continuously licensed award. VE3AIO is now VE3VY. Welcome to the Niagara Peninsula DX Group as a new League affiliated club. Upgrades to advanced: VE3s HCI LHL NBO. ONTARS is operating on 7055 kHz on the weekend. VE3GCE looking for 4 more countries to complete 5BDXCC. VE3KLX and FSN have become computer knobs. I have reviewed the section's appointments and only those who are submitting reports are listed. To all everywhere, our sincere best wishes for a merry and happy Christmas. Traffic: VE3GOL 241, VE3HGJ 144, VE3GT 121, VE3HTL 102, VE3DPO 74, VE3KCZ 55, VE3KXB 55, VE3WM 44, VE3GFN 43, VE3GNW 41, VE3AJN 31, VE3DUK 26, VE3KLX 13, VE3WG 6.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2PJ. NMs: VE2PJ VE2FSA. I have been reelected your SCM for another term. I would like to express my appreciation to all who so kindly signed my petition papers. I shall continue to do my best for Amateur Radio and our section. Season's greetings to all. VE2DKJ is now Advanced Amateur. Silent Key: VE2KC. Avec regret je dois vous annoncer le deces de VE2KC. A tous les meilleurs souhaits de la saison. Traffic: VE2BP 38, VE2EC 36, VE2EKC 27, VE2FSA 21, VE2GAG 13.

SASKATCHEWAN: SCM, W. C. Munday, VE5WM — STM: VE5QY. SEC: VE5II. NMs: VE5DC VE5HC VE5OI VE5MP. Fall is in the air and club meetings are starting up again. Congrats are extended to all incoming executives and sincere thanks to the outgoing executives for a job well done. VE3OT has retired as CRRL president. We shall miss him and wish him well. While all nets have suffered owing to band conditions, public service events have kept clubs busy providing vhf communications for marathons, parades, rowing regattas and ham radio displays. Traffic: VE5BAF 16, VE5WM 7, VE5AAT 6.

ATLANTIC DIVISION

DELAWARE: SCM, Harold K. Low, WA3WIY — STM: W3DKX. SEC: W3PQ. PSHR: WA3WIY K3JL W3DKX. SARA furnished communications for the Georgetown Air Show Sept. 26. Active were WA3ZBI K3FSP W3PVO WA3FYS WA3PWT W3EYJ K3JL KA3CDF WB3DUG W3FEG WA3KZX KA3HAE WA3WIY. Congrats KA4ZLN on upgrade. DARC officers 1983, Pres: KI3B, V.P.: K3HBF. Treas.: KA3ITN. AWARE new members, WB3HQB N3CZR WA3UHV KA3BXM W3KBS K3NCL WA3CQT WA3JHL KA3JIY and W3TTS, AWARE net held Saturday at 8:00 PM local CW RTTY Phone on 146.955. AC3U sending a nice news letter monthly to all clubs in Del. DTN QNI 271 QTC 46 in 22 sessions. DEPN QNI 54 QTC 13 in 4 sessions. SEN QNI 31 QTC 9 in 4 sessions. Traffic: W3DKX 114, W3PQ 107, W3QQ 89, WB3DUG 62, WA3WIY 54, K3JL 22, N3AXH 8, WA3PWT 8, KA5DIJ 6, WA3DUM 5, W3WD 5, K3ZXP 4.

EAST PENNSYLVANIA: SCM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: KB3LF. DEC: AA3C K3OXC KB3QW KB3UD N3BFL N3CJP W3EEK.

Net	Freq.	Time	QNI	QTC	Sess.
EPAEPTN	3917	6 P.M. Dy	458	194	30
EPA	3610	7/10 P.M. Dy	514	221	53
PTTN	3610	6:30 P.M. Dy	270	66	30
PFN	3958	5 P.M. Dy	295	252	30

Local and vhf nets reports (QNI/QTC/sess): D3ARES 176/13/4; D5ESN 69/7/4; D6ARES 35/2/5; LCARES 37/10/4; WARCVTN 47/0/5. OO reports: KB3XO W3KEK W3GTN. OBS reports: K3EBZ KB3VV W3AVJ W3CL W3VA WB3FVJ. PSHR: KA3DLY KA3EJG KA3GJT KB3LF KB3UD KB3XO KE1L/3 KE3U N3BHF N3CJP W3DP W3VA WA3EHD WA3WQP WB3FKP WB3FYT WB3KUZ. New appointments: KB3LF to STM; KB3UD to DEC for District 4, which consists of Lehigh & Northampton Cos. All NMs please note that KB3LF is new STM. Please get all net reports to him by the 10th of the month. Many thanks to K3JSZ for the fine job he did as STM. There are openings for DECs in districts 7, 8 & 9. Also openings in some counties for EC. Anyone interested in emergency work and in any of these appointments get in touch with WA3PZO or this office. This office is very interested in DEC or EC and ARES net in the Berwick/Bloomsburg area as the new nuclear power plant there is starting to operate. EPAEPTN welcomes AC3O KA3IME N3AVF. PTTN welcomes KA3EHL N3COY WB3AZA. Recent upgrades: KA3IGF W3QFI WA3JWP to "E". KA3HLT KA3IYQ WB3FYT WB3HOI to "A". KA3IFG KA3IGL N3CUB N3CXB to Gen. KA3ISU to Tech. KA3JSH new Novice in Reading area. KA3HXA now N3DBB. The MARC reports their recent hamfest a smashing success. K3AI of the air Murphy struck finals in his gear. K3EBZ reports busy summer, earned WAC & WAS and acquired new gear for 6 & 2M ssb. SARA provided communications for the Moon Run Motorcycle Enduro at Barnesville on Sept. 3. Warminster ARC now sporting a new 2.5 kw generator. WA3WQP announces PFN will move back to 5 P.M. local time starting Nov. 1. The DLARC had a busy month supplying communications for a large number of public events. New gear: KB3JK IC3A; K3ZGL Triton 4; N3AVZ SB201; N3CMC IC2AT; KA3EJG TR7730; WB3ICR TR9130. N3CJP, DEC D10, advises D10ARES Net now active every Sunday at 1900 local time on 146.28/88 rptr. It was nice to hear so many EPA appointees active in recent CD Party. Traffic: W3IPX 232, WA3WQP 180, KB3LF 167, KB3UD 151, WA3EHD 134, KA3DLY 107, W3DP 102, W3VA 97, KE3U 92, AA3B 79, WB3KUZ 77, KB3XO 53, WA3OFD 48, KE1L/3 44, KA3GJT 39, N3BFL 30, KA3EJG 26, WB3FVJ 20, N3CD 19, W3OK/3 18, WB3FKP 17, W3ADE 15, W3AQN 15, W3CL 14, W3TWV 13, KB3VV 9, N3BAY 8, N3CJP 8, WA3CKA 8, W3FAF 7, AF3Z 6, K3EBZ 6, N3BHF 5, N3AKQ 4, WB3FYT 2.

MARYLAND-DISTRICT OF COLUMBIA: SCM: Karl R. Medrow, W3FA — SEC: WA3TAI. STM: WB3GZU. KA3R, our resident OO, says most troubles are emission-clicks, hum, etc., W3MSN made his DXCC (phone) after 50 years. Congrats. Best wishes to W3AKO who has passed his 83rd milestone. WA3EOP broadcasts news bulletins at 1845 local on 147.09 MHz Tuesdays. W3CDQ finally got a hand-held for 2 mtrs. KJ3E is thinking about 2-mtr capability soon. No slouch on RTTY-W3ZNW is in midwest net! WB3KJT is finding no time left in the fast lane for hamming! KC3DW is the latest call sign for ex-KE4OI WB4FVV and WA3IIV as he takes over the WC 2-Mtr Net in Hagerstown. W3FZV is on a pleasure trip to the Far East. WB3BFK is one busy net manager! KB3WL has already seen this year's frost. W3LDD gave WA3GXN's rig a workout. KB3NL has survived rig problems. N3QA volunteers for liaison spots between duty tours. KA3CDQ had a successful MTN/MEPN/MDD booth at Gaithersburg. W3DQI says some HX signals are overworked! W3UT is Thursday's iron man. WB3GZU almost didn't make BPL. W3CVE is recovering nicely from eye surgery. The SMARC's had 59 at their weather perfect picnic. With the nets: Net/manager sessions/traffic/QNI average. WC 2-Mtr/KC3DW 4/2/20.3. MDC PON/W3OYY 5/5/18.2. WR PON/WB3BFK 21/24/14.7. MTN/KA3CDQ 22/14/5. MEPN/WB3GZU 31/130/26.0. 100% WB3BFK W3LDD. Three or less: N3AGM KA3ARH KA3CDQ N3CRW W3DKX W3FA WB3GZU. MDD/W3PQ 60/191/7.8. Brass: W3FA W3QQ WB3GZU. MDD (Aug.) 61/245/8.0. MDD (July) 60/181.7.4. Traffic: WB3GZU 518, W3CVE 272, KC3DW 168, KA3CDQ 135, W3FA 132, KJ3E 82, W3UT 63, N3QA 39, WB3BFK 21, W3DQI 19, W3ZNW 19, W3FZV 13, W3LDD 10, KB3WL 7, WB3KJT 3, WA3EOP 2.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: N2CER. Continuing from last month, most of you probably know that an aircraft ELT does not transmit a very powerful signal, as it is chiefly designed to be received from the air. When a ground team is searching it is much harder since such a weak signal cannot travel very far over the terrain. This was a major factor in the locating of the ELT, since it is impossible to DF a signal that you can't hear, you must first get close enough to be able to hear it! But how to do this? Answer ... a lot of driving! Initial reports were that the signal was originating from the Medford area, and so W2HOB headed that way around midnight. A careful search of that area with the able help of the Medford police proved fruitless. Heading north through Vincentown and over towards the Pemberton area yielded nothing. Driving towards the Burlington Co. Airport and, aha, a signal on 121.5 MHz. Calling on the Lumberton police in the middle of the night, W2HOB continued to probe the wooded areas to no avail. Around daylight the search was stopped so those involved could get some much needed rest. Meanwhile no planes had been reported missing so just what was going on was still unknown. But not for long! Tune in next month for the big find. Traffic: N2CER 366, WB2IQJ 347, WB2JCE 171, N2CNR 154, WB2ZJF 122, WA2HEB 118, WB2PKG 97, KM2E 63, WA2CUW 32, KA2GTE 18, KA2GSL 8, WB2GFM 7, WB2LCC 5.

WESTERN NEW YORK: SCM, William W. Thompson, W2MTA — SEC: W2BCH. STM: W2ZOJ. ASCM: W2GLH. DECs: WA2AIV KA2BHR WB3CUF WB2NAO. Silent Key: W2DSS, Oneida, who held QCWA Century Award and was a former WNY SCM.

Net	Freq.	Time/Day	QNI	QSP	QND
NYS/1*	7077	1000/M-S	172	77	24
NYSCN	3677	1000/Sn	36	13	4
THIN	3913	1600/Sn	47	—	4
NYPON*	3913	1700/Dy	638	311	30
NYSPTEN	3925	1800/Dy	730	94	30
ESS	3590	1800/Dy	339	52	30
Lewis Co.	43/03	1815/Sn	19	—	4
OCTEN*	34/94	1830/Dy	489	44	29
Q Net	31/91	1830/Dy	476	6	30
STAR/E*	99/39	1830/Dy	55	7	23
WDN/E*	04/64	1830/Dy	695	137	30
NARASEN	75/15	1900/Sn	64	—	4
NYS/4*	3677	1900/Dy	445	221	30
SLVARES	31/91	1930/Sn	34	—	4
JCARCN	10/70	2000/Dy	546	17	30
OARCN	25/85	2000/W	101	—	5
VHF THIN	04/64	2000/Sn	62	—	4
BRVRAN	055/655	2100/Dy	290	8	30
CNYTN*	90/30	2115/Dy	379	65	30
STAR/L*	325/925	2130/Dy	108	61	27
WDN/L*	04/64	2130/Dy	896	165	30
NYS/5*	3677	2200/Dy	391	372	30

NTS net. Only NTS and other reporting nets are listed. Aug. NYS/1 81-32-24. PSHR: W2AET WA2FJJ WB2IDS WA2KOJ W2MTA WB2OWQ KC2QQ KC2SW W2ZOJ. Appts: N2BED, EC Seneca Co.; WB2HLY, NM OCTEN; K2OC, OES. Reports: (OBS) W2GLH, K2KWK skeds Mon. 1230 on 147.18 and 1930 on 146.64 MHz, Sun. 2045 on 146.88; (OVS) K2QR. Novice classes: Auburn-KA2FES; Tompkins Co.-W2MRW; Fulton-N2ACQ and WB2LBE; GRAM-K2OS. CLUB OFFICERS: Rochester VHF-WB9EAE WA2ZNC WB2IEY. COMMS: RAGS beat bakers' dozen with SRI CHIMOY 10k; Palmyra Canal Town-Drumlins; Great Race V-Auburn; Canisteo Living Sign-K2IUT; ODP Test- CVARA; Cayuga Trials, Roller Champs and Trompton Run-Skyline; Festival Genesee Balloon Rally and 10k Run, JAYCEE Bikeathon, Tonawanda Inner Tube-GRAM. HAMFESTS: Hamburg big, Louisville building, Elmira great, Syracuse fun in sun; Canandaigua AWA Conference inspiring. NEWS: WA2FJJ recipient of W2RUF Memorial Award for 1982 from NYS net; Printer's Ink Gremlin got OCTEN and STAR/E in new *Net Directory*; BARA's W2OW sporting new brass and 40 meter beam; RARA plans by PR Director K2UDP look great. How about a future article for QST? Traffic: WA2HSB 264, W2MTA 252, KO2H 248, W2AET 225, WB2IDS 205, WA2FJJ 185, WB2OWQ 171, W2ZOJ 152, WB2QIX 108, KC2SJ 106, W2FR 82, KG2D 81, KC2QQ 80, VE2FMQ 72, KC2SW 65, KA2OOZ 51, AF2K 48, KA2BHR 42, N2ARD 40, WB2RBA 33, WA2RXO 30, N2ABA 27, K2RN 26, WA2AIV 25, WB2NAO 25, K2IUT 24, WA2KOJ 24, KA2BCH 23, KA2DBD 23, KC2SD 21, KA2DQA 14, WA2SMZ 14, WB2PID 9, K2VR 3. (Aug.) WB2NAO 9, WA2RXO 8.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM & STM: N3EE. NMs: AC3N N3ADU W3MML W3NEM. SEC: AB3Q. DECs: WB3JDI KB3OO KN3ZAN WB3EFQ WB3KJH WA3ZNP N3ADU.

Net	QNI	QTC	Sess.	kHz	T/D
WPAQW	334	231	30	3585	7:00 P/D
WPAPTN	610	150	30	3983	6:15 P/D
WPA2MTN	470	78	30	146.28/88	8:00 P/D
NWPA2MTN	528	8	29	146.04/64	9:00 P/D
PFN	295	252	30	3958	5:00 P/D

We wish to extend our condolences to the families of W3LVX and WA3FSH, now Silent Keys. I will be serving as SCM for two more years, and would like to thank all who have given me their support during the last four years. I would like to begin the switchover to the new ARRL field structure recommended by the LRPC, and will welcome any suggestions from members in the WPA Section. Any and all will be appreciated. Without your help we cannot succeed. We need operators who can spend some time on the traffic nets. It can be a great experience. Try it. New Novice KA3JVF. Upgrades: Tech-KA3JKO; General-WB3DCY; Advanced-W3ZSV WA3ITS WA3ZOE WB3IAR WB3ICC. N3BBH is now KC3CL. KA3CGF is N3CLD. Butler ARA is the recipient of a Senate Citation for their dedicated public service during the Jan. 22, 82 disastrous snow storm. WACOM Washington Co. are very active in community affairs and

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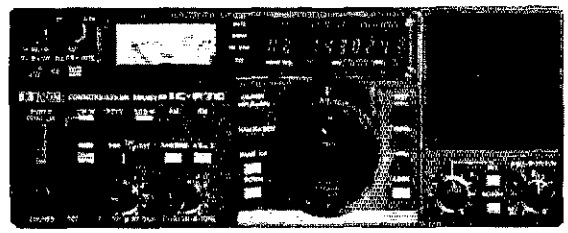

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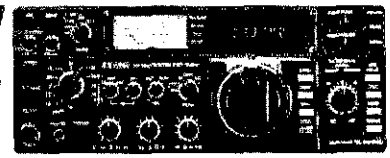

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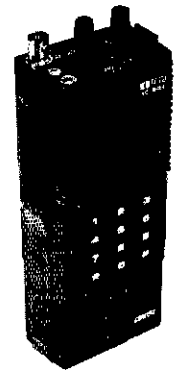

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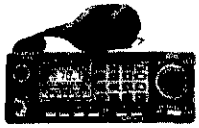

TR-7950
2M, 45 WATTS,
21 CHAN. MEMORY.

TR-2500

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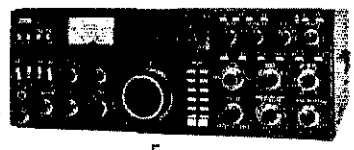
W/ANTENNA TUNER



$1799 w/*FREE* { SP-930 spkr. / MC-60A Mic. / YK-88C-1 Filter

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TRANSCEIVER
w/*FREE*
SP-230 Spkr.
YK-88C CW Filter

$949.95

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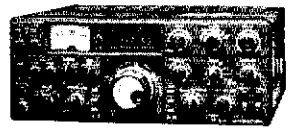

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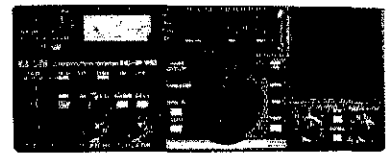

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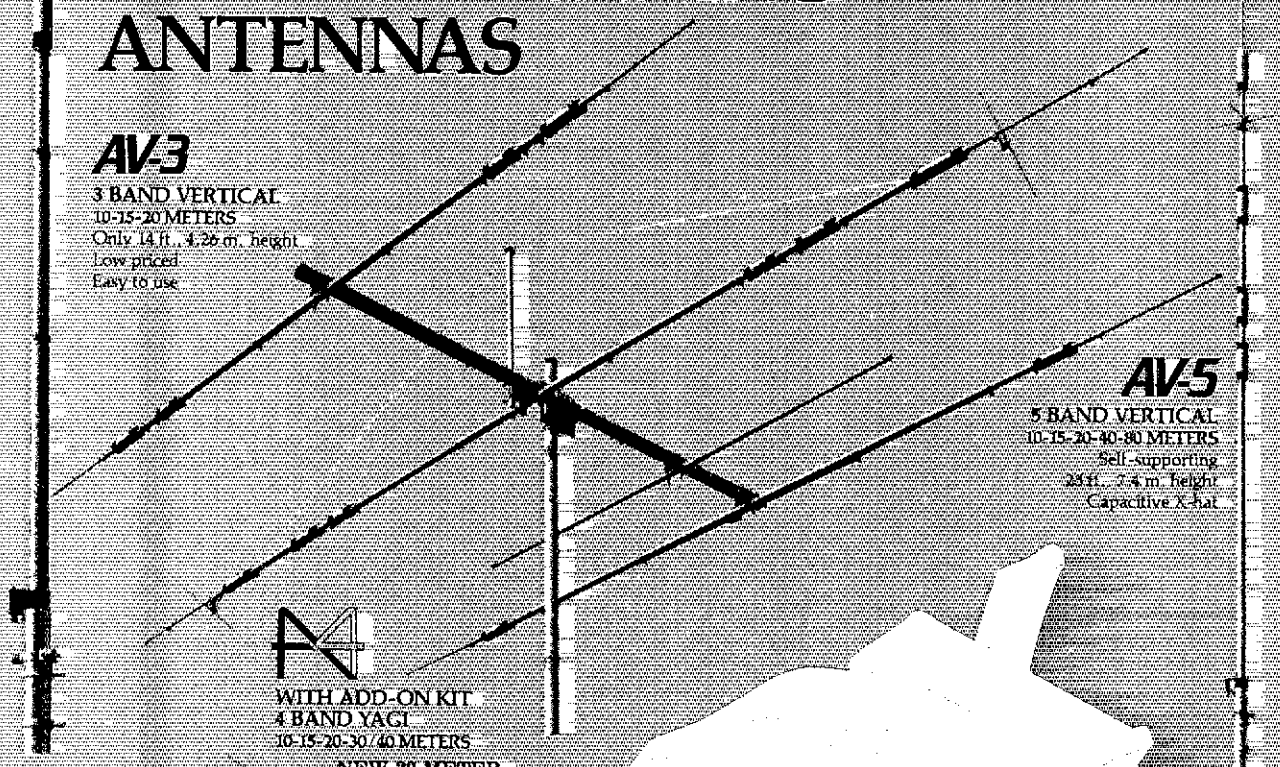

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Broadband, excellent gain and f/b ratio, 2 kw power rating direct 50 Ω feed. Boom 14 ft., 4.26 m., longest element 28 ft., 8.5 m. weight 27 lbs., 12.9 kg., turn radius 15.5 ft., 4.7 m., mast dia. 1¼ in. to 2 in., 3.18 cm. to 5.08 cm., material 6063-T832 seamless aluminum.

A4
Broadband, excellent gain and f/b ratio, 2 kw power rating, direct 50 Ω feed, boom 18 ft., 5.48 m., longest element 32 ft., 9.7 m., weight 37 lbs., 16.8 kg., turn radius 18 ft., 5.48 m., mast dia. 1¼" to 2 in., 3.18 to 5.08 cm., material 6063-T832 seamless aluminum.

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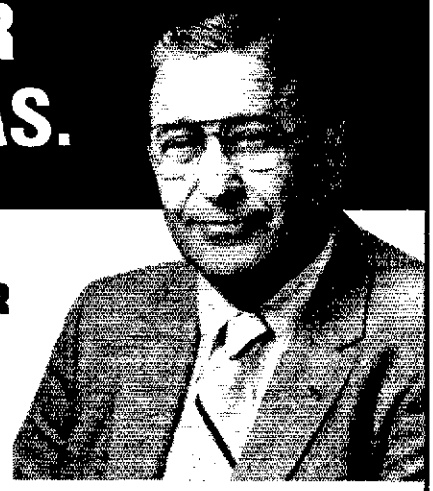

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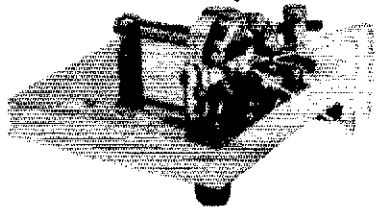
170-01/02 BY-1/2 Keyer Paddle



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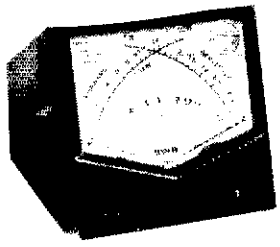
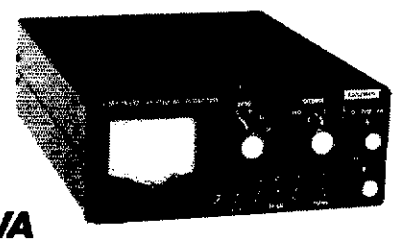
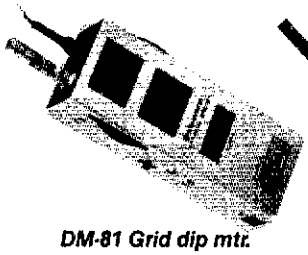
CN 520/540/550 SWR/Pwr. mtr.



CNA 2002 Antenna Tuner

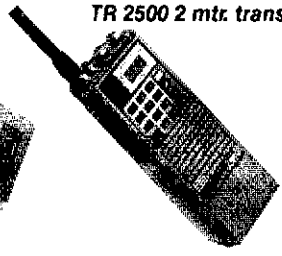


DAIWA

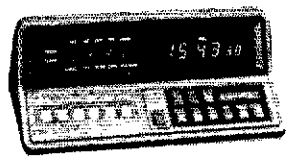


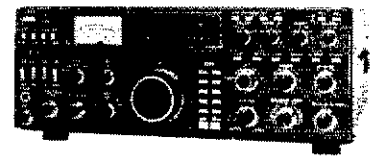
DM-81 Grid dip mtr.

TR 2500 2 mtr. transceiver



HC-10 24 hr. Digital Clock





TS930S 160-10 mtrs. (150 kHz-30 mHz. gen. coverage recvr.)

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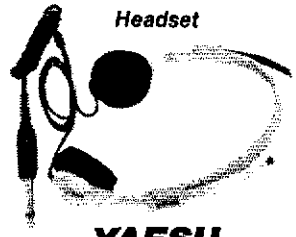
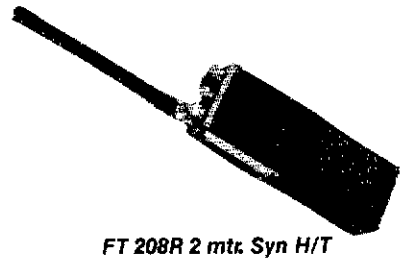
QTR 24 Quartz world clock

Headset



YAESU



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CENTRAL DIVISION

ILLINOIS: SCM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: WB9JSR. ASCM: K9ORP.

Net	Freq.	Time/Day	Sess.	QNI	QTC
ILN	3960	2330/0330 Dy	56	508	381
NCPN	7270	1215 Dy	25	398	72
NCPN	3915	1700 Dy	23	132	60
ILPN	3915	2130 (L) Dy	-	-	-
IEN	3940	1400 Sn	4	89	1
ITN	3705	1900 (L) Dy	29	172	44

D9RN 100% stns: W9HOT W9NXG K9EHP WB9WGD WB9ODN. CAND 100% stns: WB9WGD W9NXG W9HOT. K9AXS reports that the W9VEY 2M Memorial Net had 63 checkins and 10 pieces of traffic this month. K9ORP, ASCM and EC for McLean Co., reports ARES activation for a severe thunderstorm warning. EC W9SSP of McDonough Co. reports activation for one tornado watch. Christian Co. EC W9HLX reports four ARES net sessions for weather-related purposes. Bond Co. EC WB9YVE has developed an emergency plan for Greenville, outlining ARES resources and identifying agencies within the community with whom ARES has a working relationship. WELL DONE! All ECs are encouraged to develop such a plan in cooperation with the local police, fire, ESDA, Red Cross and other agencies that play a role in disaster relief. W9VA writes that his business has taken him to Brazil frequently over the last two years. Beginning January 83, he will be in Rio full time for a while using the call PY1ZFO. As reported in their publication, the *ARC OVER*, FRRL will operate two hf stations from 10 A.M. Sat. Oct. 16 til 3 P.M. on Sun. the 17th from the SEARS TOWER SKYDECK, 103 floors above ground level. This location is accessible to the public from 9 A.M. to midnight daily. They will have their signs up in English, Spanish, French, German and Japanese as the SKYDECK is an international attraction in Chicago. What a great opportunity to show off ham radio! As a result of favorable comments on the writings of WD9EBQ and WB8JGW as published in a recent issue of *QCD* regarding the removal of the 5-point max on category 9 of PSHR, K1XA has suggested that this be made effective 1 Jan 83. Keep an eye open for developments on this so that you can claim the credit that is due you in this area. On August 31, the Illinois chapter of the Associated Public Safety Communications Officers, Inc. (IL APCO) held a meeting of its emergency preparedness committee. Representing ARRL at this meeting were SCM WD9EBQ, SEC (and APCO member) W9QBH and Williamson Co. EC K9UXK. Others represented included several County ESDAs, State ESDA, CAP, NWS and Illinois broadcasters who are part of EBS. The purpose of the committee is to come up with some type of simple working document outlining the resources of each group and how they could best work together in an emergency. It was agreed that, in a large scale emergency, communications are always deficient, and that the resources of the groups represented, if properly utilized, could minimize this. Traffic: W9NXG 387, K9BVE 231, W9HOT 229, W9JJJ 138, K9MX 111, W9TLU 98, KB9X 87, K9EHP 83, W9QK 79, KD9K 75, N9DR 52, W9KR 25, WA9SHE 20, W9KSU 19, W9HBI 18, N9DIX 13, W9HLX 13, WD9CJB 9, WD9HZF 9, WA9RUM 5, W9SSP 2.

INDIANA: SCM, Bruce Woodward, W9UMH — SEC: WB9ZOE. STM: W9JUJ. SOOC: KJ9J. SSGLC: WA9BVS. SRC: N9WB. SACC: K9TUS. SCC: W9OBF. NMs: ITN-W9QYY; QIN-KJ9J; ICN-W9JUJ; VHF-W9PMT; IWN-N9BHT; IPN-W9WKM; I6SSB-WD9HQJ.

Net	Freq.	Time/UTC/Dy	QNI	QTC	QTR	Sess.
ITN	3910	1330/2300	1857	331	1828	60
QIN	3656	1430/0100/0400	729	379	1957	90
ICN	3707	0015	62	37	737	21
IPN	3910	2130	1094	111	808	30
IWN	3910	1310	4083	-	526	30
6SSB	50150	0100	501	19	2805	30

Hoosier vhf nets for Sept. QNI 4498, QTC 176, QTR 6517, bulletins 58 for 21 nets. D9RN 100% QTC 419 in 60 sess. IN stns. W9JUJ K9CGS W9URQ KA9CIV KB9NR KJ9J WB9MIK WD9MDS. CAND QTC 791 in 30 sess. D9RN 100% in stns. W9JUJ W9URQ. 9RN QTC 573 in 1155 minutes IN Stns. W9JUJ W9QLW W9EI KJ9J WD9GXW W9QLW N9HZ K9WWJ N9AEI WA9OCF WB9UYU W9FC. (NM) Silent Key W9SQH. Appts: OBS-K9SBW; ORS-KJ9J WB9OZZ W9WEI; ECs KB9DE-Marshall Co., N9DER-Washington Co., WA9JWL-Madison Co., WD9GCM-Warrick Co., K9BLK-Clay Co. We have added four new section-level appointments this month: Section Contest Coordinator, W9OBF; Section Affiliated Club Coordinator, K9TUS; Section Repeater Coordinator, N9WB; Section State Government Liaison Coordinator, WA9BVS. There are still five section-level appointments that I wish to fill: Technical Coordinator, Public Information Coordinator, Bulletin Coordinator, DX Coordinator, and Hamfest Information and Activities Coordinator. Anyone interested in volunteering yourself or someone else let me know. I enjoyed the Bloomington and Marion hamfests this month. We had a very well attended forum at Marion. The IRCC gave out Field Day awards, and the Fort Wayne RC took home some very nice trophies. They take Field Day seriously and it pays off for them. W9OBF will be in charge of IRCC Field Day awards next year. Hopefully many clubs will try to compete. W9IOH says he is feeling better and is planning to winter in Florida. I spoke to the Clark Co. Club this month. It is great to see such an active & enthusiastic club. Hats off to those clubs conducting Novice classes this fall. Remember to tell your new Novices about the ICN 3708 6:15 EST now, and when the time changes, 7:15. Traffic: W9JUJ 975, W9FC 363, KJ9J 182, WB9UYU 176, W9URQ 143, W9QLW 126, KM9B 114, W9EI 108, K9FZX 94, KB9HH 79, W9QYY 79, W9PMT 54, WA9OCF 52, KA9DHL 50, KB9NR 44, KK9N 43, W9UMH 42, WB9AWI 40, K9WWJ 36, W9UEM 35, WB9ZQE 32, WD9JAA 27, WB9MIK 24, KK9D 22, K9ET 22, N9AEI 21, K9DIY 17, KA9FFO 17, W9JZV 16, WA9OKK 15, W9RTH 14, K9OUP 13, N9AST 11, K9DCX 11, WA9OHX 11, N9CQS 10, W9WEI 10, N9BLK 9, K9FVN 9, W9BDP 6, W9DKP 6, WD9CIV 5, WA9JNC 4, W9ATG 3, W9ENU 2, W9UPI 2, WB9AJY 1, W9KMY 1.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1115Z QNI 1077, QTC

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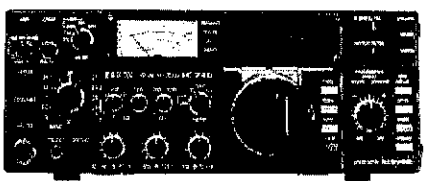
IC-720A 9-band Xcvr (Reg. $1349).. **SALE $1149.00**
FL-32 500Hz CW filter 59.50
FL-34 5.2 KHz AM filter..... 49.50

IC-730 8-band Xcvr (Reg. $829)..... **SALE $649.95**
FL-30 SSB filter (passband tuning) 59.50
EX-195 Marker unit 39.00
EX-202 LDA interface; 730/2KL/AH-1..... 27.50
EX-203 150 Hz CW audio filter..... 39.00
EX-205 Transverter switching unit..... 29.00



IC-740 9-band Xcvr (Reg. $1099)..... **SALE $979.95**
EX-238 Internal power supply..... TBA
EX-241 Marker unit..... TBA
EX-242 FM unit..... TBA
EX-243 Electronic keyer unit..... TBA
EX-54 9 MHz 500 Hz filter ..... TBA
EX-52 455 KHz 500 Hz CW filter..... TBA
EX-53 455 KHz 250 Hz CW filter..... TBA

Accessories common to IC-720/730/740

PS-15 Power supply (Reg. $149)..... **SALE $134.95**
CF-1 Cooling fan for PS-15 ..... 45.00
EX-144 Adaptor for CF-1 on PS-15..... 6.50
PS-20 20A power supply (Reg. $229).. **SALE 199.95**
CF-1 Cooling fan for PS-20..... 45.00
Adaptor cable; PS-20 to 720/730/740..... 10.00
FL-44 SSB filter; 730/740 (Reg. $159) **SALE 144.95**
FL-45 500 Hz CW filter; 730/740 ..... 59.50
SM-5 Electret desk microphone 39.00
HM-10 Scanning mobile mic; 730/740..... 39.50
SP-3 Base station speaker..... 49.50
MB-5 Mobile mount; 720A/730..... 19.50
Phone patch; specify radio (Reg. $139) **SALE 129.95**
AH-1 Mobile ant./tuner (Reg. $289).... **SALE 259.95**
AT-100 100w auto. tuner (Reg. $349).. **SALE 314.95**
AT-500 500w auto. tuner (Reg. $449).. **SALE 399.95**
IC-2KL Solid-state linear (Reg. $1795) **SALE $1395.00**
IC-R70 Gen. cov. receiver (Reg. $795) **SALE $699.95**

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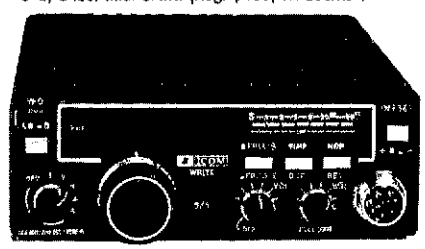
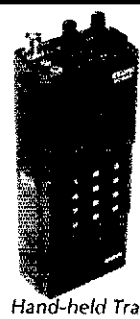
IC-251A 2m All-mode Xcvr. 144.8-148.1999 MHz. 10w, digital, memories, scan, 2 VFOs 13.8vdc/117vac. 4½"h × 9¼"w × 10½"d, 11 lbs (Reg. $749)... **SALE $599.95**
IC-451A UHF All Mode Transceiver for OSCAR mode B or J & simplex. Models for 430-440 or 440-450 MHz. Similar to IC-251A (Regular $899)..... **SALE $769.95**
IC-AG1 UHF Preamp. (Reg. $89)..... **SALE 79.95**
IC-551D 6m SSB/CW/FM* transceiver, 50-53.999 MHz, 80 watts. (Reg. $699)..... **SALE $599.95**
EX-106* FM adaptor (Reg. $125)..... **SALE 112.95**
PS-20 AC power supply (Reg. $229) ... **SALE 199.95**
CF-1 Cooling fan; PS-20..... 45.00
IC-290A 2m All Mode mobile xcvr. 143.8-148.199 MHz, 1/10w, 5 memories, 2 VFOs, T/T mic. 6¾"w × 2½"h × 8⅜"d. (Reg. $549)..... **Closeout $399.95**
IC-290H 25w 2m All Mode (Reg. $549) **SALE 489.95**
IC-490A UHF All Mode mobile xcvr. 430-439.995 MHz, 10w, memories, two VFOs, scanning microphone. 2½"h × 6⅜"w × 8⅜"d (Reg. $649).... **SALE $579.95**
IC-560 6m SSB/FM/CW mobile xcvr. 10w, digital, memories, scan, two VFOs 13.8vdc/3.5A. 2½"h × 7¼"w × 9"d, 6 lbs. Mic. & mt. (Reg. $489) ... **SALE $439.95**



IC-25A Compact 2m FM mobile xcvr. 25w, 5 memories, scan, priority, 2 VFOs, T/T microphone. 2"h × 5½"w × 7"d, 3¼ lbs. (Reg. $349)..... **SALE $309.95**
IC-45A 440-450 mob. xcvr (Reg $399) **SALE $359.95**
IC-22U 800ch. mobile. 144-147.995 MHz; 1 or 10 watts, thumbwheel frequency selection. 6⅛"w × 2⅛"h × 8½"d, 3½ lbs. (Reg. $299)..... **SALE $249.95**
EX-199 Remote frequency selector 35.00

VHF/UHF Portables:

IC-202S 2m SSB Transceiver. 3w PEP output. Uses "C" cells, optional Nicad pack/charger or AC supply/spkr. With mic., ant. & strap (Reg. $279)..... **SALE $249.95**
IC-20L 2m, 10w ampl. (Reg. $98)... **SALE 89.95**
IC-402 432 Mhz portable SSB Transceiver. Features same as IC-202S above (Reg. $389).... **SALE 349.95**
IC-30L 10w, 432 amp. (Reg. $105).... **SALE 94.95**
BC-20 Nicads & DC-DC chgr for 202S/402..... 57.50
IC-505 6m SSB port. (Reg. $449)..... **SALE 399.95**
EX-248FM module 49.95
BP-10 Internal nicad battery pack 79.50
BC-15 AC charger..... 12.50
SP4 Remote speaker for portables..... 24.95



SAVE $30

IC-2AT Synthesized 2m FM Hand-held with T/T pad. 800 ch. in 5 KHz steps, 144-147.995, selected by thumb wheels & +5 KHz upshift switch; ± 600 KHz offsets. .15 or 1.5w output with supplied nicad pack. Optional packs for larger capacity or higher power. Supplied with 250 ma. nicad pack (BP-3), wall charger, flex antenna, belt clip, strap, earphone and plugs. 6.6"h × 2.6"w × 1.4"d, 1 lb.

Hand-held Transceivers	Regular	SALE
IC-2AT HT w/TTP, nicad & chgr	$269.50	$239.50
IC-2A 2m HT w/nicad & wall chgr	239.50	214.50
IC-3AT 220 HT/TTP, nicad & chgr	299.95	239.95
IC-3A 220 HT/nicad & charger.....	269.00	229.95
IC-4AT 440 HT/TTP, nicad & chgr	299.00	239.95
IC-4A 440 HT/nicad & charger.....	269.00	229.95

Hand-held accessories	Regular
BC-25U Extra wall charger.....	$12.50
BC-30 Drop-in charger for BP-2, 3 & 5	69.00
BP-2* 450 ma, 7.2v nicad pk, 1w output.....	39.50
BP-3 Extra 250 ma nicad pk, 1.5w output.....	29.50
BP-4 Alkaline battery case	12.50
BP-5* 450 ma, 10.8v nicad pk, 2.3w output	49.50
*BC-30 required to charge BP-2 & BP-5	
CP-1 Cig lighter plug & cord; BP-3	9.50
DC-1 DC operation module.....	17.50
FA-2 Flexible antenna for 2A, 2AT (BNC).....	10.00
HM-9 Speaker/microphone	34.50
LC-2A Leather case w/o TTP cut-out.....	34.95
LC-2AT Leather case w/TTP cut-out.....	34.95
ML-1 2m mobile linear (Reg $89)	SALE 79.95
3A-TTN 16-button TTP front; 2A/3A/4A.....	39.50
Commspec SS-32M 32-tone encoder.....	29.95
IC-M12 12ch. Marine Hand-held....	Special $229.95

Other ICOM accessories:

24PP 24-pin accessory plug.....	$ 4.00
BC-10A Mem. back-up; 25A/720A/730/740.....	9.50
BU-1 Memory back-up; 25A/490A.....	38.75
EX-2 Relay box w/marker; 720A/730.....	34.00
HM-3 Deluxe mobile mic, specify radio.....	17.50
HM-5 Noise canx mobile mic, 4 pin	34.50
HM-7 Amplified mobile mic, 8-pin	29.00
HM-8 Touch-tone mic, 8-pin.....	49.50
HM-10 Scanning microphone	39.50
HP-1 Headphones.....	34.50
SM-5 8-pin electret desk mic.....	39.00

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1181 WB9YPY, BEN 3985 1700Z QNI 602, QTC 156 WB9ESM, WSBN 3985 2200Z QNI 1031, QTC 322 WD9ESZ, WNN 3723 2300Z QNI 184, QTC 24 KA9HPO, WSSN 3645 2330Z QNI 129, QTC 35 N9BYK, WIN-E 3662 0000Z QNI 314, QTC 117 W9YCV, WIN-L 3662 0300Z QNI 353, QTC 102 K9LGU, XPO 3925 1731Z QNI 187, QTC 7 WA9YVC, NWTN 3494 2330Z QNI 512, QTC 46 WB9YPY, Gr. Bay .72/.12 0145 Wed. QNI 6 QTC 0 WB9NRK, WCWTN 3191 2330Z QNI 433, QTC 39 N9AUG. KA9KUA & KA9KTX received ARRL Contest Achievement Award for more than 200 contacts in the 1982 Novice Roundup, Congrats. KA9NAT has ARRL Rag Chewers certificate. WB9SYH received top honors at Robinson Park Art Fair during Wisconsin Rapids Days. KA9OEO is a new Novice in Wisconsin Rapids area and is visually handicapped. Congrats. Sorry to report W9PFH is a Silent Key. New Novices Rhinelander area KA9NZJ & KA9NIZ. New Novice in Madison, KA9NUZ. BPL to KA9CPA. Sorry to report WB9ESM in the hospital. Hurry & get out of there. We miss you. Very glad to see the liaison stations going to D9RN and CAND. It's really appreciated, fellows. To those hams in Madison area that have been hospitalized and are home, take care. Traffic: KA9CPA 2200, WD9ESZ 358, WB9YPY 208, KC9KQ 206, W9YCV 203, KC9KQ 183, K9GDF 167, K9FHI 158, W9IEM 113, N9DIH 110, WA9WYS 108, K9AKG 98, KC9CJ 86, W9UCI 74, WD9FRI 72, N9BYK 68, WB9NRK 60, KA9HPO 59, KA9IKR 57, W9LDO 57, W9DND 55, W9IHW 54, AG9G 50, N9ATP 48, W9CBE 47, K9JPS 47, KA9BHL 45, WA9ZTY 43, N9AUG 42, W9FDY 40, WB9ICH 38, K9HDF 37, W9SO 34, KB9NG 33, WB9JGA 32, KC9GW 31, WB9PKL 28, N9DCF 27, WA9YVC 26, N9BCX 24, WB9JSW 24, KG9B 23, WB9WNA 23, KB9GO 21, KA9GYD 20, WA9DXW 19, WD9BKT 18, K9UTQ 17, WA9GYF 16, KB9FM 15, W9SOJ 15, WD9IMZ 14, W9UW 13, N9BDL 9, KA9IHR 9, WB9TOC 9, KA9BHK 7, KA9OBP 4. (Aug.) KC9KQ 183, N9BCX 33, WB9PKL 24.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes WBØHOX — STM: ADØS. SEC: KNØJ. ASCM: KCØT. Congrats to KAØNRU & KAØKOU on General and to NØDUQ & WBØDJQ on Advanced tickets. Our prayers to the families of WAØYVT & WØRIL who became Silent Keys, as did the XYL of WØTYX. A BIG THANKS to WBØBIN and crew who outdid themselves sponsoring the Dakota Division Convention this month. It was good to see old & new friends with a fine facility. Don't ask me about the hospitality room. Congrats to WØMFW and KØGA who received 50-year ARRL pins. FB. W4KFC was main speaker and made a fine impression out here. THANKS W4KFC. Rumor has it Mpls Radio Club FD beat the St. Paul Club, something about a "no-show," but it is only rumor? The SET is being organized by KNØJ. Hope ALL help. ADØS received the first "ELMER" Award presented by AFØT and the Paul Bunyan Wireless Assn. TNX VRY MUCH. At this time think SPRING is only a winter away. What is your club doing? Pse let me know.

Net	NM	Freq	Time	QNI	QTC
PICO	WØHZU	3925	9:00 A.M.	2373	284
MSPN/e	KCØT	3929	5:30 P.M.	1157	195
MNWX	WAØONE	3929	6:15 P.M.	586	396
MSPN/n	KAØJUX	3945	12:10 P.M.	573	42
MSN/1	WØDM	3685	6:30 P.M.	382	220
MSN/2	KØJCF	3685	10:00 P.M.	195	74
MSSN	WBØWXU	3710	7:00 P.M.	80	9

Traffic: KBØMB 639, WAØTFC 328, WØGRW 240, WØHZU 223, KTØU 184, WBØHOX 179, KAØEPY 175, WØDM 162, KAØIAQ 135, KAØJUX 115, WAØONE 99, NØCLS 98, ADØS 88, WDØCGM 81, KAØARP 77, WØMFW 72, WØDFX 59, KTØR 52, KØJCF 51, KCØT 42, KØCSE 32, WAØAIN 29, KNØJ 16, WDØBGS 15, NØDFR 14, NØDUQ 14, NØJP 14, WØOPX 14, WBØWXU 14, KAØJQO 10, WØRIQ 8, WBØDJQ 4.

NORTH DAKOTA: SCM, Dean R. Summers, KQØC — Tnx for ur support, 73 to outgoing SCM WAØRWM. Nice convention in Moorhead, tnx to RRRA. Need ORS, OES, OBS, OO, NMs, NCSs, ECs. If interested or need descrip. write me (page 8). Send me newsletters!!! Is ur QSL envelope on file at ARRL Ø — Dist. Bureau? S.a.s.e. to Box 291, Omaha, Ne. 68101 for info. Upgrades: Ext-KCØUP KAØLPX NØDYX; Adv.-WDØGRC KAØKZX KAØKZV NØDDS; Gen-KAØLAB KAØNUD; Tech-KAØOKW KAØNUI; Nov-KAØONX. Winner of Whatt Trophy WDØGMD. Moves: To Williston, KN9S WBØGFZ. Net ttc: G.R. 98 QNI, 2 QTC; DATA 197 QNI, 9 QTC, KAØFSM 36.

DATA	3.9965	2330Z Dy
Goose River	1.990	1400Z Sn
N.D. YL WX	3.9965	1330Z Dy
NDSN	7.145	2300Z Sn

Traffic: KAØFSM 72.

SOUTH DAKOTA: SCM, Fredric Stephan, KCØOO — Distinguished Division Convention. We met and organized with ND & Minn. SCMs, STMs and SECs. Vhf contesters WØPUF AAØF NØCDY made another valiant effort. BHARC annual meet and picnic reelected WBØPWA WØXH KØCX and WDØBJO. WBØYQT and KØTVJ apptd. mgrs. of SD WØNEO Phone Net. WØKJZ apptd. mgr. SD Emer cw and phone nets. WAØTNM apptd. mgr. SD cw net. WØZWL apptd. mgr. SD Wx net. Congrats and our many thanks for their efforts. NTS region cw and phone liaison were from WØKJZ KØFRE WAØTNM WAØAOY and WBØKWX. Please volunteer as liaison from your net to NTS DTRN and TEN. SD Cw net 51 QTC, 89 QNI; SD Emer Net 5 QTC, 86 QNI; SD Mng Net 66 QTC, 820 QNI; SD WØNEO net 30 QTC, 1080 QNI; SD WØNJQ Net 21 QTC, 524 QNI. PSHR: WØKJZ KCØOO. Traffic: KØAIE 106, KØFRE 89, WØHOJ 76, WØDVB 60, WAØVRE 58, WAØUEN 57, WØKJZ 43, KCØOO 40, WBØOMF 30, WØMZI 27.

DELTA DIVISION

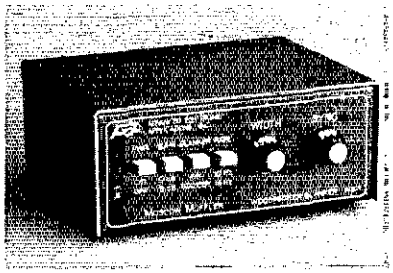
ARKANSAS: SCM, Dale Temple, W5RXU — SEC: WB5IGF. Just at press time I learned of the death of a dear ham friend, WA5DTP, of Fayetteville. Those of you who have worked the 146.16/76 rptr will recognize his call as the rptr's call. He is survived by his wife, WB5BQO, and two children. OZK net manager W5MYZ reports 123 checkins, 22 traffic. Razorback Net manager KC5CE reports 776 checkins, 51 traffic. Mockingbird Net manager WA5ZWZ reports 647 checkins, 13 traffic. Ark. represented 100 % on RN5 by AE5I, WB5GQH W4AZJ, W9YCE W5AHZ W5TUM W5YCN. W5KL visited the World's Fair ham station and QCWA National Convention. Jasper rptr 146.025/625. Traffic: W5TUM 64, WB5GQH 18, W5KL 16, W4AZJ 11.

LOUISIANA: SCM, John Meyer, N5JM — ASCM: KC5SF. STM: W5GHP. SEC: AC5R. It's been a busy year since becoming your SCM last January. The job involves more than eating hot dogs at hamfests; it's a people-oriented ARRL service designed to help hams everywhere enjoy their hobby to the fullest. Call on any of the folks listed

Don't Be Left Out in the Cold with the Russian Woodpecker

GET A MOSCOW MUFFLER™

Another first from AEA. The Woodpecker Blanker, WB-1 really works. This unit effectively blanks the pulsing interference of the Russian Woodpecker. Two versions are available, the WB-1 for use with communication receivers and WB-1C for use with all popular transceivers.



This extremely useful accessory is designed for direct insertion between your receiver (or transceiver) and the antenna. It is both MORE EFFECTIVE than I.F. type blankers and requires NO MODIFICATIONS to your receiver! The unit operates from a 13 VDC ± 2 VDC power source at less than 575 mA. (AEA AC wall unit AC-1 will operate the blanker.)

The blanker works well on both CW and SSB modes that are being interfered with by a woodpecker. Controls on the front panel include: four push button switches, a synchronize control and a width control The WB-1 also features a low-noise untuned broadbanded 6 db gain pre-amp which can be selected with or without the blanker enabled. The WB-1C uses the same circuitry but includes a carrier operated relay (COR). This provides protection to the receiver section during transmissions from the attached transceiver.

For more details, write for our latest catalog or visit your favorite dealer.

Prices and Specifications subject to change without notice or obligation.

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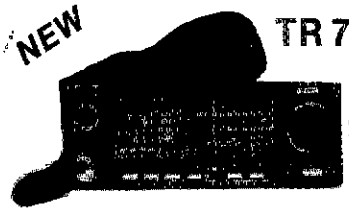

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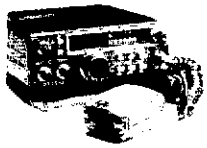
Large LCD Display, 45 watt output, Lithium memory backup, memory and band scan, 21 multi function memory channels, automatic offset, and priority channel.

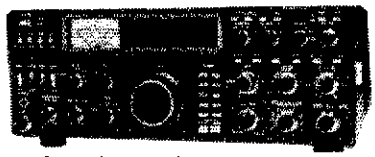
TR7730



Call for Your Price

An incredibly compact 25W 2m FM mobile transceiver with 5 memories. Memory scan and band scan, with encoding microphone.

KENWOOD TS 930S



Superior dynamic range, auto antenna tuner, QSK, Dual NB, 2 VFO's, general coverage. Top of the line.

TS 830S

An outstanding performer.
Full range of accessories in stock.

TR-2500

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SMC25	Speaker Mic. . .	34.95
TU-1	Sub Audible. . .	34.95

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Maximum attainable gain for a twin 5/8 wavelength antenna with greater than 9 MHz bandwidth. Pattern independent of mounting or feed line length. Easy to assemble. Mounts on standard TV Mast. (Not supplied)

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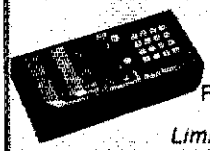

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3 - 5/8 wave sections
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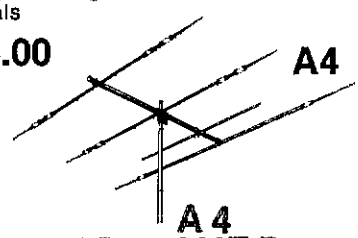
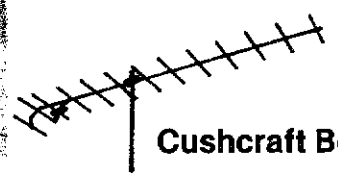


A4

A 4 Tri Band HF Beam
$229.00



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W7QG Gary

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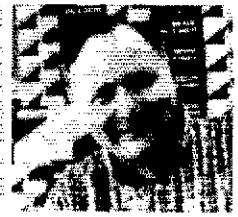

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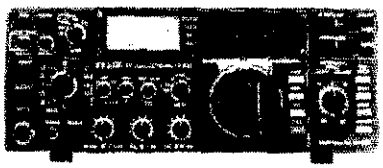

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The Affordable Mobile Transceiver

Call for your price. Reg. $829.

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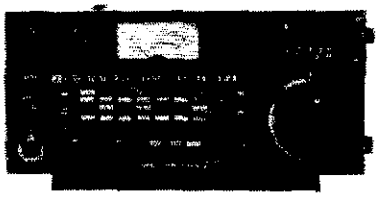

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IC-25A

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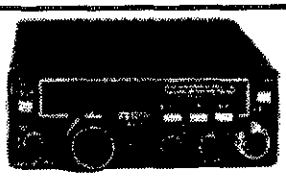

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NEW R-70 Communication Receiver

General coverage reception at it's best. Fully synthesized, Commerical grade Communications Receiver, High grade filters, passband tuning, notch filter.

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BP-3 250ma 8.4V Batt.	29.50
BP-4 Alkaline Batt. Case	12.50
BP-5 425ma 10.8V Batt.	49.50
HM-9 Speaker Mic	34.50
CP-1 Cig. lighter cord	9.50
DC-1 DC op Pack	17.50
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above for help and info or for a club visit. An experienced emergency and tfc man is taking over the long vacant SEC position. AC5R, Lake Charles, former EC and DEC, is now in the process of revamping the state's emergency comm. system. Volunteer now; it will pay dividends later! LA is known for severe wx, and both BRARC and the Lake Charles gang turned out to handle comms. during recent emergencies. On the club front: Welcome to the United RAC of Mansfield, KC5XR. Pres. on becoming affiliated with the League. W5OVV has added the Catholic High ARC and the BR chapter of the QCWA to the LCARC roster. Season's Greetings to all and may 1983 be a great yr.

Net	Freq. (kHz)	Time	Mgr.
LAN	3610	7 & 10 P.M. Dy	KC5SF
LTN	3910	6:30 P.M. Dy	N5ANH
LSN	3703	7:30 P.M. M-F	WD5CWK
LRN	3587.5	6:30 P.M. Sn	W5GHP

Traffic: K5TL 273, W5LQ 221, W5GHP 164, KA5HDT 140, KC5SF 131, W5VMY 101, WB5LBR 60, AC5R 31, N5ANH 26, WD5CWK 26, K5WOD 25, KD5MA 10.

MISSISSIPPI: SCM, Paul Kemp, KW5T — SEC: N5DDV. STM: KB5W. Three fine events this month: JARC picnic, MSBN picnic and the Biloxi Hamfest. All three were great successes and tnx to all that made them possible. New appts: DEC — K5GVG WB5YKR; EC — W4MLF W5TXK KB9TN. Still looking for people interested in working with the new section structure which will be put in effect Jan. 1. If you are interested, contact KW5T on the MSBN or by mail. Now is the chance to make your contribution to help strengthen the MS section. CAND (W5KLV) sess. 30, QTC 791. DRN5 (WB5YDD) sess. 30, QTC 461. MTN (K5OAF) sess. 30, QNI 198, QTC 83. MTN/L sess. 22, QNI 49, QTC 32. MSBN (N5DSK) sess. 30, QNI 2172, QTC 67. MN (WB5RMW) sess. 30, QNI 533, QTC 18. MSN (N5ERX) sess. 22, QNI 106, QTC 19. CAEN (KA5AGD) sess. 4, QNI 113, QTC 1. GSEN (KB5W) sess. 21, QNI 448, QTC 19. RACES (WB5RMW) sess. 5, QNI 103, QTC 0. Traffic: N5AMK 361, KB5W 263, K5OAF 148, N5RN 103, KT5Z 83, W5WZ 47, W5LSG 43, KD5P 40, N5EZQ 26.

TENNESSEE: SCM, John C. Brown, NO4Q — STM: K4YOL. SEC: K4TKQ. We are well into the winter months now. I know that there's many times that it's very difficult to hear that rare DX or net control station because of the interference caused by operations of nearby stations. Sometimes we get a bit edgy and run down and let them know by proper identification or sometimes we just get impatient and think they should hear the operation in progress. Exhibit a bit of courtesy and let them know, but only if it is essential to the operation, but, not then unless the NCS asks YOU to go and request them to move. Of course, we have those operators that JUST don't like "nets" (a term very loosely used at times). Don't get yourself caught QRMing an operation in progress. Deliberate QRM can be cause to have your ticket revoked or suspended. I know that there are some out there with the mistaken impression that they won't be caught when they participate in that type of operation. Remember, under the new law your fellow ham will be involved in getting you off the air. I indicated that at least some of the new staff under the SECTION MANAGER concept would be named in this report. I am happy to announce that Max Arnold, W4WHN, will be heading up the State Government Liaison position, and O. D. Keaton, WA4GLS, will be Affiliated Club Coordinator with TN Council. No change in STM and SEC. Net traffic — LF sess. 105, QNI 4058, QTC 202, VHF sess. 73, QNI 2144, QTC 554; CW sess. 57, QNI 464, QTC 248; RTTY sess. 31, QNI 81, QTC 18. Come on you computer etc. operators — check in with some traffic on the RTTY net on 3625 at 2330 daily. W4WXH is getting kinda lonesome. Help him out or better overload him. Traffic: NG4J 634, W4ZJY 305, W4WXH 211, W4DDK 140, W4OGG 103, WB4TDB 58, K4VM 55, KA4BSG 47, K4WOP 40, N4EFB 27, N4EAM 26, W4MRD 23, W4RUW 22, KE4OL 19, W4PFP 19, K4YOL 19, NM4W 17, N5AX 16, WA4UCE 14, KI4V 14, W4TYV 11, WD4SIG 9, W4PSN 8, K4UMW 8, W4EWR 5, KA4USF 4, KE4EO 3.

GREAT LAKES DIVISION

KENTUCKY: SCM, Dave Vest, KZ4G — STM: KA4GFU. (NTS Nets)

Net	Freq.	Time/Day	QNI	Tfc	Sess.	Mgr.
KRN	3960	0630 M-F	512	24	21	WA4IUW
MKPN	3960	0830 Dy	947	49	30	KA4SAA
KTN	3960	1900 Dy	1026	100	30	WD4BSC
KNTN	3727	1900 Dy	363	79	38	KB4OZ
KYN	3800	2000 Dy	243	116	30	WD4IYI
KSN	3600	2230 Dy	246	97	30	KC4WN

14 public service nets reported QNI 1853 with QTC of 210. D9RN 100%, PSHR: KA4GFU KA4SAA KB4OZ WA4YPQ KA4MTX KD4TY KA4BCM WD4BSC WA4JTE. New appt: NMs KA4SAA-MKPN; WD4IYI-KYN. Upgrades: N4HIB WA4FLG KB4AJZ WB4PSP KA4WUX KB4AEY WD4DUL. New time for KSN is 2230. If you have not been reporting regularly please check with SCM to see if your appointment is still current. McLean Co. has one ham for every 1000 population. Merry Christmas and best wishes for the new year. Traffic: KA4MZY 133, KA4SAA 123, WD4IYI 120, WA4JTE 103, KA4GFU 94, KB4OZ 72, WD4BSC 70, K4MHL 64, KA4BCM 56, W4WOV 51, WB4APC 35, WB4PSP 34, WB4NHO 30, KD4SN 29, KC4WN 27, KZ4G 25, WA4YPQ 25, KA4GBZ 18, KD4TY 17, WA4AVV 16, K4AXE 16, NZ4L 15, WA4CJQ 14, KA4SKV 14, K4HOE 13, KA4MTX 13, WA4SWF 13, W4PKX 12, WD4COF 11, NN4H 10, WA4JAV 9, WA4AGH 8, WA4GAL 6, WB4AUN 5, NW4P 5, WA4AGH 2, K4AVX 2.

MICHIGAN: SCM, James R. Seeley, WB8MTD — ASCM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. DECs: K8BTH N8CUH WD8IXZ WD8MBB W8VWY. NMs: WA8DHB N8DSW K8LNE K8KMQ K8KQJ W8QHB W8SCW KV8U W8YIQ K8ZJU.

Net	Freq.	Time/Day	QNI	Tfc.	Sess.	Mgr.
MITN*	3953	1900 Dy	689	321	30	K8KQJ
QMN*	3663	1800 Dy**	878	249	60	KV8U
GLETN	3932	2100 Dy	1168	154	30	WD8IBY
MNN*	3722	1730 Dy**	383	125	60	N8DSW
MACS*	3953	1100 Dy*	490	91	30	K8LNE
UPN*	3922	1700 Dy	521	84	34	WA8DHB
WSSBN	3935	1900 Dy	463	32	30	WB8SUR
TASYL	3922	1900 M	-	-	-	KM8E
BR	3930	1730 M/S	-	-	-	WB8ZGP
MEN	3930	0900 Sn	-	-	-	WB8ZGP

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn 1300, Vhf nets, 9 rpts, QNI 459, tfc 30, sess. 37, mgr WD8RHU. 3932 is MI emer. freq. ARES net Sn, 3932, 1730. Traffic Workshop Sn, 3953, 1600. Silent Keys, with deep regret: W8DCQ WA8ZCR. Many thanks to WA8PIM, retiring after two years as QMN

general manager. KV8U (ex-WD8RNQ) moves up from QMN slow net air boss to the G.M. job, and W8QHB takes the slow net post. New officers for Motor City RC: W8ARH, pres.; WD8CKC, v.p.; KA8LTV, secy.; KB8NV, treas. The Repeater Council elected a complete new slate of leaders at the Sept. meeting: WD8RJS, chairman; WD8JOC, vice-chairman/freq. coordinator; KA8BFF, Secy/Treas. In four years time the MI Area Repeater Council has come to be one of the most highly respected organizations of its kind. Its work goes on quietly, behind the scenes, with praises largely unsung. WB8UPM said it at the meeting, "We've come from the black art stage to technically sound computerized validity." It is true, and today the hassles we do have among repeaters are caused mostly by renegades who avoid or ignore or defy the coordination process. These numbers too are dwindling." I have issued a Certificate of Merit to W8QOI, retiring this year from the frequency coordinator job. It was primarily through his efforts that the present highly efficient and effective computer system was conceived, nurtured and perfected. Not to ignore the efforts of WB8UPM, who rescued the program from near-oblivion four-plus years ago, or the support and hard work from WB8VWK W8LSS and others, or the contributions of the members themselves, but W8QOI's efforts were simply outstanding, and well beyond any demands expected of a volunteer leader. OO reports: WB8IKJ K8NKB AC8Y. Traffic: AF8V 368, KA8CPS 384, WB8WKQ 322, K8KQJ 238, WD8LRT 214, WB8MTD 138, K8KMQ 125, N8DSW 116, WD8MJB 102, WA8DHB 93, WD8RHU 93, WB8YDZ 86, K8GXV 74, KA8NCR 74, KE8X 66, WD8EIB 56, W8IHX 56, KV8U 50, N8BNC 45, K8LNE 45, N8DTZ 41, W8QHB 38, W8YIQ 34, W8VIZ 31, WB8SYA 27, KA9JFM 23, K8OCP 23, K8ZJU 22, W8YY 20, KI8Q 18, W8JXJ 17, WB8YRY 16, KU8H 13, K8UPE 13, KA8AEE 12, KS8P 12, KT8G 11, KF8M 11, WB8POL 11, W8RNQ 11, N8BBY 10, WA8EFK 10, W8LDS 10, WB8DJS 9, K8BGT 9, WB8ITT 8, W8VWY 8, WA8PIM 7, WB8HSN 6, W8TBP 6, W8BEZ 5, WB8SIW 5, WD8IXZ 4, K8DD 3.

OHIO: SCM, Allan L. Severson, AB8P — ASCM: W8MOK. SEC: K8AN. STM: K8OZ. NMs: WA8BUW WA8DYX W8EK WA8GMT KF8J WD8KFN WB8YTD.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	389	233	0	6:45/10 P.M.	3.577
BNR	223	59	27	6:00 P.M.	3.605
ONN (Aug.)	117	19	21	6:30 P.M.	3.708
ONN (Sept.)	184	38	29	"	"
OSN	282	140	30	6:10 P.M.	3.577
OSSBN	2418	778	90	10:30 A.M, 4:15 & 6:45 P.M.	3.9725
OSSN	179	73	29	6:45 A.M.	3.577
O6MN	595	20	30	9:00 P.M.	50.160

Club officers, I'm sure you all realize we need more young folks in our ranks, but are you also stymied in your efforts to interest the local high schoolers in Amateur Radio? Ever thought we might be after the wrong age group? K8AN does. He has proof we should be trying to interest grade-school youths in what we have to offer. If you want more info, I'm certain he will send you a copy of his TSRAC BNT editorial. (Maybe to keep peace in his family, you should ask me and I'll send it.) All the prognosticators (including indigenous woolly bears) are predicting a tough winter here in the East (and Middle West), so check out all antennae and emergency power units to see if they can stand up to what may face them. If we lose gear, we can't say we weren't warned. Congrats to WA8CAE KC8KI and all the rest responsible for the Cleveland Hamfest and the proclamation issued by Cleveland's mayor announcing Amateur Radio Week, with attendant publicity and certificates. Remember, the new Section organization will be introduced in Ohio on Jan. 1, 1983. Please let me have your input, what you want from me, and this Section's appointees, both new and carry-over. Club elections: DARA: N8AM, pres.; N8BLB, v.p.; N8ALN, secy.; KG8Q, treas. Appointment: K8KVK, EC Athens Co.

Local Nets	QNI	QTC	Sess.
BARF	108	21	22
BRTN	309	153	30
Hamilton Co. ARPSC	75	—	4
Medina Co.	275	29	30
NCTW	32	49	18
NEON	162	37	29
RARA	74	1	4
TATN	358	95	30
TSRAC	1181	95	38
VWCEN	15	—	2

Traffic: K8NCV 510, WD8MIO 504, W8PMJ 420, K8OZ 396, WD8KFN 235, WB8MZZ 225, W8GGX 221, WA8GMT 205, N8BQK 176, AB8P 175, K8BYR 146, KF8J 134, N8EES 122, WB8KKI 107, N8AUH 105, N8DSU 105, WA8HGH 105, WD8KBW 104, N8CSL 98, WB8UBR 89, WB8JGW 88, KA8GJV 87, WB8DMF 82, KA8IUK 76, W8QZK 74, WB8YTD 64, K8YUW 63, K8AN 60, N8CWU 58, W8EK 58, KV8Q 55, WA8SSI 54, KA8IAF 51, K8JDI 48, K3RC 47, KA8DJZ 45, W8SKP 40, WA8QYJ 34, WD8IKC 32, WD8MLN 31, WD8RGS 30, WD8NEC 29, WD8AYI 28, KA8GGZ 27, WB8QHV 27, N8AEH 23, W8KKK 22, N8DMN 21, WA8DYX 21, KA8GMF 21, WB8AWM 20, WD8ODV 19, K8VOY 19, W8MOK 18, W8FUP 17, WB8SIQ 17, K8EF 16, N8JR 16, W8QEM 16, W8UQY 16, WD8AYH 15, KA8DGO 15, KA8KFW 15, WD8RZG 15, WA8TWM 15, WB8QXN 14, KB8VE 14, WB8KQJ 13, WA8ZID 13, KA8MEB 12, W8ZM 12, WB8VOA 11, N8CW 10, WD8DOS 10, WB8MRL 10, KB8YS 10, W8MGA 9, N8CGM 8, WD8JAJ 8, WB8NHV 8, KA8HVN 7, N8CJS 6, K8CKY 6, WD9HDZ 6, WB8KWD 6, W8QQL 6, W8RG 5, N8AJU 4, WD8EKI 4, WA8HED 4, KA8PHB 3, (Aug.) K8DIG 76, KA8CDE 68, N8JR 36, N8COU 22, KC8GN 21, W8FUP 19, WA8HED 15, KA8NXV 6, W8UQY 6, K8EF 4.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Paul S. Vydareny, WB2VUK — SEC: KB2KW. STM: WA2SPL.

Net	Time/Day (Z)	Freq.	NM
EPN	2300	3.902	WB2MCO
ESS	2300	3.590	W2WSS
NYS	0000/0300	3.677	N2APB
NYS/M	1500 M-S	7.077	WB2EAG
NYPON	2200	3.913	K2KQC
NYSPTEN	2300	3.925	KA2Q
NYS RATT	2330	3.625	W2ODC
CDN	2330	146.34/94	WB2ZCM
HVN	0030 SnMT	144.535/135	N2BDW
HVN	0030 W-S	146.37/97	N2BDW
SDN	0230	147.66/06	K2ZVI
SCRN	0100	147.735/135	KV2U

Club news: WA2SPL spoke about traffic at Oct. meeting of Albany ARA. AARA also held annual big auction in Nov. Saratoga Co. RACES has been busy with public service, parades, etc. Ulster RACES and Overlook Mt.

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We're AGL, North Texas' AUTHORIZED Dealer for more than 70 different product lines of Amateur Radio Equipment. Need antennas and towers? We got 'um—just call Bill (K5FUV) or Gordon (N5AU) for your special requirements. Mike (KG5F) can advise you on transceivers and accessories. Let Gary (KM5X) box it up and send it your way, while Bob (W5AH) stands ready to help with your service and warranty needs. We like to talk radio, DX, contests, or tell jokes...Gordon's busy learning some new Texas Tall Tales!

CUSHCRAFT

A3 3el triband beam	$174.00
A4 4el triband beam	$227.00
A743 7-10 mhz add-on kit	$62.00
A744 7-10 mhz add-on kit	$62.00
20-3CD 3el monobander	$172.00
20-4CD 4el monobander	$240.00
15-3CD 3el monobander	$96.00
15-4CD 4el monobander	$108.00
10-3CD 3el monobander	$76.00
10-4CD 4el monobander	$89.00
A32-19 19el 2m "Boomer"	$84.00
214B 14 elem. SSB "Jr. Boomer"	$69.00
214 FB FM "Jr. Boomer" 2m	$69.00
ARX2B 2m "Ringo Ranger II"	$35.00
ARX450B 450 mhx "Rng. Rngr."	$35.00
A-147-20T 20el 2m	$62.00

HY GAIN

V2S 2m gain vertical	$38.00
TH7DX 7 el tribander	$369.00
TH5MK2S 5el tribander	$312.00
TH3MK3S 3el tribander	$215.00
TH2MK3S 2el tribander	$135.00
TH3JRS 3el jr. tribander	$157.00
HQ-2S 2el quad	$265.00
402BAS 2el 40m	$195.00
205BAS 5el 20m	$295.00
204BAS 4el 20m	$226.00
203BAS 3el 20m	$132.00
155BAS 5el 15m	$176.00
153BAS 3el 15m	$74.00
105BAS 5el 10m	$115.00
103BAS 3el 10m	$55.00
DB1015AS 3el duobander	$150.00
648S 4el 6m	$52.00
668S 6el 6m	$99.00
18 HTS hy tower vertical	$339.00
18AVT/WBS 5 band vertical	$89.00
14AVQ 4 band vertical	$54.00
214 14el 2m	$32.00
2BDQ 2 band dipole	$49.00
5BDQ 5 band dipole	$98.00
BN86 balun	$17.00

Note: Part numbers with S on the end denote stainless steel hardware. Some small quantities remain of older stock; call for prices.

KLM

KT34XA 32 ft. boom tribander	$449.00
KT34A 16 ft. boom tribander	$309.00
7.2-1 40m dipole	$155.00
7.2-2 40m 2el beam	$289.00
7.2-3 40m 3el beam	$439.00
7.2-4A 40m 4el beam	$599.00
5el 20m "Big Sticker" mono	$429.00
6el 20m "Big Sticker" mono	$610.00
6el 15m "Big Sticker" mono	$389.00
6el 10m "Big Sticker" mono	$225.00
144-14B-13LB 2m "Long-Boomer"	$76.00
144-150-16C 2m circular	$95.00
432-16LB 432mhz "Long-Boomer"	$59.00
420-470-18C 450mhz circular	$57.00

KLM antennas may be shipped from California or Texas, Freight Collect. Most require truck shipment. Call for details.

HUSTLER

5BTV 5 band trap vertical $99.00

Mobile antenna resonators:

	std	super
10m	$10.00	$15.00
15m	$10.00	$15.00
20m	$12.00	$18.00
40m	$15.00	$21.00
75m	$17.00	$32.00
BM-1 bumper mount		$16.95
MO-1 fender mount mast		$22.36
MO-2 bumper		$22.36
CGT-144 2m colinear w/mount		$46.70

SANTEC

October Special $285.00

ST-144 µP

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CALL!!

The Newest in Competition Grade Radios.

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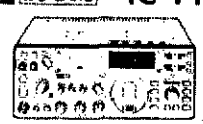
It's what the Competition is trying to Equal!

ICOM **IC-740**



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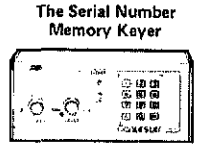
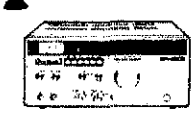
CK2



Other AEA Products Available

KWM-380



CALLING AND CAN'T GET THROUGH?

In their infinite wisdom, the phone people require that we have twice as many lines as people to answer them. Just be patient and try again later; we aren't going belly-up any time soon. Also, we can't keep someone down here to answer the phone at night or on weekends, and we're too busy to answer the WATS on Saturdays.

TEXAS FOLKS

Please note that we're open until noon on Saturdays just for you. Visitors are welcome, too. We're in Keystone Park Shopping Center, across from Texas Instruments. Look for us under our two towers.

TELREX ANTENNAS

WARNING: These antennas are not for the faint of heart. They are heavy. They are large. They are expensive. **They also work.** These antennas require truck delivery and come in large boxes.

	WT.	Area
10m523 5el 10m beam	64lb.	4.5
10m636 6el 10m beam	85lb.	6.0
15m532 5el 15m beam	95lb.	10.0
15m845 5el 15m beam	140lb.	14.0
20m436 4el 20m beam	108lb.	12.0
This is a custom antenna.		
20m536 5el 20m beam	113lb.	13.5
20m546 5el 20m beam	n/a	n/a
This is a custom antenna.		
20m646 6el 20m beam	176lb.	17.0
40m329 3el 40m beam	110lb.	12.6
40m346 3el 40m beam	177lb.	13.8
TB5EM 5el tribander beam	49lb.	7.0
TB6EM 6el tribander beam	85lb.	10.0

Call for pricing – F.O.B. Dallas.

ROHN TOWER

25G 10 ft. section	$40.50
45G 10 ft. section	$91.90
25AG4 top sec., req. bearing	$54.00
45AG4 top sec., req. bearing	$103.00
GA25G guy bracket with bars	$22.00
GA45G guy bracket with bars	$43.00
SB25G short base section	$19.00
SB45G short base section	$43.00
EP 2534-3 3 hole equalizer plate	$9.95

Self Supporting Towers

HBX56 56 ft. self support	$335.00
HDBX40 40 ft. self support	$249.00
HDBX48 48 ft. self support	$305.00

Our BX series towers include the base stubs. Beware those who charge extra for them. Also, freight collect from Dallas may save over freight pre-paid because of varying distances and routing. Drop ship or factory pick-up prices may be higher due to factory pricing policies. West Coast/Rocky Mountain prices may be 10% higher depending upon shipping point. Call for firm quote before ordering.

ROHN FOLD-OVER TOWERS

FK2548 48 ft. 25G foldover	$699.00
FK2568 68 ft. 25G foldover	$869.00
FK4544 44 ft. 45G foldover	$981.00
FK4564 64 ft. 45G foldover	$1170.00

Freight prepaid on foldover towers. Sales tax may be applicable in some areas. West Coast/Rocky Mountain prices 10% higher.

HY-GAIN CRANK-UP TOWER

HG-52 SS 52 ft. self support $874.00
HG-54-HD 54 foot self support $1414.00
HG-70 HD 70 foot self support. $2187.50
Above shipped from Lincoln, NE. Sales tax required in some areas, freight paid on shipments in 48 states. Call for details on these and other Hy-Gain items.

PHILYSTRAN GUY CABLE

This is RF transparent, sun resistant, guy cable. Avoid those hours of putting insulators into steel cable. Enjoy the advantages of freedom from unwanted resonances that can soak up your radiated RF energy.

HPTG 4000 4000 lb. test cable . $.44/ft.
HPTG 6700 6700 lb. test cable . $.60/ft.
9901LD potting head $4.99
9902LD potting head for 6700 lb. $5.49
Socketfast potting compound. $9.00/pt.

TOWER HARDWARE

3/16" EHS steel guywire	$.12/ft.
1/4" EHS steel guywire	$.15/ft.
3/16" ccm cable clamp	$.29 ea.
1/4" ccm cable clamp	$.39 ea.
3/8 x 6" TBE&E turnbuckle	$5.39
1/4" th thimble	$.24 ea.
3/16" preformed guy grip	$1.75
GAS604 screw anchor	$12.00
GAR604 concrete guy anchor	$12.00
M200H 2" x 10' steel mast	$37.00
500D guy insulator	$.85
502 large guy insulator	$1.80

Note: Some items too large for UPS shipment. Call before ordering to check shipment mode.

HY-GAIN PACKAGE #1

TH7DX ..... 7el Tribander
HG 52SS ..... Self Supporting Tower
Ham IV ..... Rotor
COA ..... Coax Arms (3 Furnished)
HG-10 ..... 10 ft. steel mast
HG-TBT ..... Thrust Bearing

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ARC provided communications for cancer bike-a-thon, with K2HA KC2IW W2FMY W2PCV W2XL WA2ONN and WA2RUW assisting. Westchester ECA was busy with Guiding Eyes for Blind walk-a-thon. To all those who assisted with communications for the NYC Marathon a heartfelt thanks! Job well done! Those who are interested in positions on the SM staff, contact me. BPL: WB2EAG WA2SPL. PSHR: WB2MCO K2ZM WB2EAG WA2SPL W2BIW K2ZVI AK2E WA2YBM N2CPX N2CSX. Traffic: WA2SPL 872, WB2EAG 526, WB2MCO 356, K2ZM 202, K2ZVI 113, AK2E 90, AG2X 76, WA2JBO 72, W2BIW 58, W2PKY 58, WB2OHR 46, WA2YBM 42, K2MI 25, N2CPX 22, W2YJR 19, N2CSX 18, WB2SON 18.

NEW YORK CITY-LONG ISLAND: SCM, John H. Smale, K2IZ — SEC: WA2KKJ. STM: K2GCE.

NLI CW*	3630	1900/2200	W2LWB
NLIPN*	3928	1815	KS2G
NLS*	3720	1930	WB2EUF
NCVHF	6.04/64	2100 MWTh	N2BZL
SCVHF	4.77/5.37	2030 M-F	WA2ARC
BAVHF	7.915/315	2030 M	N2BQD
LIMARC	6.25/85	2100 F	N2BZL
ESS	3590	1800	W2WSS
NYS	3677	1900/2200	N2APB
NYS	7077	1000 M-S	WB2EAG

* Denotes section net. All times are local. Please try and help out by checking in whenever you can. On behalf of myself, the XYL and the four jr. ops, I want to wish everyone Merry Christmas and the hope for a happy and healthy New Year. W2TCR upgraded to Extra after 25 years in ham radio. NLIPN welcomes WB2RVA. Congrats to WA2UWF and the 58 operators who made the 4th Annual American Heart Assn. cyclethon a success, to quote *Newsday* Oct 4, 1982, "One of the reasons for the success this year was that the event was organized more professionally. With 56 ham radio operators posted at rest stops and dangerous intersections along the route, accidents and mishaps were kept at a minimum." WA2PMW worked K8WW in Ohio on cw for his seventh state on 432 MHz. Welcome to new ORS W2AHV. KS2G is now publishing a NLI phone net bulletin. It's called *QNB*. If you would like to be included on the mailing list please contact KS2G. Grumman ARC and the Sperry Lake Success ARC had their 3rd annual picnic at Eisenhower Park. WB2DXD has started Novice classes at West Islip H.S. LIMARC holds a cw practice every Tues and Thurs at 2030 local on 146.25/85. LIMARC's fall flea market was a success, and for once the weatherman (or person) cooperated with beautiful weather. N2CRV reports a Sinclair computer net meets every Monday at 2030 local on 146.67 rptr. Net control is W2EWE, a Sinclair ZX81 (now Timex 1000) being a small computer. NLIPN certificates were awarded to W2AHV WA2ARC KR2B WB2EUF KA2FFC KS2G K2GCE AH2M W2MLC AH20 KV20 KA2OXK and W2TZO. KA1NH has resigned a DEC for Western Suffolk. I want to thank him for all the time and effort that he gave to the job. WA2KKJ has named KA2KJI as EC for Manhattan and KA2ABV as EC for Bronx. Traffic: W2AHV 172, N2AKZ 155, WB2TQC 103, W2GKZ 60, K2GCE 48, KA2NMA 37, W2TZO 36, WA2ARC 30, W2DBQ 29, K2IZ 28, KS2G 20, KR2B 10, WA2PMW 10, KV20 7, N2BQD 1.

NORTHERN NEW JERSEY: SCM, Curtis R. Williams, W5DTR/2. SEC: WB2VUF. STM: W2XD. NMs: W2CC AG2R N2BNB N2BOP KA2GSX KA2HNQ WB2IQJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJPN	3950	6 P.M. Dy 9 A.M. Sn	34	429	168
NJN/E	3695	7 P.M. Dy	30	391	175
NJN/L	3695	10 P.M. Dy	30	309	122
NJSN	3735	6:30 P.M.	30	206	107
OBTTN	72/12	6 P.M. Dy	30	535	98
TCETN	855/255	7:30 P.M. Dy	30	188	36
NJVN	49/49	10:30 P.M. Dy	29	312	110
NJRTTY	147.51	Autostart			

Congrats to KA2JMH KA2GGM (now KX2G) and WA2OVE (now KR2J) on upgrading to Extra, and to KA2KTR on upgrading to Advanced. Your local and state nets need your support. Can you spare a few minutes to be NCS or a liaison once a week? NJN welcomes back W2CQB. The Cherryville RA Novice class is off to a good start, with 19 enrolled. W2KB is watching for bills in the NJ legislature affecting hams. Sussex Co. ARC members supported a cross-country bicycle race, using their portable rptr built by K2YHY and N2WM. The Ramapo Mountain ARC did well in the September VHF QSO Party from the Bearfort Fire Tower site. Congrats to KA2NDZ on upgrading to General. The Ramapo Valley Emergency Network (RAVEN) has prepared a fact sheet outlining their role to be given to leaders of events asking for public service support. This is an excellent idea that should be adopted by other clubs. The Rutgers ARC and Middlesex Co. ARES supported their University Homecoming Parade. NJVN Aug. stats: QNI 314, QTC 112, QTR 676. PSHR: W5DTR AG2R KB2HM N2BOP W2XD N2XJ K2VX KA2GSX KA2JMH WB2QMP N2DPV. PSHR (Aug.): KA5DLV. Traffic: KB2HM 284, AG2R 206, K2VX 173, N2XJ 170, W2XD 131, WA2NPP 118, N2BOP 95, KA2JMH 91, WB2QMP 72, W5DTR 59, KA2LEB 56, W2RQ 54, KA2GSX 48, N2BNB 40, W2CC 26, W2ZEP 19, N2BC 14, N2DPV 11, KC2MM 7, W2KB 1. (Aug.) W2CQB 33, KA5DLV 21, KA2LEB 12, N2BC 5.

MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, K∅CY — SEC: WA4VWV. STM: K∅GP. NMs: WB∅AVW. W∅YLS WA∅AUX WD∅HND. Looks like a good SET this year. Be sure to send your paperwork into Hq. Would like to welcome two new clubs, Great River ARC from Dubuque and the Megahertz Manor Maniacs from Central Iowa (that's what happened to CIDXA). Novice classes at SooCy, DSM and Mason City. New officers for the EIDXA are KD∅O W∅IZ K∅LUZ. W∅SR is to continue as chmn of DX-AC. New OOs are N∅DYN WB9GTD KM∅Q. Old Threshers at Mt. Pleasant a great success again, visited by 172 hams from 16 states. KA9GBG/N and KA∅JQG made PSHR. KA∅OXQ on the air QRP/HW8. Congrats to KA∅OXX. Working on plans for RTTY net. Let me know the interest either vhf/hf. Iowa reps doing well on both DTEN and TEN, good support. Keep it up. For Novices on Sunday at 8 AM, the 3NNN net. Keep the reports coming. If you would like to participate with the new section organization let me know. Let's all originate some traffic for holidays.

Net	Freq.	UTC	Days	QTC	QNI	Sess.
TLCN	3560	0030-400	Dy	318	135	60
75M Phone	3970	1830-0000	M-S	1857	130	46
ITEN	3970	2230	Sn	34	2	3
PM Net	3989	2130	M-F	106	1	18

Traffic: WA∅AUX 246, W∅YLS 166, W∅SS 148, K∅GP 191,

KAØLUZ 80, KAØJQG 79, KAØADF 49, KØCY 31, WDØHND 31, KA9GBG/N 26, WBØFWB 23, WØBW 21, KQØI 20, KBØOZ 20, W4JL 19, WBØAVW 16, KØZQ 14, KCØSC 9, KAØNNQ 7, NØCWQ 6, WBØCPR 4. (Aug.) WBØJFF 82, KCØSC 13.

KANSAS: SCM, Robert M. Summers, KØBXF — SEC: WØKL. STM: WØOYH. NMs: KAØCUF WBØZEN NØBDG WAØLBB. Regretfully we pass the information on of the addition to SILENT KEYS KØGII of Wichita and WØMCH of Kansas City. News of a new rptr KAØE/R, on the air. Freq. 222.94/222.54.

Net	Sess.	QNI	QTC	Mgr.
KSBN	30	1188	175	KAØCUF
KPN	21	435	57	KAØCUF
KWN	30	814	522	WAØLBB
QSTN	30	1563	84	WAØOMB
QKS	60	292	84	WBØZEN
QKS-SS	13	45	2	NØBDG

ARES registration is holding 914 total, still looking for an additional 86 plus by the end of the year. WØKL reports 46 drills were held this month throughout the state. CKRC group at Salina had a busy month of activities. KØFPC and other operators showed Amateur Radio to the Girl Scouts at the camp. Other operators WBØGCL KBØBH WBØOQB KØFPC WAØJFC KBØEY WDØCFZ and ABØR provided communications for the 'Bike-a-thon for Diabetes. A tower raising for WØCY. KBØEC became active on cw. And lots of work on the communications van. Is your group this active? Traffic: WØFRC 264, WBØZEN 187, WØHI 102, WØOYH 101, WØFIR 88, KAØCUF 79, WØQMT 73, WØAM 72, WAØLBB 65, KØBXF 63, WØCHJ 45, WØFDJ 20, NØBDG 14, WØRBO 14, KØGSC 13, WØNYG 10, KAØE 8, WØPB 8, WØKL 1.

MISSOURI: SCM, L. G. Wilson, KØRWL — ASCM: WØOTF. STM: KMØL. SEC: NØAJI. Many Kansas City area clubs will be taking part in a "Mall-a-thon" in Nov., being coordinated by the Southside ARC. Stations will be set up in all the areas major shopping malls. WØGCL is designing a 10-MHz transmitter for the upcoming band opening. KCØVY has a new tri-bander and WBØSEN has a new FT-102. Net-HBN, QNI-378, QTC-31. Congrats to KAØIKS and WBØHNO who recently tied the knot and are now sharing the same ham shack. KAØCSJ/Ø is a new EC and is presently reorganizing the area emergency operations network. Congrats to the following: Novice-KAØOWV; General-WDØGEX; Advanced-WBØZNG KAØNSM KAØKBX (now KCØVH), WBØOVZ (now KCØJL); Extra-WAØAOJ. Get well wishes this month go to KCØCL. Deepest sympathy goes to the friends and families of WØMCH and KØWKE who joined the ranks of Silent Keys. Owing to the lateness of the hour, this must go to press without traffic reports. Hope to have more to print next month. Traffic: KCØAS 804, KØSI 181, KØRWL 10.

NEBRASKA: SCM, Shirley M. Rice, KAØBCB — SEC: NØAIH. STM: WDØBQG. Our sympathy to family & friends of KAØHOD. KAØDGT of Co. received a scholarship from QCWA & will attend school in Fremont. Congrats to KØGND & his new XYL Barbara. WBØGOB & KØDKM still the old faithfuls on the traffic nets. KØDKM tells me he is sporting a new beam. FB! My TNX to NØAIH & WDØBQG for their persistence in the reactivation of RACES stations in NE. Those of you with a generator and a sincere desire to operate in the time of a national disaster please contact ur local EC or any of the 3 of us. New Novices are KAØQQD KAØKXU and KAØOSL. M & I wish you all a very Merry Christmas season & a most Happy New 1983. May God Bless You All! Traffic: WBØGOB 57, KØDKM 39, WØHOP 35, WØZNI 21, KAØBCB 10, WAØDXY 5, WØERW 2, WØHNS 2, WØNIK 2, WAØPCC 2, WØYFR 2, WAØKHK 1.

NEW ENGLAND DIVISION

CONNECTICUT: SCM: Pete Kemp, KA1KD — SEC: K1WGO. STM: K1EIC. ASEC: K1AH KA1AMK.

Net	Freq.	Local time	QNC	QNI	NM
CN	3840	1900/2200	0238	356	K1EIR
CPN	3965	1800 Dy/1000 Sn	215	329	W1OD
NVTN	28/88	2130	29	215	WA1ELA
WCN	7818	2030	108	395	W1DPR
RTN	13/73	2100	32	286	WB1ESJ

Station appointments: ORS-K3ZJJ; OO-K1KTB K1PLR; OES-K3ZJJ. Upgrades: Adv-N1BXO; Gen-KA1GRD KA1GRL KA1ENA; Tech-KA1HZT KA1CWP N1CIT; Nov-KA1JJZ. FARA now meets on the first and third Wednesdays. New CARA officers: W1PV, pres.; KA1FJR, v.p.; WB1HHW, treas.; KA1ECL, secy; Season's Greetings to all. SARC active at the Chester Fair. Congrats to KA1BB and the ops from SARC, SCRAMS & RASON for their valued participation in the East Lyme Marathon. Best wishes to WB1AVA & K1JX on their marriage, & to K1ZZ & KA1ZD on their new harmonic. A BIG TNX to all who participated in this year's SET. K3ZJJ & daughter, KA2OGQ, spent part of their summer operating cw from the High Sierras. RASON's Wouff Hong ceremonies were again a big hit at the Boxboro ARRL Convention. All section appointees please note that the big switch commences Jan 1. Therefore, your December reports should be sent to the Leadership Official tasked with administering your area of interest. SEC-K1WGO; STM-K1EIC; OO/RFI-KA1ML; SGL-K1AH; ACC-K1UQE; PIO-WB1AIU; OBS-WA1DWE; TC-W1HAD. All clubs within the section are encouraged to send copies of their newsletters to the SCM and ACC. In this way your activities can be shared with others. Stations wishing new station appointments should contact the coordinators directly. FARA provided communications for the Thanksgiving Race in Southport. Murphy's Marauders recently took first place in the ARRL DX Test. MM also has a new president W1OD. On the subject of presidents, President Reagan has signed HR 3239, a big step forward for Amateur Radio. TNX to all who worked long and hard for its passage. Traffic: WB1GXZ 445, W1EFW 224, WB2PJU 177, K1UQE 103, WB9IHH 84, K1AQE 77, K3ZJJ 61, WB1ESJ 50, KA1BHT 27, W1CUH 5, W1QV 5, N2BQA 4, W1VS 2.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — STM: WA1TBY. SEC: WA1BLG. ASCM: K9HI.

Net	Mgr	Freq.	Time(loc)/Dy	QNI	QTC
EMRI	N1GQ	3.658	1900/2200/Dy	511	488
EMRIPN	KA1ON	3.949	1730/Dy	306	269
EM2MN	N1BNI	23/63	2000/Dy	438	204
NEEPN	K1BZD	3.945	0830/Sn	64	10
HHTN	K1BSO	04/64	2230/Dy	624	234
EMRISS	N1BHH	3.715	2030/Dy	135	77

Well, the New England Division Convention is history, and the Committee that has been doing it for so long did another bang-up job. I thought that the program was particularly excellent with ARRL President Clark, Lloyd and Iris Colvin of DXpedition fame, Wayne Green, Dick Bash,

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Bruce Schwoegler and others in attendance. The wx was great for the flea market and dealer prices were low. All in all I had a real good time and it was good to meet some of you personally. As for next year, plans are not firm as to a division-wide convention, but at least one group has contacted me regarding at least a section-wide affair. We'll see what develops. Minuteman Rptr Assn. is holding a series of Amateur Radio public service seminars in Waltham. Middlesex club member KA1ACY upgraded to General class and was thoughtful enough to thank the club members who helped him by putting it in writing in the newsletter. Nice gesture. Colonial Wireless had a talk on cable TV. Billerica club had a talk by W1JR, and is celebrating its 4th place (national) finish in Field Day. Honeywell 1200 club is preparing for another Teleconference over the 72/12 rptr. Wellesley club is running a General class. Waltham ARA is working on the 04/64 autopatch. Framingham club member KK1F underwent major surgery recently and is coming along fine now. South Shore Rptr. Assn. had an excellent talk on aids for the handicapped by WA1CDQ. Yankee Clipper Contest Club member K1AR has a new son (first harmonic). WA4STO has moved to the Cape from Virginia where he was SCM. He's already active on the traffic nets and we are fortunate to have another able ARRL worker on the team. Welcome, Luck! Traffic: N1BBT 816, WA1TBY 567, KA1DB 508, N1BHH 316, KA1GBS 313, W1IDK 220, KA1ON 166, N1AJJ 162, N1BGW 161, WA4STO 155, KA1BBU 96, N8TM 87, KA1MI 73, KA1AE 59, KA1KF 54, N1CDI 36, W1BNS 36, WA1DXT 31, KE1U 28, WB1GVD 27, WA1FNM 25, K1BZD 21, W1CE 13, W1CZB 11, W1ATX 6, KA1BTV 6, K1LCQ 5, KA1R 5. (Aug.) KA1R 14.

MAINE: SCM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. Maine had a good representation at the ARRL convention in Boxboro. KL7IJG/1 has done an excellent job setting up the SET schedule. Please be sure to report your public service activities and your club activities. PSHR: AK1W KA1AVU N1BJW W1RWG.

Net	Sess.	Checkins	Traffic	Mgr.
AEs	4	52	1	WA1YNZ
CMEN	8	132	18	W1WCI
PTN	52	450	284	W1HDC/N1BJW
SGN	26	972	228	K1GUP
MPSN	4	59	2	N1BCE
SPSN	10	70	10	N1BCE

Traffic: AK1W 253, N1BJW 94, W1RWG 84, KL7IJG 83, KA1TJ 75, W1GKJ 63, W1JTH 59, W1BMX 52, W1HDC 51, KA1AVU 42, W1KX 39, KA1GCW 23, W1WCI 22, N1BCE 21, WB1EIL 18, KA1FTL 15, K1PV 15, KA1EIW 14, WA1ZJL 14, AK1A 13, WA1YNZ 9, W1CTR 4, N1BMO 3.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH — SEC: AK1E. STM: W1TN. NMs: N1NH K1OSM W1VTP. Welcome back to W1FYR, EC for Cheshire Co. ARRL GM K1ZZ spoke at Nashua club. KA1ACC worked P49SP. Sad to report K1EON former mayor of Nashua is a Silent Key. Moonbounce king K7WHS featured in many publications. New Hampshire QSO Party scheduled for Feb. 5 & 6, sponsored by Concord Brasspounders. Get on and represent your rare county and state. W1HCS and XYL hosted an excellent DX gathering at their home. W1KGZ mobile in his antique Woody Wagon. KB1A now retired. K1OX on 2-meter SSB. The new 18/76 equipment on the air. Very best of Season Greetings to everyone. Traffic: W1TN 221, KI1M 207, W1QYY 199, K1OSM 124, K1YMH 106, KA1BJ 87, KA1CJI 75, N1NH 70, KI1R 65, W1ALE 57, AK1E 57, KB1A 51, W1VTP 50, W1MHX 46, N1ALM 35, WB1CFT 30, W1CUE 29, KA1FKM 23, KA1FFX 20, K6UXO 18, N1AKS 18, K1ACL 15, KA1HUW 6. (Aug.) N1NH 95, WA3BZM 14, WA1HOB 12.

RHODE ISLAND — SCM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: KC1G. NM WA1OSL reports 22 sessions, 158 QNI, 32 QTC for RIEM2MTN. AE1S is full time on 145.55 auto/start freq. Congrats to K1AOS for upgrade to Extra and KA1DRI for Gen. Good luck to KA1SO in new job and QTH in Maine. N1RI back in harness on hf tfc nets after new antenna appeared. How does he do that? RITN NM KB1G has requested Section Net certificates for KA1EHR W1YNE WA1RBT AE1S and KC1G. Season's Greetings to all and best for the New Year. Traffic: W1EQF 510, KC1G 55, N1RI 40, KB1G 36, KA1EHR 35, WA1CSO 27, KA1DRI 14, AE1S 10, K1AOS 9, W1YNE 9, KA1SO 6.

VERMONT: SCM, Bob Scott — W1RNA — SEC: WA1ABQ. STM: N1ARI. The DEC for W1KOO rptr group is W1VSA; for the WA1HSG group is WA1OVW. Several mbrs expressed opinions on the ARRL nonchalant handling of the SCM ballots vs the directors, none of which were exactly complimentary, including the quality of material used. VSB 30/550/128; VTN 28/107/72; VTFM 30/343/63; GMN 26/394/32; Carrier 25/488/27; RFD 4/68/15; VPN 4/72/5. The SEC is working on the emergency setup via 2-mtr rptrs. Lack of response to his efforts and communications makes it very difficult. How abt btr cooperation? Tnx to all for the increased activity reporting. Traffic: W1RNA 161, K1BQB 158, KA1GID 94, AE1T 88, WB1ABQ 87, N1ARI 84, W1KRV 44, W1KJG 28.

WESTERN MASSACHUSETTS: SCM, William J. Hall, W1JP. Congrats to KA1CDC who has accepted appointment as NM for W. Mass. Emerg. Net. WMEN meets Sundays at 0830 local on 3937 kHz with liaison to eight rptrs and to NTS system. Section has 214 active members with QNI of 375 this month. KA1CDC has spawned new net session of WMEN at 2030 local Wednesdays on 3725 kHz in Novice section. Your SCM prepared a 4-page newsletter aimed toward SET preparation. It was distributed via local newsletters. Many thanks to the concerned editors. KA1T and XYL hosted a reception at their home for members of W. Mass. (cw) Net to celebrate 50th anniversary of continuous 7 day/week NTS service of WMN. ACC W1YI reports Mt. Tom ARA meeting with police on the method of reporting emergencies and for plans for covering the Mt. Holyoke regatta. Hampden Co. RA received engraved gavel from NE Director W1HHR for top US score in the VHF SS Medium Class. PSHR: WB1HIH KA1T K1JHC W1KK. Traffic: KA1T 229, WB1HIH 181, KA1CDC 152, W1UD 130, W1KK 88, K1JHC 72, K1IJV 61, W1JP 11, W1ZPB 7.

NORTHWESTERN DIVISION

ALASKA: SCM, Richard Henry, AL7O — ASCM: AL7AC. STM: WL7H. DEC: KL7JFT AL7AW. OO: W6SJJ. In cooperation with the University of Alaska, the clubs in the Fairbanks area will be helping with aurora penetration tests being conducted this winter. New ARES net in North Pole/Fairbanks meeting Sunday evenings at 8:30 P.M. on the .37/.97 rptr. All interested amateurs are encouraged to support this new ARES net. The Southeastern ARA meets the first and third Wednesdays 0430Z on 3892 kHz usb. AL7X reporting a new 110' tower in the center of Nome. KL7AM and KØKJ

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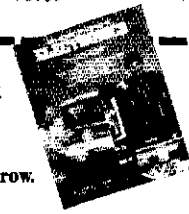

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are new ECs in the Fairbanks area. The Arctic ARC conducted communications support for the 1982 Equinox Marathon. KL7EVO and KL7FO are reported to have competed in this marathon run. Anyone interested in traffic handling contact WL7H or KL7LO for particulars. Traffic: None Reported.

MONTANA: SCM, Les Belyea, N7AIK — Upgrades reported: to extra-N7ARA KA7GPG N7AIU (now KQ7S); to general-KA7HUV KA7NMA; to tech-KA7MGK KA7MGG. Congrats to all. A new Novice in Lewistown is KA7OJC, who practiced sending cw on the keyboard of a harpsichord. Sorry to report that K7ECF from Dillon in a SK. KD7O WB7OYP and WB7OYO were participants & hot air mobile in the Albuquerque International Balloon Fiesta Oct. 2-9. The Beartooth ARC voted to purchase a 10/70 RTTY rptr. K9PP puts on a very excellent workshop on how to install connectors on coax cable. If your club would like to see this, contact him. A special congrats goes to a Whitehall YL, KA7BFK, for making EXTRA. Starting next month, Montana will go along with the new ARRL restructuring (see June *QST*). There will be added participation in League affairs from section members. New appointments are:

Section Emergency Coordinator	W7LR
Section Traffic Manager	KF7R
Official Observer & RFI Coordinator	KS7U
State Government Liaison	W7JMX
Technical Coordinator	K9PP
Affiliated Club Coordinator	WB7TWG
Public Information Officer	WA7GQO
Bulletin Manager	W7DB

Net	Sess.	QNI	QTC	Mgr.
IMN	22	229	124	K7JV
BSN	13	186	4	WB7UTJ
MTN	22	651	116	K7TQM

Traffic: N7AIK 105, WA7GQO 46, W7LBK 4.

OREGON: SCM, William R. Shrader, W7QMU — STM: W7VSE. SEC: (vacant)

Net	Time/Day	Freq.	QNI	QTC
OSN	0230/0600Z Dy	3587	700	1357
BSN	0145Z Dy	3908	991	44
WCN	0300Z Dy	3702	383	131
PTTN	0300Z Dy	146.76	258	30
PTTN (Aug.)	"	"	279	29
MPARES (Aug.)	0300Z TTh	147.02	224	2
PdxARES (Aug.)	0330Z Dy	147.32	1386	28

Oregon section lost K7WWG to W4-land. His position as SEC is vacant; anybody interested? UPGRADES: Novice-KA7OFM; General-N7EJO KA7KCW KA7MTY; Extra-WA7LGN KV7R KS7J KC7IQ. KA7GNQ has new junior op. N7BIJ has 150 DX countries and KC7QV has 160. Congrats to all! N7DB keeping 6 meters alive. AL7W has broken foot. KA7IAX W6OFF & W7LNE running Novice class in Roseburg. Grants Pass/Medford clubs holding first duo-club swapmeet/potluck. OSN set new record for traffic-AGAIN. Six traffic handlers made BPL: W7VSE KN7B WA7LGN KA7ELI K7GV KT7X. Quite a show!! SARC did a bang-up job representing Amateur Radio at state fair. Thirteen ops turned out for G.P. Bike-A-Thon. Traffic: W7VSE 1174, KN7B 988, WA7LGN 579, KA7ELI 557, KT7X 539, K7NTS 238, K7GV 222, WB7OEX 125, W7ZB 108, W7LNE 78, KI7Y 75, KA7AID 25, N7BGW 17, W7DAN 6, W7LT 6. (Aug.) KI7Y 66, W7DAN 29, K7WWR 13.

WASHINGTON: SCM, Joe Winter, WA7RWK — ASCM: KD7G. SEC: K7SH, STM: W7GB.

Net	Freq.	Time (Z)	QNI	QTC	Sess.	Mgr.
WSN	3590	0145/0445	490	330	60	W7GB
WARTS	3970	0100	2817	546	30	W7SFT
NTN	3970	1830	634	64	30	W7VL
NWSSB	3945	0130	669	51	30	W7JGM
EWTN	146.64	0030/0430	38	25	17	WA7CBN
PSTS	145.33	0030/0530	154	101	60	W7IEU
SCARES	147.18	0230 (W)	25	4	4	KA7AML

WB7VSZ Inland Empire Amer. Red Cross EC, KA7BQI and N7DNU handle comms for the ARC at a 4-alarm fire in Spokane, starting regular assignments for this service. From *I.E. REPEATER* WB7PSO teaching 10-week Amateur Radio Course. Spokane to Portland with 2-mtr, HT thanks to Central Wash. Rptr Assn., linking 147.80/.20, 147.99/.39, 147.90/.30 & 147.70/.10. WB7OGA & KA7BQI co-chair successful Am. Radio Booth at Spokane Fair with all bands, modes & msg tfc for good PR. KM7U rpts Spokane Rad. Am's elected: KT7E, pres.; K7EFB, v.p.; KA7FQB, secy.; N7ER, treas. Lower Columbia ARA (W7DG) had 25 mbrs participating in Emerg. Siren Test providing public service. K7WF presented program on "traffic handling." Clark Co. ARC (W7AIA) rpts, the Reid Blackburn Scholarship is now established at Clark College and will be supported by W7AIA activities. $1000 has been raised for 1982-83 year. Blackburn, a Ham, lost his life during the eruption of Mt. St. Helens. KA7ACY rpts 8 mbrs of the Radio Am. of Skagit Co. furnished comms for Skagit Flats Marathon, a 300 runner, 26-mile event. W7JGM rpts a successful RACES drill in Skagit Co. W7JGM is new NWSSB net mgr. Chehalis Val. ARS has new home, and is planning and preparing the meeting room & station. Congrats. N7DFV provides CVARS with prog. on computers. No. Sea. ARC (W7DA) heard program by WA7FAH on six-meter QRP. W7MAK rpts six completed Novice course. Yakima ARC (W7AQ) provides comms for Sunfair Parade, with 133 entries over very long route. WB7QAP heads up AR booth at fair. Congrats to N7BRB who is new DEC for Dist. 6. N7BRB also erected 90-ft pole with Wilson Tri-bander & 2-mtr ringo on top and completed 12V/15A p.s. Western Wash DXC is presented interesting program on solar power by K7HO. KB7G rpts K7LXC K7MX W7RM & N7ML now have 40-mtr beams installed. PIA W7CKZ provides Wash. Am. Radio News Serv. info. on Mon. at 7 P.M. on 3.940 MHz. Rad. Club of Tac. orders 220 rptr, which may be in use in Jan '83. K7SRU rcvd nat'l NOAA award as wx net computerized NCS. Traffic: WB7TQF 1022, WB7WOW 993, W7DZX 622, K7GXZ 386, N7DNG 229, N7ANE 224, KS7I 185, W7DK 178, N7CSP 160, W7GB 157, W7HNA 138, KC7NA 127, K7CTP 109, N7AFZ 101, WA7BDD 82, N7AFY 64, W7IEU 57, K7VW 46, W7GIP 45, W7BUN 33, KR7F 28, WA7JEB 21, KD7G 20, N7DDP 16, K7BFL 10, K7RBT 10, W7ERH 6, W7APS 5, K7OXL 5, W7AIB 2.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — ASCMs: W6ZF N6DHN VE2AQV/W6. SEC: W6LKE. STM NI6A again made BPL, while finding time to do The Amer. Cancer Soc. Bike-a-thon with Contra Costa Co. ARES members WA6JSO N6DRT WB4DWU KA6IGI WD6DRQ & KA6OLK. NM W6VOM was left off the July PSHR listing! Napa Co. EC, N6XN, thanks NI6A, WD6BIY, N6FYV, WA6IXT, KF6CA, W6NL & "the bunch on '41" for their NTS support of the Napa wildland five. Certificates of Merit for

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1.5W	80-90W	2C100-2/25
2W-5W	>30W	2C025-2W
2W-5W	>50W	2C050-2W
2W-5W	>100W	2C100-2/25
10W	100W	2C100-10/25
25W	100W	2C100-2/25
25W	100W	2C100-10/25

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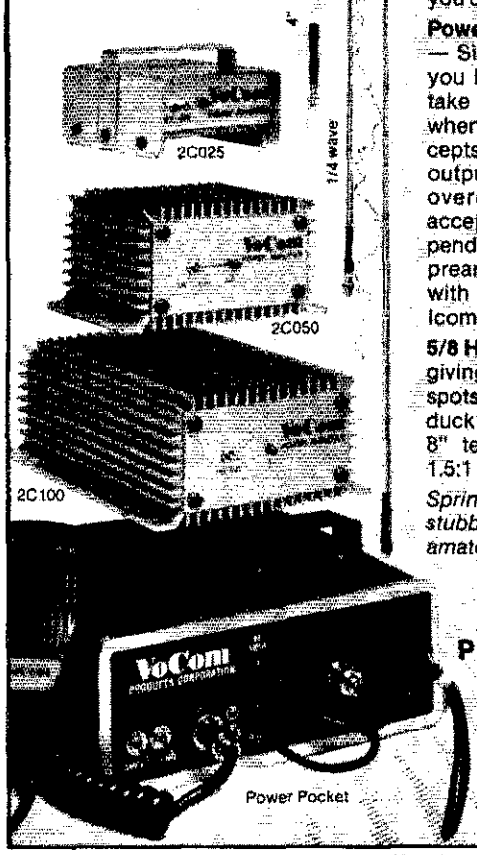

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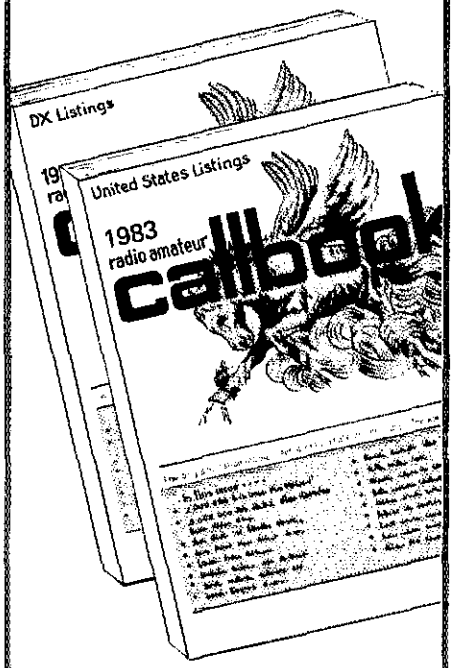

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their participation is support of comms for the Silverado Five in St. Helena were presented to KA6DFP N6GLL KA6NEJ & W6SJA. Thanks to the combined efforts of K1XA at Hq. and WB6SQY. LARK presented their J.K. Murphy award to KB6BD & his XYL, KA6LEW, for service to the club & Amateur Radio. HARC members WD6CAX N6DOE N6APQ KA6FIY WA6BLG KA6ITV WD6CAZ KA6HZT N6BNY & WA6QVG provided comms for the Children's Hospital Bathtub Regatta. SBARA had 22 members active in the City of Fremont disaster drill. EBARC members WA6JSO WA6ZFV KA6OLK W6CPO N6DRT WD6DRQ N1GA & KA6IVF supported Cal. Div. of Forestry at the Mt. Hamilton Fire. Traffic: N1GA 931, W6VOM 131, K6APW 119, WB6UZX 31. (Aug.) WB6UZX 32. (Jul.) K6AGD 54, WB6UZX 43.

NEVADA: SCM, Bill J. Marshall-Gratrix, KA7Q — STM: W7BS. This column is dedicated to W7SK who has served as SCM for Nevada ably since July 1979 and who for personal reasons decided recently he would no longer be able to continue in the office. KA7Q is picking up the reins for the rest of W7SK's term, and would appreciate news and newsletters about activities in the Nevada area. Thank you WD9CKM of the Las Vegas RAC for the newsletter. This month KB7QY completes ten years of technical and code instruction classes. FB. Sagebrush Net meets weeknights at 1900 Pacific Time on 3906 MHz. AE7K and KB7XJ are active on this net from Elko and WB5VDV from Ely. Traffic: N7AKX 513, W7BS 148, W7BKQ 57, WA7UXO 2.

PACIFIC: SCM: Army Curtis, AH6P — STM: KH6HIJ. SEC: KH6B. ECs: Hawaii — AH6K; Kauai — KH6S; Maui — KH6H; Oahu — KH6NP. Mele Kalikimaka me ka Hauoli Makahiki Hou. It's that time of year again; it looks like another White Christmas, at least here on the Big Island. Snow? In Hawaii? Sure! The Pacific Traffic Net is again alive and well under the capable direction of KH6HIJ and crew. Look for it at 14077 kHz at 0300Z or give KH6HIJ or myself a call on how you can help with traffic work. We need your help! Look for the new rptr on Haleakala, 147.63/.03. It should be accessible from many areas around the state. Traffic: KH6B 276, KH6H 24, KH6LO 24, KH6S 20.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: N6AUB. ASCM: KI6T. The Mount Vaca RC provided communications for the Heart Cyclethon. The Golden Empire ARC of Chico has moved their 160-meter net to 1930 kHz. It meets at 8 P.M. local time on Monday night. Chico also has a Microcomputer Net, which meets at 8 P.M., Wed. night on WB6RHC/R (147.375). Congrats to KA6GQR on passing the Advanced test. K6ZY has added an FB7 to his stock of rcvrs. A correction: K6FO has been appointed to the Public Relations Advisory Committee. New Chico Novices include KA6s VLA VSG VST VUC and WBR. Traffic: N6EPG 12, N6AUB 5.

SAN FRANCISCO: SCM, Bob Smith, NA6T — SEC: N6BLN. STM: K6TP. Congrats to the new EC for Sonoma Co., W6DTV, and for Lake Co., WB6UVO. Let's get out and support the ARES programs in these counties. MARC planning Xmas potluck at HAFB Clubhouse. Requa AFB is new site of FWRA rptr in Del Norte Co. 145.550 MHz is new emergency calling frequency in Humbolt Co. Mendocino Co. amateurs are combining ARES-RACES Groups. SCRA helped in NAPA fire communications. SFRC-VA radio station is in operation. Now is the time to attend the meetings at the VA hospital and become acquainted with the station operation. SFRC participated with communications on Bridge-to-Bridge Run in San Francisco. Traffic: W6IPL 404, W6NL 300, K6TP 105, K6TWJ 91, WB6RTE 28, NA6T 16. (Aug.) W6NL 350.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6OPD — SEC: WA6YAB. STM: N6AWH. ASCMs: W6TRP K6YK NF6K. Officers of the Turlock ARC are: K6IXA, pres.; KB6DJ, v.p.; KD6QA, secy.; W6SM, treas.; WB6MDN, memb. The Amador Co. ARC is an ARRL affiliated club. Congrats! WA6WIY is pres and WA7QQR is treas. The club worked the Amador Co. Fair. The radio clubs in W. Kern Co. had a successful 2nd Southern San Joaquin Valley picnic and swapfest in Bakersfield. Appt renewed: WA6YAB, ORS. N6AWH is Extra and continues to make PSHR each month. N6HEZ and N6GAZ are General. KA6RUF and KA6UKF are Tech. KA6SFQ is N6HEW. KE6UW is KE6YF. KA6APQ is KF6CL. WA6BUH has TS820S and R820. KL7JFP has an IC25A. KB6DJ has TR2500. K6OZL has new tower, and talked about operation from VQ9 at a recent CCDXC-QCWA meeting. KB6DI has two Collins stations, a round S-line and a KWM2. W6QOE has KDK2030. What has happened to W6XP? WA6JDB is moving up the DXCC ladder. Merry Christmas and a Happy New Year to all. Traffic: N6AWH 155, W6DPD 26, WA6YAB 26, WD6FRS 10, K9YBM 8, W6SX 7, WA6JDB 5.

SANTA CLARA VALLEY: SCM, Ross Forbes WB6GFJ — STM: W6ZRJ. SEC: KA6R. During the Christmas season, the warmest holiday greetings to everyone in the section, and best wishes for 1983! With the rainy season here, everybody should be in contact with their EC so that we can all be ready in case we have a repeat of last winter's storm. Congrats to W6JZU on upgrade to EXTRA! New OBS in the Santa Cruz area is W6PHT. NPSARC is looking into new whistles and bells on their rptr. Many clubs in the section are starting off the year with new officers. Each of us should do everything possible to work with each of the officers in the clubs we belong to. The officers need YOUR input! Don't forget that as of January 1st, the SCV will operate under the new section structure. San Mateo RC enjoyed a program by K6ORP, and NPEC enjoyed a program from W6ZRJ and W6VZT. If you have an interest in emergency communications and/or traffic, contact W6ZRJ about joining NCTEA. NCTEA was formed to create a dialoque among us about traffic and EC. GREAT IDEA! From the sounds of the bands, a number of stations in SCV were on during the California QSO Party. WB6GFJ had a visit from FO8GW and FO8DF, and spoke to LERA ARC. Congrats to W6PLT for his efforts with SC OES and the new county ID! The Smoked Hamfest again was a smashing success. Thanks to all for your efforts. Traffic: W6KZD 250, WA6HAD 76, W6ASH 68, W6YBV 59, KE6ZA 44, WD6EKR 36, W6RFF 36, W6ZRJ 21, W6OII 18, WB6GFJ 6, W6CF 4. (Aug) W6YBV 185.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ian C. Black, WD4CNR —

Net	QNI	QTC	Tfc	Time	Sess.
CMN	416	156	121	637	30
CN	620	346	335	1815	60
CSN	212	47	42	870	30
JFKN	902	139	119	1575	30
THEN	860	124	116	585	30

Introducing Corsair

A New No-Compromise HF Transceiver

The CORSAIR is an extraordinary new HF transceiver. Every function operates without compromise. New unique features make it a delight to operate.

A new front end provides extreme sensitivity, low internal noise and high dynamic range to bring weak signals to life. For even greater overload prevention, the integral rf preamplifier can be switched out. More effective than the usual rf attenuator.

The filtering system, a TEN-TEC exclusive, virtually switches to privacy. It starts with a superb 2.4 kHz 12-pole ladder sideband filter system, standard. It provides variable bandwidth for ssb, great for today's crowded phone bands. A novel pass band tuning circuit allows a received signal to be moved within the pass band to its optimum position with respect to QRM. Optional narrow band filters are available for ssb, cw and RTTY, all switched from the front panel. The ultimate in QRM reduction.

Full cw break-in opens a window on the band while transmitting, turning monologues into conversation. Or, if conditions dictate, just switch to semi-break-in. And no VOX adjustment when changing modes.

A versatile offset tuning system allows the receiver and transmitter to be tuned separately with a ± 1 kHz range for fine tuning or ± 4 kHz for working off frequency. For net operation, both can be moved simultaneously.

Reliability is designed in. The CORSAIR system is so rugged it will operate into infinite SWR. And we guarantee it unconditionally (except for lightning) for one year. The CORSAIR is designed for 100% duty cycle, ideal for RTTY, SSTV and of course, contests.

Beauty is more than skin deep. The contemporary styling with the blackout LED frequency display (last digit in green), the baked-on textured bronze/black finish with aluminum trim will retain its handsome appearance permanently. Beneath its sleek exterior is a carefully crafted chassis packed with performance.

There are many other features, each with superb performance. An effective speech processor, notch filter, adjustable noise blanker, signal spotter, three position AGC, threshold ALC, simplified VOX, all controlled from the front panel. In addition, the CORSAIR has a compression loaded speaker, less than 2% audio distortion, and full accessory connections including remote bandswitch output. It even has a volume equalizing headphone output.

The CORSAIR is a total system of pure operating pleasure—it really must be put through its paces to be fully appreciated. Its smooth controls, comfortable and logically spaced, give it the feel of a superlative transceiver. One that will be a faithful companion for the years ahead.

All TEN-TEC products are completely manufactured in the U.S.A., in the foothills of the Great Smoky Mountains.

Model 560, CORSAIR transceiver . . . . . $1169.
See your TEN-TEC dealer or write for full information.

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862

TS-930S

"DX-traordinary"... superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

A superlative, high-performance, all solid-state HF transceiver, that covers all Amateur HF bands, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.

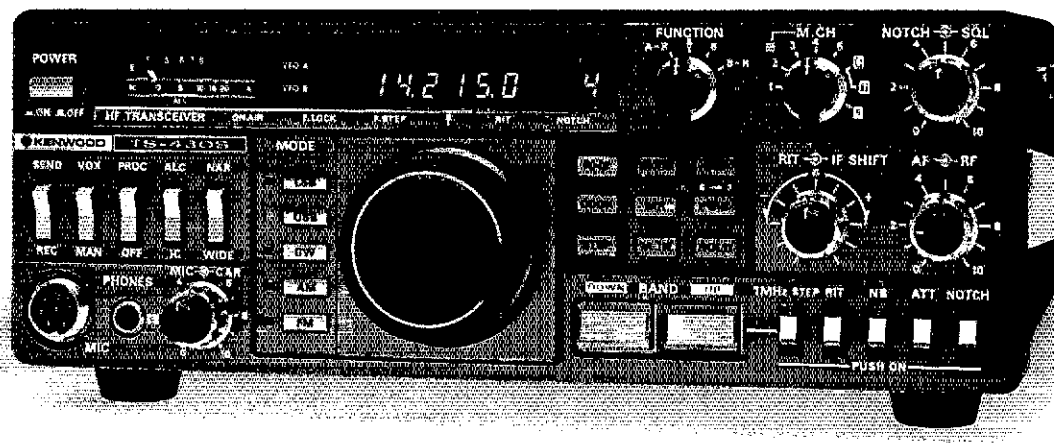
TS-930S FEATURES:

- 160-10 Meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC, on SSB, CW, FSK, and AM. UP conversion digital PLL circuit.
- Excellent receiver dynamic range. Typical two-tone dynamic range, 100 dB (20 meters, 50-kHz spacing, 500 Hz CW bandwidth).
- All solid-state 28 volt operated final amplifier. Lowest IM distortion. Power input 250 W on SSB/CW/FSK, 80 W on AM. SWR/ Power meter.
- Available with AT-930 automatic antenna tuner built-in, or as an option. Covers 80-10 meters, including WARC bands.
- CW full break-in. CMOS logic IC, plus reed relay. Switchable to semi break-in.
- Dual digital VFO's, 10-Hz steps, includes band information.
- Eight memory channels. Stores frequency and band data. Internal battery memory back-up, est. 1 yr. life. (Battery not Kenwood supplied.)
- Dual mode noise blanker. NB-1, with threshold control, for "pulse" noise. NB-2 for "woodpecker."
- SSB IF slope tuning, allows independent adjustment of the low and/or high frequency slopes of the IF passband.
- CW VBT and pitch control. VBT tunes out interfering signals. CW pitch control shifts IF pass-band and beat frequency. "Narrow-Wide" filter switch.
- Tuneable, peak-type audio filter for CW.
- AC power supply built-in.
- Fluorescent tube digital display (100 Hz resolution, modifiable to 10 Hz) with digitalized sub-scale, in 20-kHz steps.
- RF speech processor.
- One year limited warranty.
- SSB monitor circuit.

Optional Accessories:

- AT-930 Auto. antenna tuner.
- SP-930 External speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455 kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83 MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83 MHz IF.
- SO-1 commercial grade TCXO.
- MC-60A deluxe desk microphone, 8-pin, with pre-amplifier UP/DOWN switches.

NEW



TS-430S

"Digital DX-terity"... General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch, COMPACT!

Combines compact styling with state-of-the-art circuit design and performance.

TS-430S FEATURES:

- 160-10 meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC. UP-conversion digital PLL circuit.
- USB, LSB, CW, AM, and FM (optional) all mode.
- Compact lightweight design. Only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm); only 14.3 lbs. (6.5 kg.).
- Superior receiver dynamic range with Dyna-Mix high sensitivity direct mixing system.
- 10-Hz step dual digital VFO's. Operate independently, include band and mode information. Dial torque adjustable. Step switch for 10-Hz or 100-Hz steps. A=B switch shifts "B" VFO to "A" VFO frequency and mode, or vice versa. VFO LOCK switch. RIT for VFO or memory. UP/DOWN manual scan with optional UP/DOWN microphone.
- Eight memories store frequency, mode, and band data. 8th memory stores RX/TX frequencies independently.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- Memory Scan.
- Programmable automatic band scan width.
- IF shift circuit for minimum QRM.
- Tuneable notch filter, built-in.
- Narrow-wide filter selection on SSB, CW, AM (filter optional).
- Speech processor, built-in.
- All solid state. Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Operates on 12 VDC or on 120 VAC, or 220/240 VAC with optional PS-430 AC power supply.
- Fluorescent tube digital display indicates frequency to 100 Hz (10 Hz modifiable).
- All-mode squelch circuit, built-in.
- Built-in noise blanker.
- RF attenuator (20 dB).
- VOX circuit, plus semi break-in with side-tone.

Optional accessories.

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC supplies.
- SP-430 external speaker.
- MB-430 mobile mounting brac
- AT-130 compact antenna tuner 80-10 m, incl. WARC.
- AT-230 base antenna tuner, 160-10 m, incl. WARC.
- FM-430 FM unit.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand microphone.
- MC-60A deluxe desk microphone, UP/DOWN switch.

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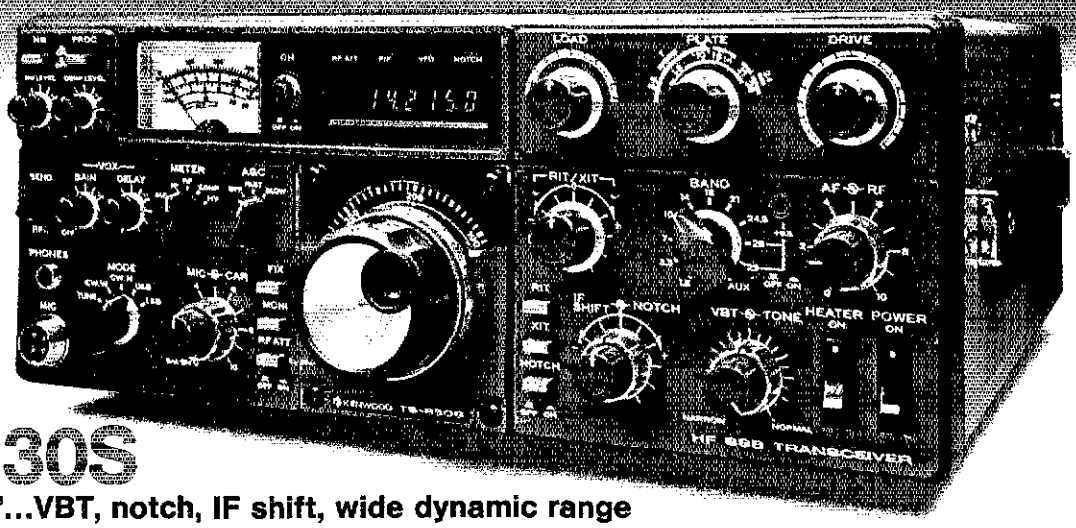


TS-830S

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

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

TS-830S FEATURES:

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

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

TS-530S

"Cents-ational"...IF shift, digital display, narrow-wide filter switch

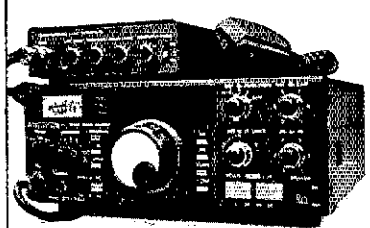
The TS-530S SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

TS-530S FEATURES:

- 160-10 meters, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- IF shift tunes out interfering signals.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.



TS-660

The TS-660 "QUAD BANDER" covers 6, 10, 12, 15 meters.

- FM, SSB (USB), CW, and AM
- Dual digital VFO's
- Digital display
- IF shift built-in
- 5 memories with memory scan
- UP/DOWN microphone
- All-mode squelch
- Noise blanker
- CW semi break-in/sidetone
- 10 W on SSB, CW, FM; 4 W on AM.

Optional accessories:

- PS-20 power supply
- VOX-4 speech processor/VOX
- SP-120 External speaker
- MB-100 Mobile mount
- YK-88C, YK-88CN CW filters
- YK-88A AM filter.

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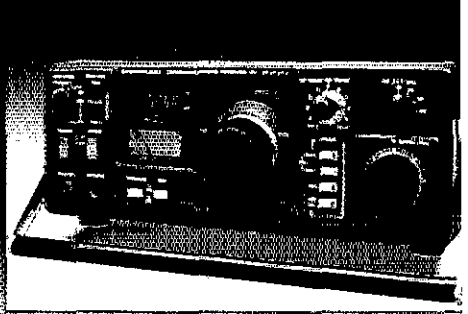


R-600

"Now hear this"...digital display, easy tuning

The R-600 is an affordably priced, high performance general coverage communications receiver covering 150 kHz to 30 MHz in 30 bands. Use of PLL synthesized circuitry provides maximum ease of operation.

R-600 FEATURES:

- 150 kHz to 30 MHz continuous coverage, AM, SSB, or CW.
- 30 bands, each 1 MHz wide, for easier tuning.
- Five digit frequency display, with 1 kHz resolution.
- 6 kHz IF filter for AM (wide), and 2.7 kHz filter for SSB, CW and AM (narrow).
- Up-conversion PLL circuit, for improved sensitivity, selectivity, and stability.
- Communications type noise blanker eliminates "pulse-type" noise.
- RF Attenuator allows 20 dB attenuation of strong signals.
- Tone control. • Front mounted speaker.
- "S" meter, with 1 to 5 SINPO "S" scale, plus standard scale.
- Coaxial and wire antenna terminals.
- 100, 120, 220, and 240 VAC, 50/60 Hz. Selector switch on rear panel.
- Optional 13.8 VDC operation, using DCK-1 cable kit.
- Other features include carrying handle, headphone jack, and record jack.

Optional accessories for R-600 and R-1000:

- DCK-1 DC Cable kit. • SP-100 External Speaker.
- HS-6, HS-5, HS-4 Headphones.
- HC-10 Digital World Clock.

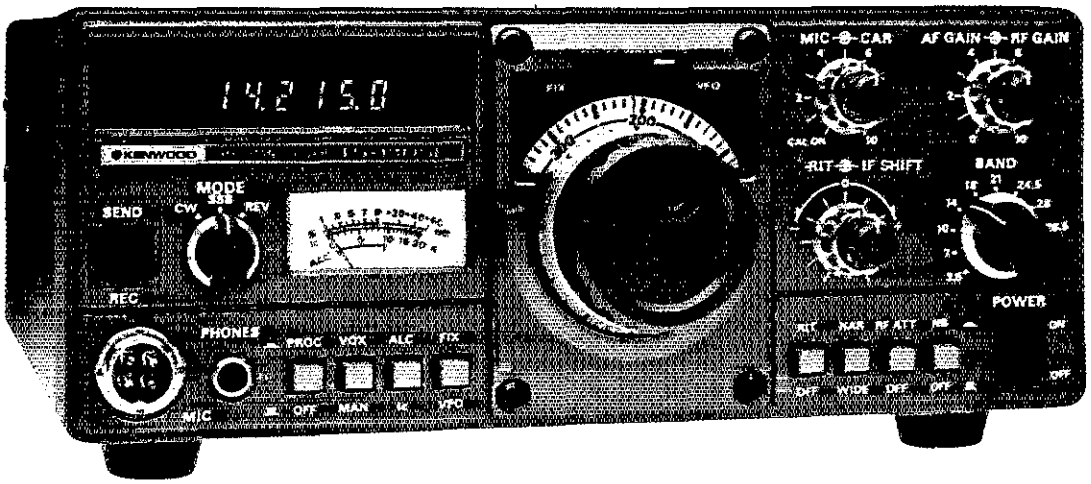
R-1000

High performance, easy tuning digital display

The R-1000 high performance communications receiver covers 200 kHz to 30 MHz in 30 bands. An up-conversion PLL synthesized circuit provides improved sensitivity, selectivity, and stability.

R-1000 FEATURES:

- Covers 200 kHz to 30 MHz.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock/timer.
- RF step attenuator.
- Three IF filters for optimum AM, SSB, CW.
- Effective noise blanker. • Tone control.
- Built-in 4-inch speaker. • Dimmer switch.
- Wire and coax antenna terminals.
- Voltage selector for 100, 120, 220, and 240 VAC. Operates on 13.8 VDC with optional DCK-1 kit.



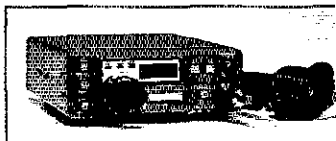
TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.
- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Effective noise blanker.
- Final amplifier protection circuit assures maximum reliability. Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.



Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

Optional accessories:

- PS-30 matching power supply (TS-130SE).
- KPS-21 power supply (TS-130S
- PS-20 power supply (TS-130V).
- SP-120 external speaker.
- VFO-120 remote VFO.
- FA-4 fan unit (TS-130SE).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 antenna tuner.
- MB-100 mobile mounting bracket.

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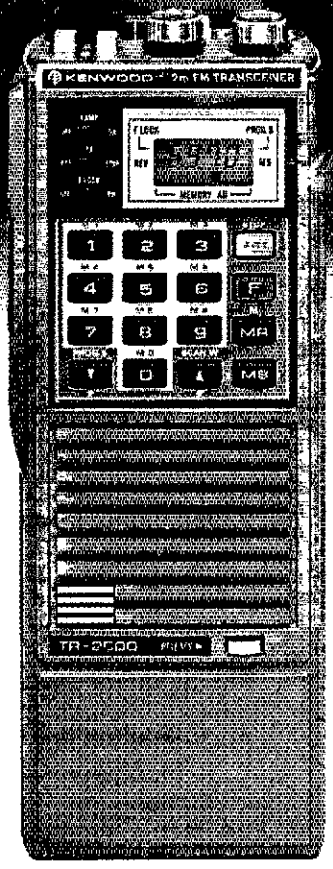
TR-2500

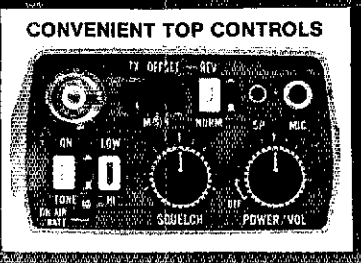
size, smallest price!

The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.

TR-2500 FEATURES:

- Weighs 540 g, (1.2 lbs). 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches).
- LCD digital frequency readout.
- Ten memories includes "MO" for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output, (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch encoder.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz.





- Speaker/MIC socket for optional AC charger/supply for operation while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

Optional accessories:

- ST-2 Base station power supply/charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/charger/power supply.
- VB-2530 2 M 25 W RF power amps., (TR-2500 only).
- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.

TR-3500

70 CM FM Handheld

- Covers 440-449.995 MHz in 5-kHz steps.
- HI-1.5 W, Low-300 mW.
- TX OFFSET switch, ±5 kHz to ±9.995 MHz programmable.
- Auto/manual squelch control.
- Tone switch for opt. TU-35B
- Other outstanding features similar to TR-2500.

- BH-2A Belt hook.
- RA-3 2 m 3/8 λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap.
- EP-1 Earphone.

TR-7950/7930

Big LCD, Big 45 W, Big 21 memories, Compact.

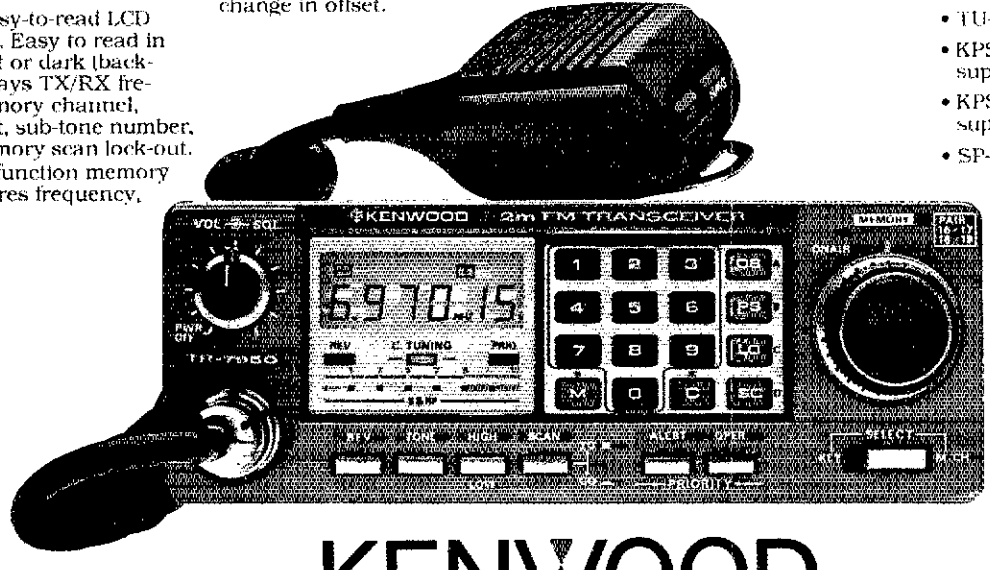
Outstanding features providing maximum ease of operation include a large, easy-to-read LCD display, 21 multi-function memories, a choice of 45 watts (TR-7950) or 25 watts (TR-7930), and the use of microprocessor technology throughout.

TR-7950/TR-7930 FEATURES:

- New, large, easy-to-read LCD digital display. Easy to read in direct sunlight or dark (back-lighted). Displays TX/RX frequencies, memory channel, repeater offset, sub-tone number, scan, and memory scan lock-out.
- 21 new multi-function memory channels. Stores frequency, repeater offset, and optional sub-tone channels. Memory pairs for non-standard splits. "A" and "B" set band scan limits. Lighted memory selector knob. Audible "beep" indicates channel 1 position.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- 45 watts or 25 watts output. HI/LOW power switch for reduction to 5 watts.
- Automatic offset. Pre-programmed for simplex or ±600 kHz offset, in accordance with the 2 meter band plan. "OS" key for manual change in offset.
- Programmable priority alert. May be programmed in any memory.
- Programmable memory scan lock-out. Skips selected memory channels during scan.
- Programmable band scan width.
- Center stop circuit for band scan, with indicator.
- Scan resume selectable. Selectable automatic time resume-scan, or carrier operated resume-scan.
- Scan start/stop from up/down microphone.
- Programmable three sub-tone channels with optional TU-79 unit (encoder).
- Built-in 16-key autopatch encoder, with monitor (Audible tones).
- Front panel keyboard control.
- Covers 142.000-148.995 MHz in 5-kHz steps.
- Repeater reverse switch. (Locking)
- "Beeper" amplified through speaker.
- Compact lightweight design.

Optional accessories:

- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.



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NEW

TR-9130

All mode (FM/SSB/CW) 25 watts, plus...!!!

The TR-9130 is a powerful, yet compact, 25 watt FM/USB/LSB/CW transceiver. Available with a 16-key autopatch UP/DOWN microphone (MC-46), or a basic UP/DOWN microphone.

TR-9130 FEATURES:

- 25 Watts RF output on all modes, (FM/SSB/CW).
- FM/USB/LSB/CW all mode. Selectable tuning steps of 100-Hz, 1-kHz, 5-kHz, 10-kHz.
- Six memories. On FM, memories 1-5 for simplex or ±600 kHz offset, using OFFSET switch. Memory 6 for non-standard offset. All six memories may be simplex, any mode.
- Memory scan.
- Internal battery memory back-up, using 9 V Ni-Cd battery, (not KENWOOD supplied). Memories are retained approx. 24 hours, adequate for the typical move from base to mobile. External back-up terminal on the rear.
- Automatic band scan.
- Dual digital VFO's.
- Transmit frequency tuning for OSCAR operations.
- Squelch circuit for FM/SSB/CW.
- Repeater reverse switch.
- Tone switch.
- CW semi break-in; sidetone.
- Compact size and lightweight.
- Covers 143.9 to 148.9999 MHz.
- High performance noise blanker.
- HI/LOW power switch. 25 or 1 watts on FM or CW.
- RF gain control. • RIT circuit.

Optional accessories:

- KPS-7A AC power supply.
- PS-20 AC power supply (TR-9500 only).
- BO-9A system base with memory back-up supply.
- SP-120 external speaker.
- TK-1 AC adapter for memory back-up.

TR-9500

70 CM SSB/CW/FM transceiver

- Covers 430-440 MHz, in steps of 100-Hz, 1-kHz, 5-kHz, 25-kHz or 1-MHz.
- CW-FM Hi—10 W, Low—1 W, SSB 10 W.
- Automatic band/memory scan. Search of selected 10-kHz segments on SSB/CW.
- 6 memory channels.

TR-7730

Dyna-"mite"... miniaturized, 5 memories, memory/band scan.

The TR-7730 is an incredibly compact, reasonably priced, 25 watt, 2 meter FM mobile transceiver, with five memories, memory scan, automatic band scan, plus other convenient operating features. It is available with a 16-key autopatch UP/DOWN microphone, (MC-46), or with a basic UP/DOWN microphone.

TR-7730 FEATURES:

- Dimensions: 5-3/4 W x 2 H x 7-3/4 D, inches. Weighs 3.3 lbs.
- Extended frequency coverage, 143.900-148.995 MHz, in 5 or 10-kHz steps.
- 25 watts RF output power, with HI/LOW power switch.
- Five memories. Simplex or repeater operation, with transmit offset switch. The 5th memory stores receive and transmit frequencies independently, for non-standard splits. Memory back-up terminal on rear panel.
- Memory scan, plus automatic band scan. Locks on busy channel, resumes when signals disappear, or when scan switch is pressed. Scan HOLD or PTT switch on microphone cancels scan.
- UP/DOWN manual scan on microphone, either version.
- Four digit LED frequency display.
- S/RF bar meter, LED indicators for BUSY, ON-AIR, REPEATER operation.
- Tone switch for internal tone encoder (not Kenwood supplied).
- Offset switch ±600 kHz, or simplex. Fifth memory for non-standard offset.

Optional Accessories:

- MC-46 16-key autopatch UP/DOWN microphone.
- SP-40 Compact mobile speaker.
- KPS-7A Fixed station power supply.

TR-8400

Synthesized 70-cm FM mobile rig

- Covers 440-450 MHz, in 25-kHz steps, with two VFOs
- Transmit offset switch for ±5 MHz. Non-standard offset uses fifth memory.
- HI/LOW power switch selects 10 or 1 watt RF output.
- Similar to TR-7730 in other features, including five memories, memory scan, automatic band scan, UP/DOWN manual scan, four digit display, S/RF bar meter, LED indicators, tone switch, and same optional accessories.
- Basic UP/DOWN microphone supplied with unit.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

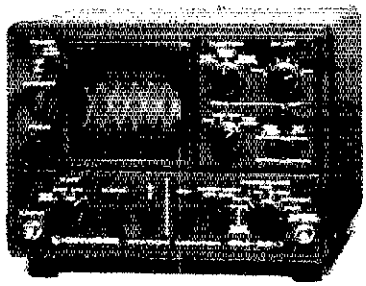
TL-922A

Maximum legal power on 160-15 meters

The TL-922A linear amplifier provides maximum legal power on the 160-15 meter Amateur bands.

TL-922A FEATURES:

- 2000 W PEP (SSB)/1000 W DC (CW, RTTY) input power on 160, 80, 40, 20, and 15 meters, with 80 W drive.
- Excellent IMD characteristics.
- Pair of EIMAC 3-500Z high-performance transmitting tubes.
- Safety protection.
- Blower with automatic turnoff-delay circuit.
- Variable threshold level type ALC.
- Two meters, one indicating plate current, and the other indicating grid current, relative RF output, and high voltage.



SM-220

High-performance oscilloscope for various monitoring functions

The SM-220 Station Monitor provides a variety of waveform-observing capabilities, and an optional pan display.

SM-220 FEATURES:

- Monitors transmitted SSB and CW waveforms from 1.8 to 150 MHz.
- Monitors signal waveforms in receiver's IF stage.
- Functions as high-sensitivity, wide-frequency-range (up to 10 MHz) oscilloscope.
- Tests linearity of linear amplifiers (provides trapezoid pattern).
- Allows observation of RTTY tuning points (cross pattern).
- Built-in two-tone (1000-Hz and 1575-Hz) generator.
- Expandable to pan-display capability for observing the number and amplitude of stations within a switchable ±20 kHz/±100 kHz bandwidth.

Optional accessories:

- BS-8 pan-display module for TS-180S, TS-830S, and TS-820 Series.
- BS-5 pan-display module for TS-520 Series.

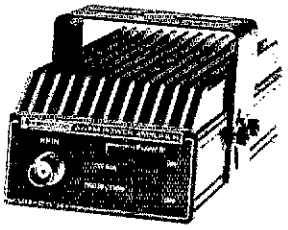
ACCESSORIES

A wide selection of optional accessories is offered for optimum operating flexibility. In addition to the optional items listed with each piece of equipment described in this catalog, the following accessories are also available:

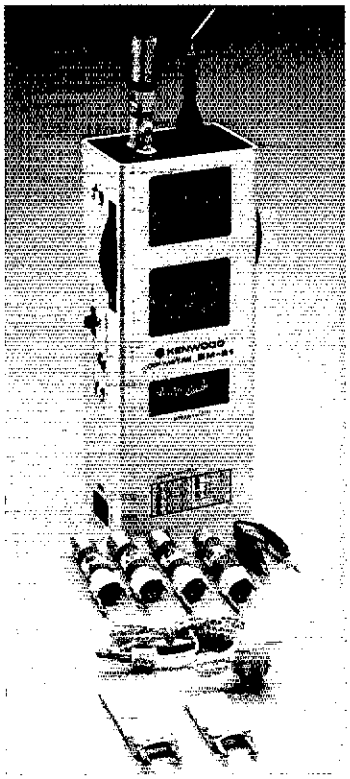
(FCC Part 68 registered)

PC-1A Phone Patch
PC-1A Phone Patch with hybrid circuit and VU meter for null and audio gain measurements.

BO-9A System Base (for TR-9130, TR-9500, TR-9000).
With memory backup supply, speaker sound port, ST-BY switch, power switch, headphone jack.



VB-2530 25 W RF Power Amplifier (for TR-2500).
BNC-BNC cable, and mounting bracket supplied.

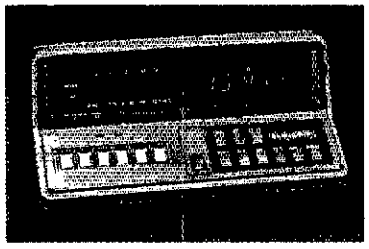


DM-81 Dip Meter

The DM-81 dip meter is highly accurate and features, in addition to the traditional inductive-coupling technique, capacitive coupling for measuring metal-enclosed coils and toroidal coils.

DM-81 FEATURES:

- Measuring 700 kHz-250 MHz in seven bands.
- Capacitance probe for measuring resonant frequencies without removing coil shields, and also for measuring resonant frequencies of toroidal coils.
- Built-in storage compartment for coils, and accessories.
- All solid-state and built-in battery.
- HC-25U and FT-243 sockets for checking crystals and marker-generator function.
- Amplitude modulation.
- FET for good sensitivity.
- Absorption frequency meter function.
- Earphone for monitoring transmitted signals.



HC-10 Digital Quartz Clock
The HC-10 digital world quartz clock with dual 24-hour display shows local time and the time in 10 preprogrammed plus two programmable time zones.

MICROPHONES:

- **MC-60A** Deluxe desk microphone with UP/DOWN switch, pre-amplifier, 50 kΩ/500Ω, 8-pin. Adapter cords PG-4A (4-pin), PG-4B (6-pin), available. PG-4C, supplied with MC-60A.
- **MC-60N4** Deluxe desk microphone, 50 kΩ/500Ω, 4-pin. (UP/DOWN switch, pre-amp. (not included). PG-4C available.
- **MC-50** Desk microphone, 50 k/500Ω, 4-pin.
- **MC-46** 16-key autopatch UP/DOWN microphone, 6-pin.
- **MC-42S** Hand microphone with UP/DOWN switch, 500Ω, 8-pin.
- **MC-30S** Hand microphone, 500Ω, noise-cancelling, 4-pin.
- **MC-35S** Hand microphone, 50 kΩ, noise-cancelling, 4-pin.

Microphone Plug Adapters:

- MJ-48 (4-pin microphone to 8-pin transceiver).
- MJ-84 (8-pin microphone to 4-pin transceiver).
- MJ-86 (8-pin microphone to 6-pin transceiver).

HEADPHONES:

- **HS-5** Deluxe headphones.
- **HS-6** Lightweight headphones.
- **HS-4** Standard headphones.

GENERAL PURPOSE AC POWER SUPPLIES:

- **KPS-7A** 13.8 VDC, 7A intermittent.
- **KPS-12** 13.8 VDC, 12A intermittent.
- **KPS-21** 13.8 VDC, 21A intermittent.

OTHER ACCESSORIES:

- **SP-40** Compact external mobile speaker.
- **RD-20** Dummy load, 50Ω, DC-500 MHz, 50 W intermittent, 20 W continuous.
- **PG-3A** DC line noise filter for mobile.

SERVICE MANUALS:

- Available for most transceivers, receivers, and major accessories.

NOTE: Prices and specifications of all Trio-Kenwood products are subject to change without prior notice or obligation.

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KENWOOD

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Only the best dealers are Authorized Kenwood Dealers. If your dealer displays a Kenwood Authorized Dealer banner and plaque in his store, you will know he can provide you with the service you demand...of the same quality as factory service. Authorized Kenwood Dealers employ factory-trained service technicians, maintain an extensive inventory of spare parts, and have direct access to factory service information. When you deal with an Authorized Kenwood Dealer, you deal with an expert on the entire line of Kenwood Amateur Radio equipment.

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Anaheim, CA 92801
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Los Angeles, CA 90025
(213) 820-1234

Henry Radio & Electronics
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Honolulu, HI 96814
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The Comm Center
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San Antonio, TX 78222
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Seattle, WA 98155
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Amateur Radio Supply Co
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Seattle, WA 98108
(206) 767-3222

C-COMM
6115 15th Avenue N.W.
Seattle, WA 98107
(206) 784-7337

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Amateur Electronic Suppl
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Milwaukee, WI 53216
(414) 442-4200

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1111 West Walnut, Compton, California 90220

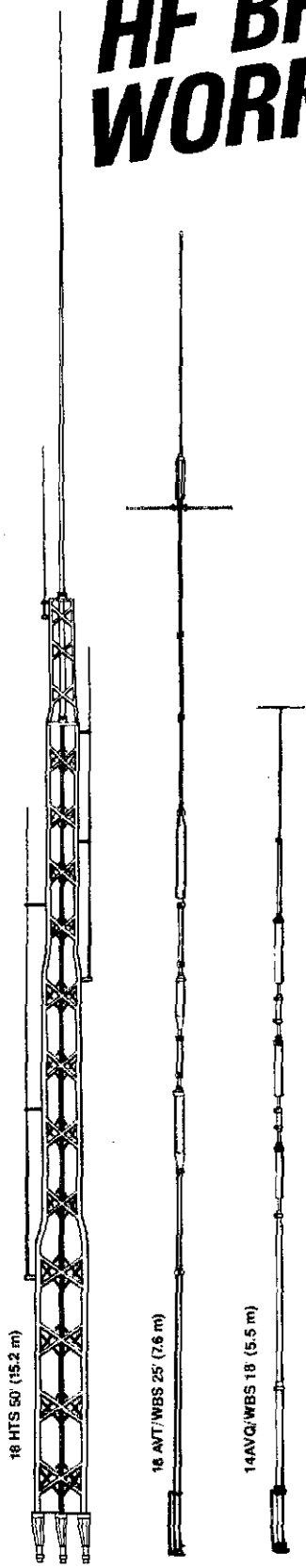
As of October 1, 1982, all of the above are fully Authorized Trio-Kenwood Communications Dealers.

*Interim Dealer

hy-gain®

HF BROADBAND VERTICALS WORK THE WORLD

Hy-Gain broadband vertical antennas load the new auto-tune solid state rigs, require minimal space and provide low angle radiation without the expense or the problems of support structures.



18AVT/WBS (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is dc grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included.

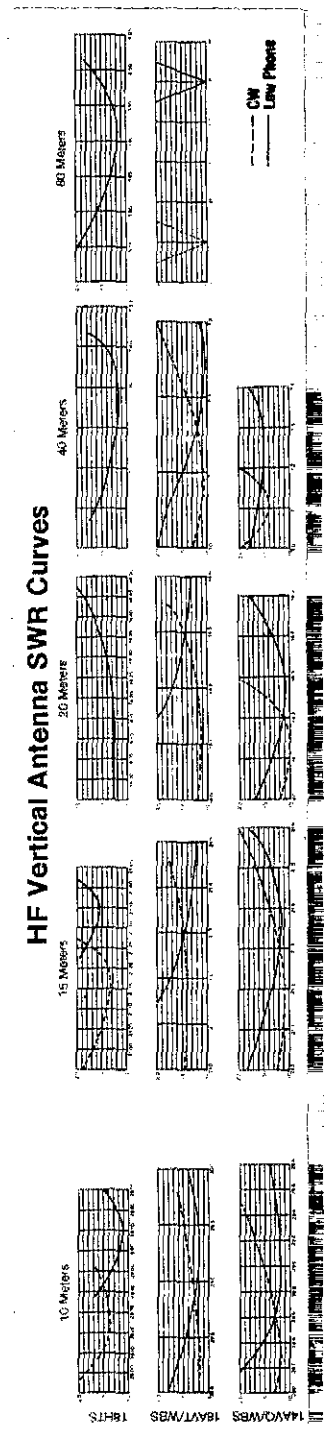
14AVQ/WBS (40-10 meters) Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel.

18 HTS (80-10 meters. 160 meters with optional loading coil) The superb reliability of the *18 HTS* is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical ¼ wavelength (or odd multiple ¼ wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended ¾ wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware. WARC kits to be available.

Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware.

PHASE FOR GAIN

Any two identical Hy-Gain verticals can be phased for excellent gain and directivity. A great system for beam performance on 40, 80 and 160 meters or for 10, 15 and 20 meters where space is limited. Send for our free technical report "Phased Verticals".



Hy-Gain Verticals that work the world at better Amateur Dealers.

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.

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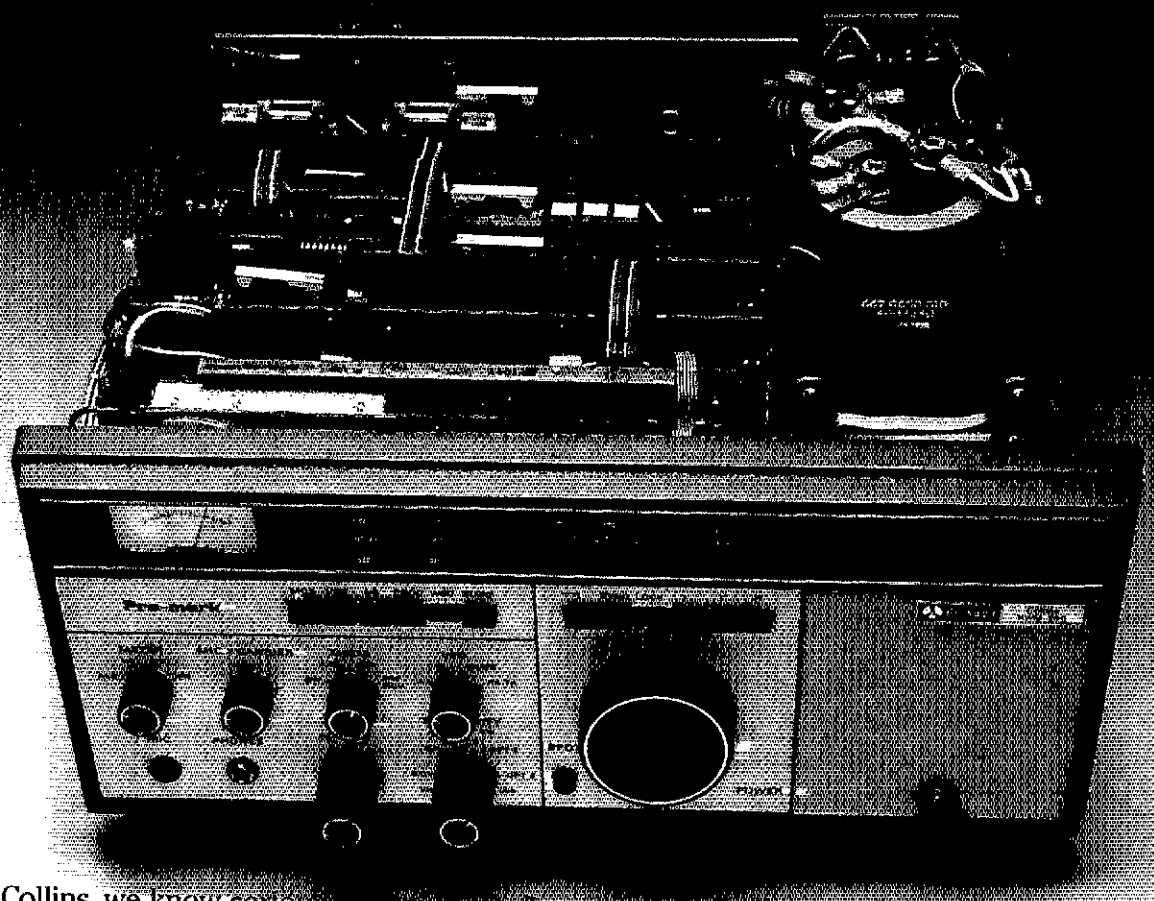
Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

The real beauty of the Collins KWM-380 is behind the panel, not on it.



At Collins, we know serious amateurs won't settle for less than professional performance. So we build every KWM-380 to commercial rather than amateur standards. For example, our PC boards are connected by ribbon cables with gold-plated pinfield connectors. The boards themselves are all glass epoxy, and virtually

unaffected by temperature and humidity which cause intermittents in the more commonly used phenolic boards.

Once built, every KWM-380 undergoes 24-hour burn-in, then is aligned and tested to meet or exceed every spec on the data sheet. Which makes us very confident about warranting your KWM-380 for one full year.

The result is a radio with superior performance and lasting quality, not front-panel glitter. Frequency stability is just one example of its beauty: typically, drift is as low as 10-12 Hz per hour for normal ham shack environments. Other companies haven't matched our performance because they don't match our quality behind the panel.

Add some real beauty to your station. See the KWM-380 at your nearest authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, IA 52498. Phone (319) 395-5963. Telex: 464-435.

Rockwell International

...where science gets down to business

ICOM Handhelds

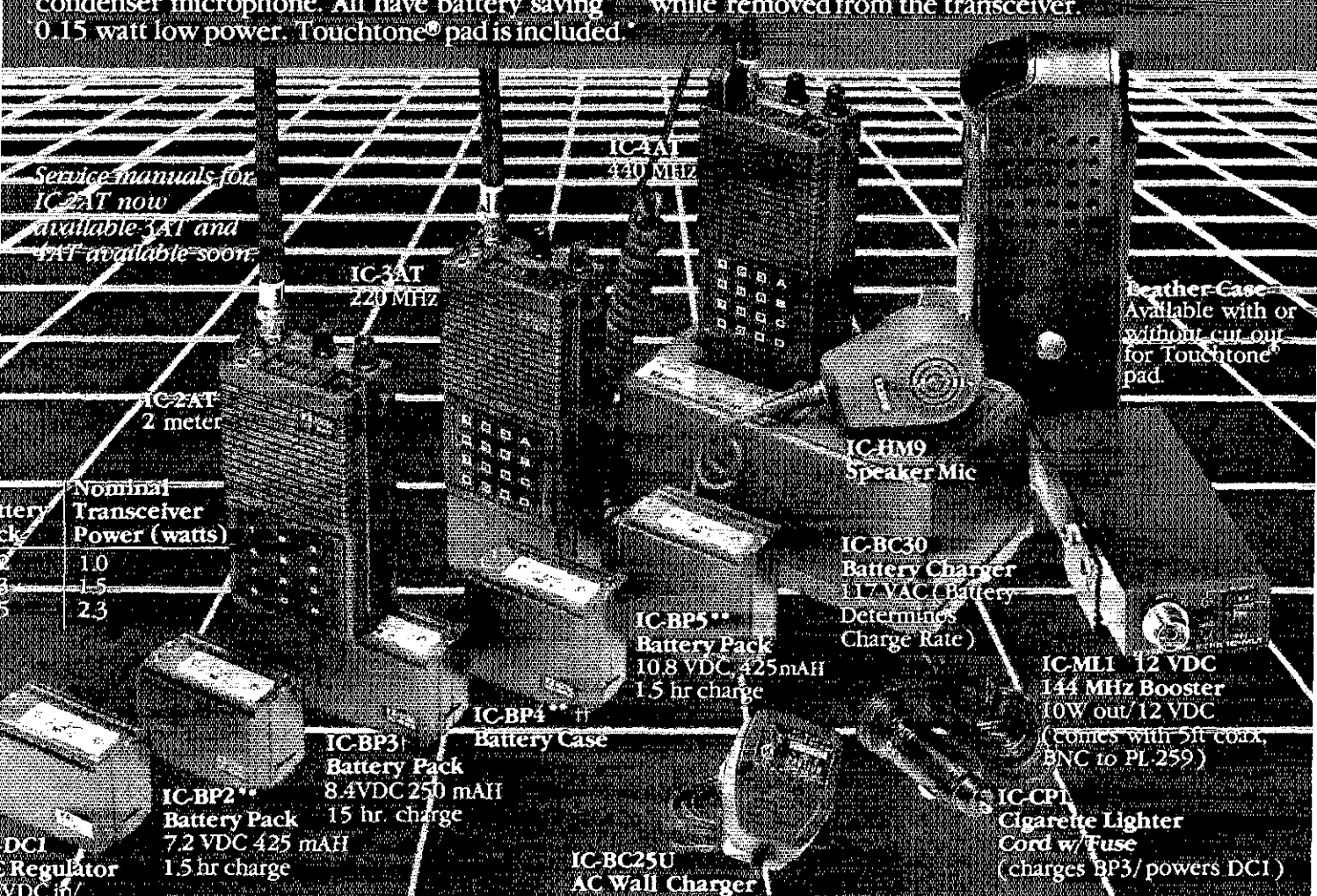
2 Meter, 220 or 440 MHz

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

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

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

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



Nominal Transceiver Power (watts)
1.0
1.5
2.3

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

DCI
Regulator
VDC in/
VDC out
comes with DC
d-2 will not get
wer from BC30)

** Also available without Touchtone® Pad*
*** Requires BC30 Charger*
† Will charge from BC30, BC25U, CP1, or 12 VDC Direct (pack is internally regulated)
†† Accept 6 AA size batteries - Alkaline or NiCd (Do not attempt to charge Alkaline batteries)

ICOM
The World System

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

ICOM IC-730

ICOM's Go-Anywhere HF Rig for Everyone's Pocketbook

Compact.

Only 3.7 in (H) x 9.5 in (W) x 10.8 in (D) will fit into most mobile operations (compact car, airplane, boat, or suitcase)

Affordable.

Priced right to meet your budget as your main HF rig or as a second rig for mobile/portable operation.

Convenient.

- Unique tuning speed selection for quick and precise QSY, choice of 1 KHz, 100 Hz or 10 Hz tuning.
- Electronic dial lock, deactivates tuning knob for lock on, stay on frequency operation.
- One memory per band, for storage of your favorite frequency on each band.
- Dual VFO system built in standard at no extra cost.

Full Featured.

- 200W PEP input—powerful punch on SSB/CW (40 W ou on AM)
- Receiver preamp built-in • VOX built-in
- Noise blanker (selectable time constant) standard
- Large RIT knob for easy mobile operation
- Amateur band coverage 10-80M including the new WARC bands
- Speech processor—built-in, standard (no extra cost)
- IF shift slide tuning standard (pass band tuning optional)
- Fully solid state for lower current drain
- Automatic protection circuit for finals under high SWR conditions
- Digital readout • Receives WWV • Selectable AGC
- Up/down tuning from optional microphone
- Handheld microphone standard (no extra cost)
- Optional mobile mount available

ICOM

2112 116th Avenue N.E., Bellevue, WA 98004
3331 Towerwood Dr., Suite 307, Dallas TX 75234

The Dynamic Duo

ICOM's 2 Meter and 440 MHz FM

IC-2AT IC-4AT

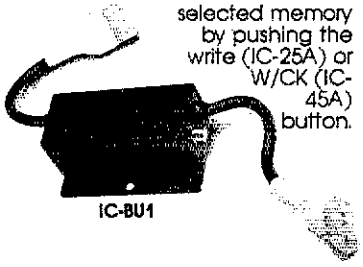
IC-25A IC-45A

25 watt/5 memories/2 scanning systems in a 2"H x 5½W x 7"D package is what has made the easy-to-use IC-25A the most popular 2 meter FM mobile transceiver ever. Now ICOM presents the second half of its mobile duo...IC-45A. The IC-45A covers 440-449.995 MHz. Both transceivers are supplied with touchtone™ microphones standard.

Dual VFO's. Dual VFO's give an extra stored frequency for scanning (memory scan scans 5 memories plus 2 VFO's) and each VFO has a different tuning rate for easy QSY.

	VFO A	VFO B
IC-25A	5 KHz	15 KHz
IC-45A	5 KHz	25 KHz

5 Memories. Instant access to most used frequencies. VFO A information is transferred to the selected memory by pushing the write (IC-25A) or W/CK (IC-45A) button.



IC-BU1

Priority Channel. Any memory channel may be monitored for activity on a sample basis, every 5 seconds, without disruption of a QSO conducted on a VFO frequency.

LED Bar Meter. Shows strength of received signal as well as relative transmitter output from the fully protected final RF amplifier. APC (automatic power control) is used to detect SWR and adjust the power output to a safe level.

Simplex/Duplex Operation. Standard 600 KHz offset initializes into radio at turn on. Offset may be changed by pressing the priority button while in VFO operation. Rotating the main tuning knob will now change the offset up or down and the offset will be displayed on the frequency readout.

Adjustable Power Levels.

	Hi Pwr	Lo Pwr
IC-25A	25 W	1 W
IC-45A	10 W	1 W

Pulling the squelch knob out places the unit into low power. Both the high and low power may be independently set to accomodate your simplex/repeater requirements or amplifier input characteristics.

Nor/Rev Capability. Use of this button on the IC-25A or the W/CK button on the IC-45A, in the duplex mode, allows one touch monitoring of the repeater input frequency. If simplex operation is possible you will know instantly.

Scanning. Pushing the S/S button initiates the scan circuitry. With the mode switch in a memory position the unit will scan all 5 memories plus the 2 VFO frequencies.

With the mode switch in a VFO position, the unit will scan the entire band or the portion of the band defined by memories 1 and 2. Full band scan or program band scan is selected from the front panel in the IC-25A, internally on the IC-45A.

Both units have internally switched scanning choices of adjustable delay period after a carrier is received then resume scan, or resume on carrier drop.

The Most Compact FM Mobiles on the Market. Fits in the smallest of places. Stacking, matching Mobile Mounts for complete mobile communications for your car.

Memory Backup. When the optional IC-BU1 backup power unit is installed on the back of the IC-25A or IC-45A, memory will be maintained while transferring the unit from power source to power source. If the unit is not removed from power, it will maintain memory even when turned off with or without the IC-BU1.

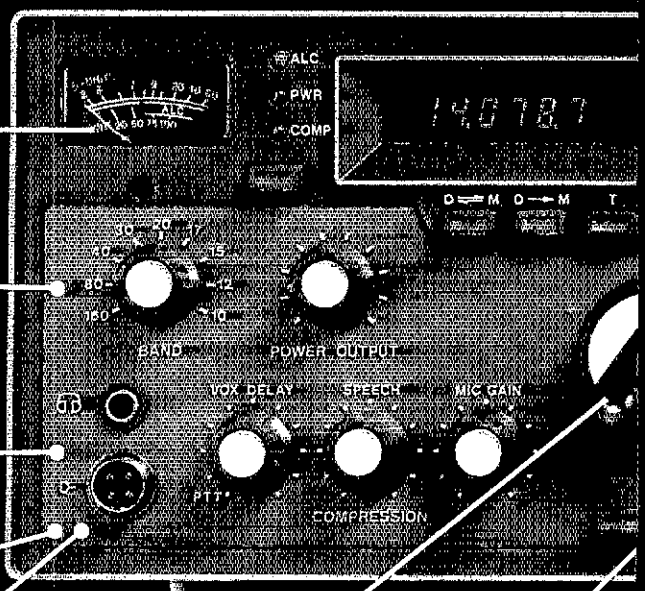
ICOM

The World System

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

More Transceiver

Heath's SS-9000 Deluxe Synthesized HF Transceiver is a quantum leap ahead in terminal-controllable communications gear. Streamlined for ultimate performance. Consummate in every design detail. Pacesetting amateurs will use it to set a new high standard for station and contest control.



Entirely solid-state, broadbanded in design. Delivers 100 watts out on SSB, CW and RTTY.

Built-in Motorized Bandswitch rotates band selector to the desired setting under remote control.

A *Terminal Interface* offers two-way communication between the Transceiver and an ASCII teletype, video terminal or computer through a rear panel RS-232C I/O port.

Commands are available to select, display and change the band, mode, all 27 memory and operating frequencies, passband shift, plus the band scanning and baud rates.

Also, set and toggle T/R/Tr status on the display, and freely manipulate the three frequencies on each band, with full diagnostic error-prompting.

Main tuning dial has optically-encoded shaft for smooth, linkage-free control and zero backlash.

Pushbutton up & down variable-speed scan traverses the band in 16 selectable rates, with 100 Hz final resolution and ultra-low drift.

There's more for the Ham at Heath

Heathkit

Heath Company

AM-133

than ever before

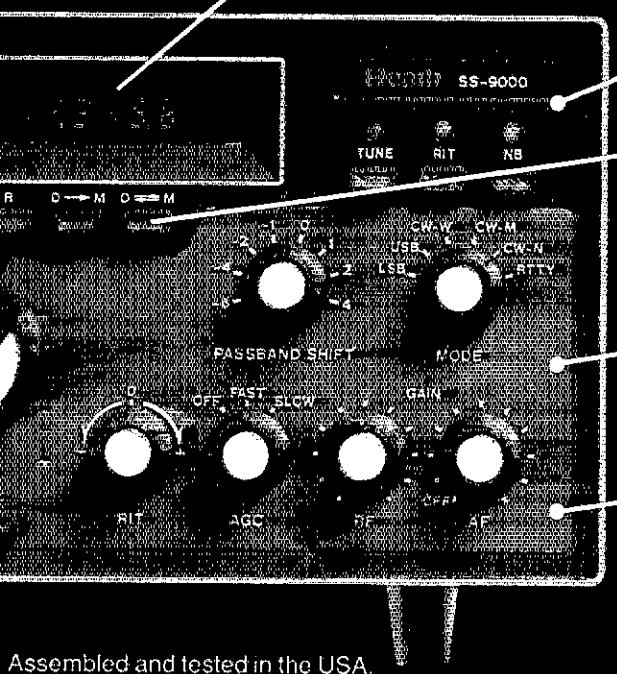
Unique dual digital display gives the smart operator multiplied advantage in frequency-handling speed and agility.

100% synthesized and microprocessor-based. A crystal controlled master oscillator provides exact PLL reference for super stability and repeatability.

Simultaneous readout of working frequencies. Pushbutton exchange with (and copy into) memory or opposite display permits instantaneous QSY.

256 bytes of on-board CMOS Random Access Memory accepts three inputs per band (preserved with battery backup) for a total of 27 frequencies to recall and work at will.

Superior over-current, thermal and high VSWR protection incorporated for safe, worry-free operation.



Assembled and tested in the USA.

The PS-9000 AC Power Supply with Speaker and independent 12/24-hour digital clocks (illustrated below) is a perfectly matched component.

MORE IN THE CATALOG

For complete details and specs, get a ***FREE*** Heathkit catalog. WRITE: Heath Company, Dept. 009-964, Benton Harbor, MI 49022. Or visit your nearby Heathkit Electronic Center.
See last page for nearest location.

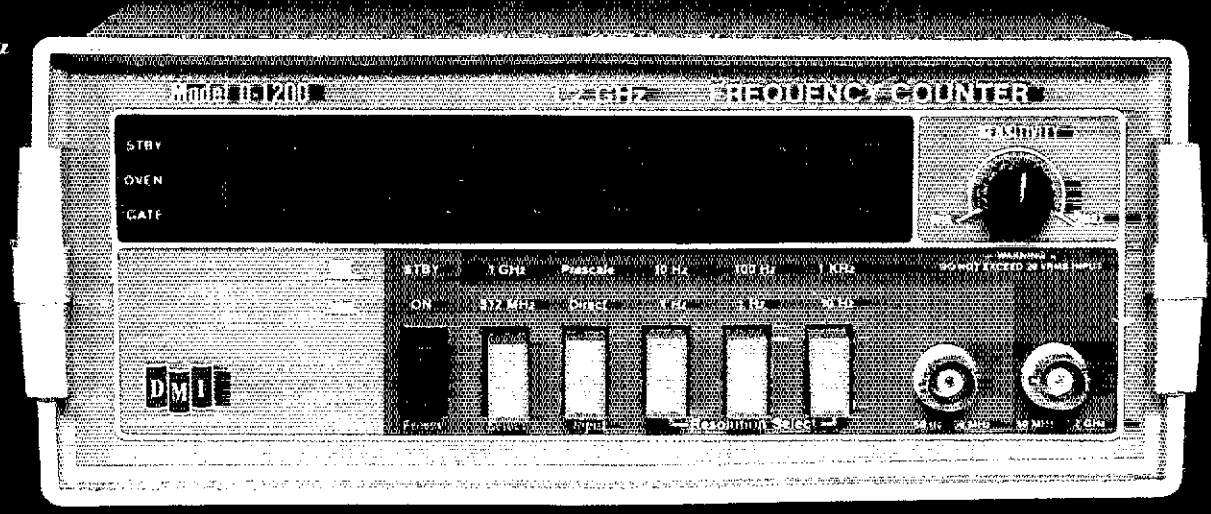
Add the Heathkit SA-1480 Remote Coax Switch. When changing bands, the proper antenna will be selected automatically.

DELIVERS DIGIMAX
MAXIMUM — PERFORMANCE — ACCURACY

50 Hz to 1.2 GHz

.1 PPM Accuracy

10 MHz Oven Osc.



MODEL D1200 INCLUDES — .001 Hz RESOLUTION — SENSITIVITY CONTROL — HANDLE

WHY BUY DIGIMAX?

The built-in .1 PPM TCXO 0° to 40°C 10 MHz proportional oven OSC. and bright .5 in. LED readouts make the D1200 or D612 ideal for solving all those difficult bench and field problems. When checking audio frequency tones the D1200 will resolve 1 Hz to 1000th Hz in ten sec., 1 to 100th Hz in 1 sec., and 1 to 10th Hz in only .1 sec. This is made possible by the built-in audio multiplier. D612 resolves 1 Hz in 1 sec. and 1 to 10th Hz in 10 sec. The D1200 also has a prescale input sensitivity control — and the models D612 & D1200 include a 512 MHz prescaler — which makes checking an 800 MHz mobile transmitter a snap. The D1200 and D612 will meet all FCC land mobile, broadcast, telecommunications requirements. In addition you may check Complex PLL TV tuner, VTR, and Computer CRT's. Plus they can help to meet your QSO on the correct frequency. Add a BAC-12 (20 Hr. 8 oz.) rechargeable battery pack and your counter is ready for field use. Rugged construction — High quality control systems — and 48 hr. burn-in testing helps to assure years of trouble free service.

Because we produce the most accurate frequency counter for the money — Because most models count to 1 GHz even 2 GHz standard prescaler — Because DigiMax models types have sold more than 45,000 units — Because DigiMax has the best quality specifications to price ratio in the industry — NOT Because if you write for any counter with lesser specifications than DigiMax offers, or pay $100 - $200 or even $300 more — You have simply made a mistake. We feel confident that when you compare DigiMax specifications & prices, you will discover for yourself that DigiMax instruments provides the best features for the price of any frequency counter manufacturer. Your choice is clear — Buy quality — Buy performance — Buy the newest — Buy DigiMax.

ALL MODELS MEET FCC LAND MOBILE BROADCAST TELECOMMUNICATIONS REQ.

— 512 MHz or 1 GHz — 1 PPM — PORTABLE — 1 MEG — 50 OHM INPUTS

5" x 5" x 1½"

The D500 will count from 50 Hz to 512 MHz — the D510 from 50 Hz to 1 GHz — the 500 series includes a 1 PPM 0° to 35°C TCXO — combined with the compact size and portability when a BAC-5 rechargeable battery pack is added — the 500 series becomes the perfect addition for any tool box, car, boat, or ham shack — plus they can help you meet your QSO on the correct frequency or check your transmitter frequency. The D500 will resolve 1 Hz to 50 MHz, 10 Hz to 500 MHz, and the D510 will resolve 100 Hz to 1 GHz. The excellent accuracy, high reliability, clean styling makes the D500 or D510 the perfect choice for that bench, tool box, or ham shack. Plus DigiMax's low cost will fit most any budget.

VISA

DEALER LOCATION — ORDERS — OEM
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5625 Kearny Villa Road
San Diego, CA 92123
California Call 714-569-6582

Prices and specifications subject to change without notice or obligation. TERMS: MC-VISA-Check or C.O.D. in U.S. funds. Please add 10% to a maximum of $10.00 for shipping, handling and insurance. Orders outside U.S.A. & Canada will require air freight collect. California residents add 6% Sales Tax.

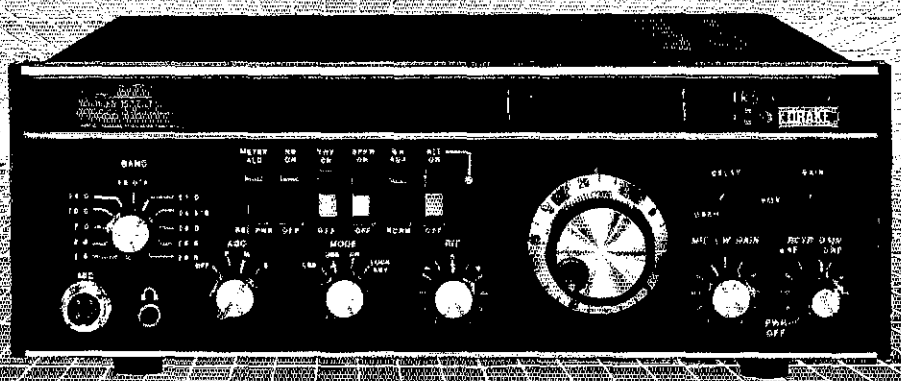
MODEL	PRICE	FREQUENCY RANGE	ACCURACY OVER TEMPERATURE	READ OUTS	SENSITIVITY TYP. 50 Hz to 25 MHz	SENSITIVITY TYP. 25 MHz to 400 MHz	POWER REQ.
D500	$149.95	50 Hz to 512 MHz	1 PPM 0° to 35°C TCXO	8	15 to 50 MV	20 to 50 MV 50 to 100 MV @ 1 GHz	8.5 VDC 300 MA ACT2
D510	$179.95	50 Hz to 1.0 GHz	TIME BASE				
D612	$259.95	50 Hz to 1.2 GHz	1 PPM 0° to 40°C PROPORTIONAL	8	15 to 50 MV	15 to 50 MV 50 to 75 MV @ 1 GHz	110 VAC 8.5 VDC 300 MA
D1200	$299.95	50 Hz to 1.2 GHz	10 MHz OVEN		5 to 50 MV		

AC-12 AC ADAPTER $8.95 — T-BNC-BASE $7.95 ANT. $8.95 — BAC-2 $24.95 — BAC-5 $69.95

DRAKE

TR5 Transceiver

1942-1982
Celebrating our 40th Anniversary in business
SPECIAL ANNIVERSARY PRICE
$799.95 Amateur Net



A NEW DIMENSION IN PERFORMANCE

• U.S. Made • Competitive Price • All Solid State • 12V DC • SWR Protected •
• Broadband • No Tune Up • Full Break-in CW • 150 Watts PEP, SSB or CW Input •
• High Dynamic Range • Excellent Sensitivity/Selectivity • Digital Readout •
• 160-10 Meters Plus WARC Bands and MARS Coverage*•

Front panel switching allows independent MODE and optional crystal filter selection.

A passive double balanced mixer is employed in the receiver front end. This stage is preceeded by a low noise high dynamic range bipolar rf amplifier to provide good, strong signal performance and weak signal sensitivity.

Accurate digital readout of operating carrier frequency is displayed to 100 Hz.

A rugged, solid-state PA provides continuous duty in SSB and CW modes. A cooling fan (FA7) is available for more demanding duty cycles, such as SSTV or RTTY. The PA also features very low harmonic and spurious output.

VOX GAIN, VOX DELAY, VOX disable, QSK, selectable AGC time constants, RIT and noise blanker selection are front panel controlled for ease of operation.

The TR5 is designed with modular construction techniques for easy accessibility and service.

GENERAL

Frequency Coverage: 1.8-2.0*, 3.5-4.0, 7.0-7.5, 10.0-10.5, 14.0-14.5, 18.0-18.5*, 21.0-21.5, 24.5-25.0*, 28.0-28.5*, 28.5-29.0, 29.0-29.7* MHz. (*With accessory range crystal).

Modes of Operation: Usb, Lsb, Cw.

Frequency Stability: Less than 1 kHz drift first hour. Less than 150 Hz per hour drift after first hour. Less than 100 Hz change for a ± 10% line voltage change.

Readout Accuracy: ± 10 ppm ± 100 Hz.

Power Requirements: 13.6 V-dc regulated, 2 A. 12 to 16 V-dc unregulated, 0.8 V rms maximum ripple, 15 A.

Dimensions:
Depth: 12.5 in (31.75 cm), excluding knobs and connectors.
Width: 13.6 in. (34.6 cm).
Height: 4.6 in. (11.7 cm) excluding feet.

Weight: 14 lb. (6.35 kg)

TRANSMITTER

Power Input *(Nominal):* 150 Watts, PEP or Cw.

Load Impedance: 50 ohms.

Spurious and Harmonic Output: Greater than 40 dB down.

Intermodulation Distortion: Greater than 30 dB below PEP.

Carrier Suppression: Greater than 50 dB.

Undesired Sideband Suppression: Greater than 60 dB at 1 kHz.

Duty Cycle:
Ssb, Cw: 100%.
Lock Key (w/o FA7 Fan): 30%, 5 minutes maximum transmit.
Lock Key (w/FA7 Fan): 100%.

Microphone Input: High Impedance.

Cw Keying: Instantaneous full break-in, adjustable delay.

RECEIVER

Sensitivity: *Less than 0.5 uV for 10 dB S+N/N* except less than 1.0 uV, 1.8-2.0 MHz.

Selectivity: 2.3 kHz minimum at −6 dB, 4.1 kHz maximum at −60 dB (1.8:1 shape factor).

Ultimate Selectivity: Greater than −95 dB.

Agc: Less than 5 dB output variation for 100 dB *input signal change, referenced to agc* threshold.

Intermodulation: (20 kHz or greater spacing) *Intercept Point:* Greater than 0 dBm. *Two-Tone Dynamic Range:* Greater than 85 dB.

I-f Frequency: 5.645 MHz.

I-f Rejection: 50 dB, minimum.

Image Rejection: 60 dB, minimum below 14 MHz. 50 dB, minimum above 14 MHz.

Audio Output: 2 watts, minimum @ less than 10% THD (4 ohm load).

Spurious Response: Greater than 60 dB down.

ACCESSORIES AVAILABLE

Model 7021 SL300 CW Filter	Model 7026 SL4000 AM Filter	Model 1531 MS7 Speaker
Model 7022 SL500 CW Filter	Model 7024 SL6000 AM Filter	Model 1507 CW75 Keyer
Model 7027 SL1000 RTTY Filter	Model 1570 PS75 AC Power Supply	Model 1558 NB5 Noise Blanker
Model 7023 SL1800 RTTY Filter	Model 1545 RV75 Synthesized Remote VFO	Model 7077 Microphone

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B108 10W in=80W out $179.95
(1W=15W, 2W=30W) RX preamp

B1016 10W in=160W out $279.95
(1W=35W, 2W=90W) RX preamp

B3016 30W in=160W out $239.95
(useable in: 15-45W) RX preamp

220 MHz ALL MODE

C106 10W in=60W out $199.95
(1W-15W, 2W=30W) RX preamp

C1012 10W in=120W out $289.95
(2W=45W, 5W=90W) RX preamp

C22 2W in=20W out $89.95
(useable in: 200mW-5W)

RC-1 AMPLIFIER REMOTE CONTROL $24.95
Duplicates all switches, 18' cable

WATT/SWR METERS

- peak or average reading
- direct SWR reading

MP-1 (HF) 1.8-30 MHz
MP-2 (VHF) 50-200 MHz
$119.95

430-450 MHz ALL MODE

D24 2W in=40W out $199.95
(2W=25W)

D1010 10W in=100W out
(½W=24W, 1W=70W) $319.95

Available at local dealers throughout the world.

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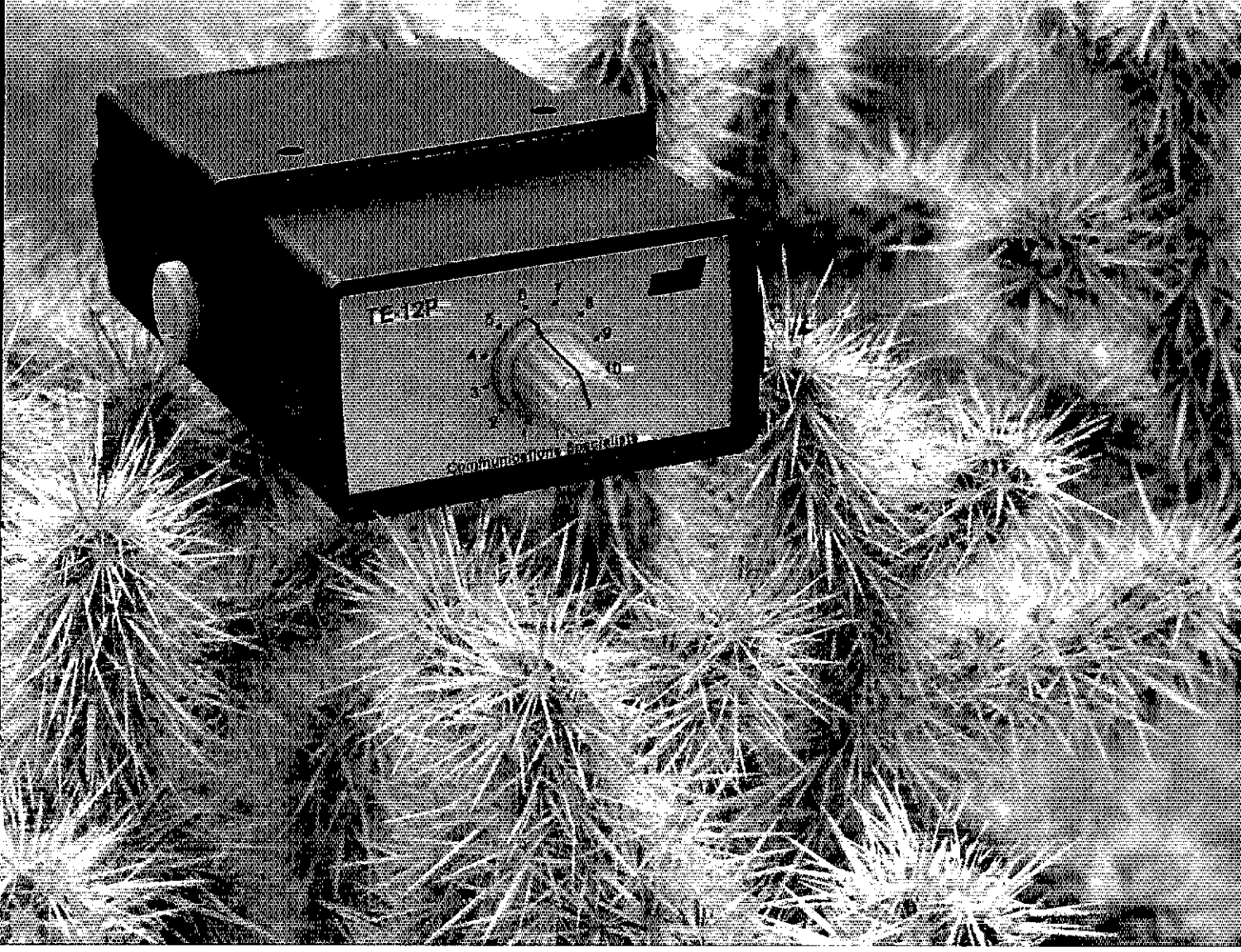
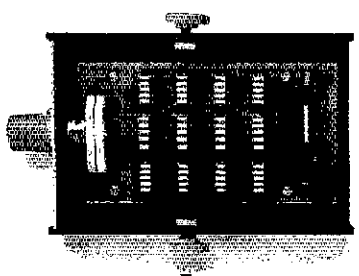


Stuck with a problem?

Our TE-12P Encoder might be just the solution to pull you out of a sticky situation. Need a different CTCSS tone for each channel in a multi-channel Public Safety System? How about customer access to multiple repeater sites on the same channel? Or use it to generate any of the twelve tones for EMS use. Also, it can be used to access Amateur repeaters or just as a piece of versatile test equipment. Any of the CTCSS tones may be accessed with the TE-12PA, any of the audible frequencies with the TE-12PB. Just set a dip switch, no test equipment is required. As usual, we're a stickler for 1day delivery with a full 1 year warranty.

- Output level flat to within 1.5db over entire range selected.
- Immune to RF.
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak.
- Instant start-up.



TE-12PA

67.0 XZ	85.4 YA	103.5 1A	127.3 3A	156.7 5A	192.8 7A
71.9 XA	88.5 YB	107.2 1B	131.8 3B	162.2 5B	203.5 M1
74.4 WA	91.5 ZZ	110.9 2Z	136.5 4Z	167.9 6Z	
77.0 XB	94.8 ZA	114.8 2A	141.3 4A	173.8 6A	
79.7 SP	97.4 ZB	118.8 2B	146.2 4B	179.9 6B	
82.5 YZ	100.0 1Z	123.0 3Z	151.4 5Z	186.2 7Z	

- Frequency accuracy, ±.1 Hz maximum −40°C to +85°C
- Frequencies to 250 Hz available on special order.
- Continuous tone

TE-12PB

TEST-TONES:	TOUCH-TONES:		BURST TONES:			
600	697	1209	1600	1850	2150	2400
1000	770	1336	1650	1900	2200	2450
1500	852	1477	1700	1950	2250	2500
2175	941	1633	1750	2000	2300	2550
2805			1800	2100	2350	

- Frequency accuracy, ±1 Hz maximum −40°C to +85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

$89.95

COMMUNICATIONS SPECIALISTS

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The ultimate team...the new Drake "Twins"

The TR7A and R7A offer performance and versatility for those who demand the ultimate!

TR7A Transceiver

• **CONTINUOUS FREQUENCY COVERAGE** — 1.5 to 30 MHz full receive coverage. The optional AUX7 provides 0 to 1.5 MHz receive plus transmit coverage of 1.8 to 30 MHz, for future Amateur bands, MARS, Embassy, Government or Commercial frequencies (proper authorization required).

• **Full Passband Tuning (PBT)** enhances use of high rejection 8-pole crystal filters.

New! Both 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity are standard, plus provisions for two additional filters. These 8-pole crystal filters in conjunction with careful mechanical/electrical design result in realizable ultimate rejection in excess of 100 dB.

New! The very effective NB7 Noise Blanker is now standard.

New! Built in lightning protection avoids damage to solid-state components from lightning induced transients.

New! Mic audio available on rear panel to facilitate phone patch connection.

• **State-of-the-art design** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provided a no tune-up, broadband, high dynamic range transceiver.

R7A Receiver

• **CONTINUOUS NO COMPROMISE 0 to 30 MHz frequency coverage.**

• **Full passband tuning (PBT).**

New! NB7A Noise Blanker supplied as standard.

• **State-of-the-Art features** of the TR7A, plus added flexibility with a low noise 10 dB rf amplifier.

New! Standard ultimate selectivity choices include the supplied 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity. Capability for three accessory crystal filters plus the two supplied, including 300 Hz, 1.8 kHz, 4 kHz, and 6 kHz. The 4 kHz filter, when used with the R7A's Synchro-Phase a-m detector, provides a-m reception with greater frequency response within a narrower bandwidth than conventional a-m detection, and sideband selection to minimize interference potential.

• **Front panel pushbutton control** of rf preamp, a-m/ssb detector, speaker ON/OFF switch, i-f notch filter, reference-derived calibrator signal, three agc release times (plus AGC OFF), integral 150 MHz frequency counter/digital readout for external use, and Receiver Incremental Tuning (RIT).

The "Twins" System

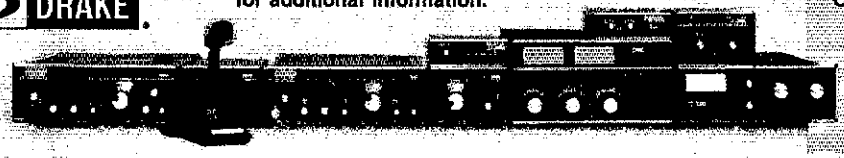
• **FREQUENCY FLEXIBILITY.** The TR7A/R7A combination offers the operator, particularly the DX'er or Contester, frequency control agility not available in any other system. The "Twins" offer the only system capable of no-compromise DSR (Dual Simultaneous Receive). Most transceivers allow some external receiver control, but the "Twins" provide instant transfer of transmit frequency control to the R7A VFO. The operator can listen to either or both receiver's audio, and instantly determine his transmitting frequency by appropriate use of the TR7A's RCT control (Receiver Controlled Transmit). DSR is implemented by mixing the two audio signals in the R7A.

• **ALTERNATE ANTENNA CAPABILITY.** The R7A's Antenna Power Splitter enhances the DSR feature by allowing the use of an additional antenna (ALTERNATE) besides the MAIN antenna connected to the TR7A (the transmitting antenna). All possible splits between the two antennas and the two system receivers are possible.

Specifications, availability and prices subject to change without notice or obligation.

DRAKE

See your Drake dealer or write for additional information.



COMING SOON: New RV75 Synthesized VFO Compatible with TR5 and 7-Line Xcvrs/Rcvrs

• Frequency Synthesized for crystal-controlled stability • VRTO (Variable Rate Tuning Oscillator*) adjusts tuning rate as function of tuning speed. • Resolution to 10 Hz • Three programmable fixed frequencies for MARS, etc. • Split or Transceive operation with main transceiver PTO or RV75

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* Patent pending

RIGHT AWAY, YOU CAN SEE THE DIFFERENCE

With a suggested retail price of $649.50 the Ameritron AL-80 is one of the lowest priced kilowatt amplifiers in America. Stop at your dealer's and take a look. You will instantly see the kind of features that make the AL-80 so different:

- Extremely compact size measures 12" W x 6.6" H x 13.8" D.
- For CW and computer enthusiasts the AL-80 is the only amplifier in its price range to offer QSK full break-in.
- The AL-80 incorporates the most rugged amplifier tube, the 3-500Z.
- Individually tuned pi network, broad banded tuned input providing a perfect 50 ohm resistive load to the transceiver.
- Complete coverage of the new WARC bands.

With the ever sunspot activity now more than ever, your signal will need a shot of adrenaline from the AL-80. *It can actually make legal limit exciting!*

AL-80 Specifications and Features:

Frequency coverage: 1.8-21.5 MHz amateur bands. [illegible]

[illegible]

QSK: full break-in CW

Drive requirements: typically 65W PEP on SSB and 55W on CW

Input impedance: 50 ohms, tuned input, low pass pi network type

Output impedance: adjustable pi network, matches 50-100 ohm line with SWR of 2:1 or less

Intermodulation distortion products: in excess of −33 dB below PEP

Power requirements: 240 volts 50/60 Hertz 10 amperes, or 120 volts 50/60 Hertz 20 amperes

Tube: one 3-500Z triode included with amplifier

Dimensions: 12" W x 6.6" H x 13.8" D

Weight: 43 lbs.

One Year Limited Warranty

Significantly exceeds FCC regulations.

Suggested retail: $649.50

AMERITRON INC
3? Maple Drive
Hudson, Ohio 44236
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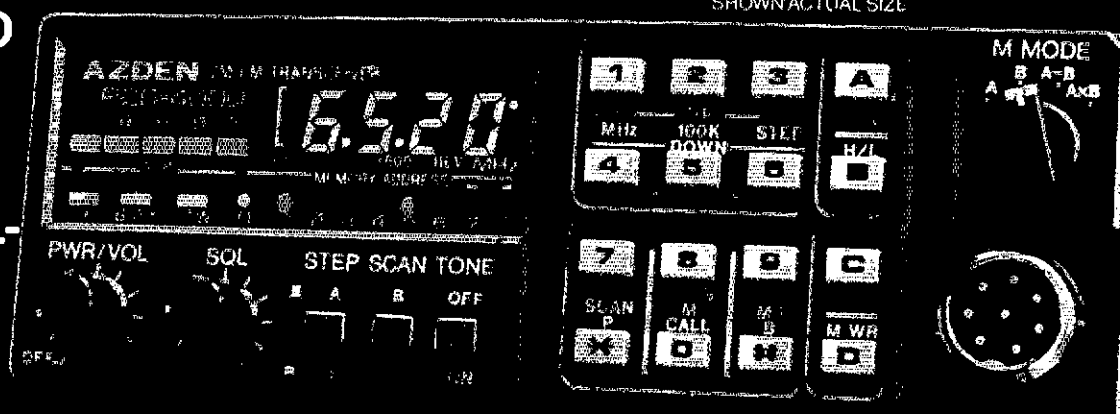
New!

AZDEN® PCS-4000

Small-yet so Sophisticated.... so Advanced-there is No Comparison

FEATURES SO UNIQUE AND OF SUCH SUPERIOR COMMERCIAL-GRADE QUALITY, THAT...

SHOWN ACTUAL SIZE



IT CARRIES A 1 YEAR LIMITED WARRANTY!

- **8 MHZ COVERAGE, CAP/MARS BUILT IN:** 142.000-149.995 MHz in selectable steps of 5 or 10 kHz. **COMPARE!**
- **TINY SIZE:** Only 2" H x 5.5" W x 6.8" D! **COMPARE!**
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NON-STANDARD SPLITS:** Ultimate versatility for CAP/MARS. **COMPARE!**
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard offset.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. **COMPARE!**
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. **COMPARE!**
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency.
- **TWO PRIORITY MEMORIES:** Either may be instantly recalled at any time. **COMPARE!**
- **NICAD MEMORY BACKUP:** Never lose the programmed channels!
- **FREQUENCY REVERSE:** The touch of a single button inverts the transmit and receive frequencies, no matter what the offset.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting.
- **PL TONE:** Optional PL tone unit allows access to PL repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and fidelity.
- **25 WATTS OUTPUT:** Also 5 watts low power for short-range communication and battery conservation. (Transmitter power is fully adjustable)
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV for 20-dB quieting. Audio circuits are designed to rigorous specifications for exceptional performance, second to none. **COMPARE!**
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! **COMPARE!**
- **OTHER FEATURES:** Dynamic microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses and hardware are included.
- **ACCESSORIES:** CS-6R 6-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE-YEAR LIMITED WARRANTY!**

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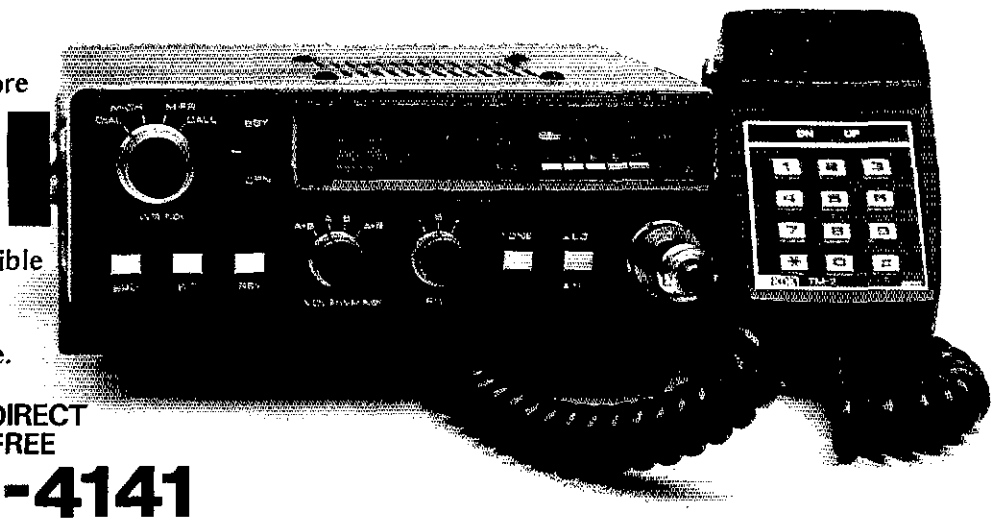

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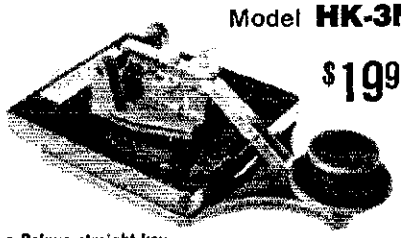

- **Deluxe straight key**
- **Heavy base. No need to attach to desk**
- **Navy type knob**

CC-3P shielded cable & plug for HK-3M **$1.50**

Model **HK-1** **$24.95**

- **Dual lever squeeze paddle**
- **For use with all electronic keyers**

Model HK-2 Same as above less base **$15.95**

CC-1P shielded cable & plug for HK-1 **$2.00**
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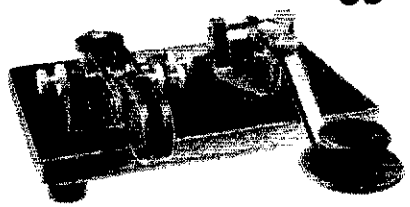
Model **HK-4** **$39.95**



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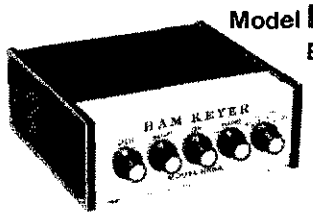
Model **HK-5A** Electronic Keyer **$49.95**



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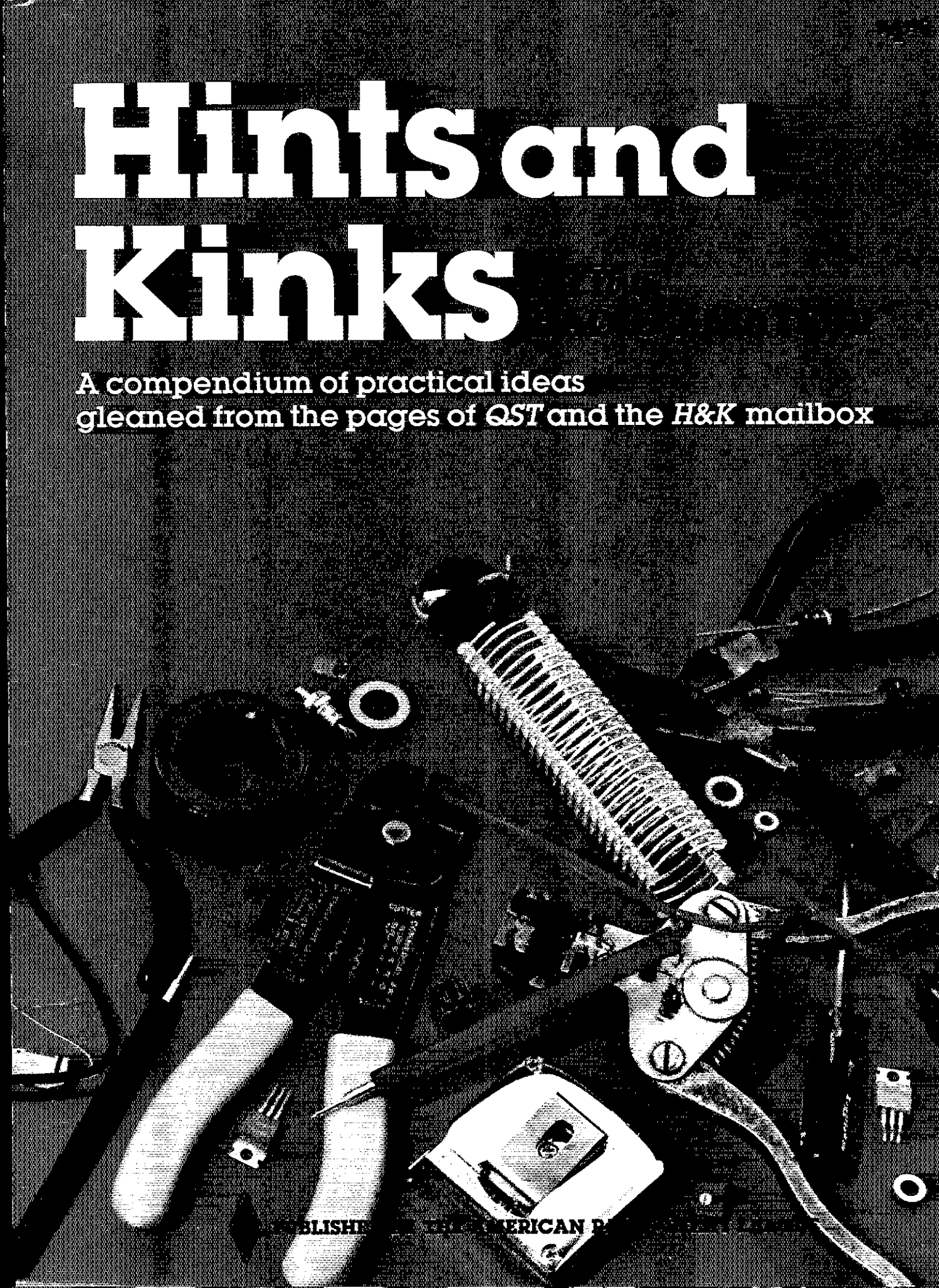
Hints and Kinks

A compendium of practical ideas gleaned from the pages of *QST* and the *H&K* mailbox



PUBLISHED BY THE AMERICAN RADIO

Thru the magic of journalism, I'm recovering from SET here in the middle of Oct., but knowing I should be saying "Seasons Greetings" in this article. Most of the year this time shift is unimportant but Xmas is special to me, so ignoring the temporal disparity (see Webster's Unabridged), let me wish all of you a very Merry Christmas from Dot, Ken and myself. Now, back to October. Our SET exercise has yet to be evaluated but it is obvious that NC has an abundance of operators who are ready and willing to serve in an emergency. A lot has been learned — a lot of holes have to be plugged — but it seems to me our SEC is moving toward a workable statewide emergency plan. My thanks to those ECs who gave of their time and energies. Now, I need your help, All of you. In various past issues of QST, the new field organization has been examined, defined and explained. As we approach the NEW YEAR, we have some options to look at. As SCM, I have the option of implementing the new plan now or allowing it to take effect after election of the next SCM/SM. You have the option of letting me know your feelings on the implemented schedule. If you are unsure, read or reread K1ZZ's article in June QST. An easy way to get your message to me is to put a club oriented editorial in your club's newsletter. I read 'em all, folks. Of course, you can write me direct if you wish. For the record, I'd like to make two points. First, I took the job of SCM, not SM, and it seems a little presumptuous to change nature and scope of my job without your approval. Second, the Section already has ongoing programs incorporating a lot of the jobs proposed under the new system. But it's your section. How do you feel about it? Traffic: K4GCN 577, WD4CNQ 312, WB4WII 270, KU4W 171, KD4PJ 128, W4EAT 115, AB4S 98, WA4OBR 79, NJ4K 71, KA4KJI 49, NE4J 48, WD4LRG 45, WB4CYN 42, WA4SRD 36, N4CJJ 34, N4CYG 33, KZ4A 32, KA4DHP 30, W8JUP 28, WD4EIQ 25, KA4LKF 20, NB4L 18, W4RVE 16, WD4LOO 10, W4WXZ 6, WD4BCX 5, WB4SLF 4, N4UE 4.

SOUTH CAROLINA: SCM, Jimmy Walker, WD4HLZ — ASCM: WB4UDK. SEC: K4SUG. STM: W4ANK. NMs: K4PFC WB4SOD NJ4L AB4S. SC amateurs were represented by K4EAR during the evacuation in Charlotte. He was drafted into service while attending a meeting of the Mecklenburg ARS. Hams in our section were called to action Sept. 11 at 1800Z for our yearly SET. Up to 100 amateurs throughout the state participated in a drill to provide communication for NOAA weather offices during a simulated hurricane. It was a very good drill that pointed out deficiencies that we can work on for the next drill. Congrats to all for a job well done. NMs and ECs: Don't forget your reports for the SET. SCSSB 1236/111, SCNT 324/79, Blue Ridge 1773/62, Greater Pee Dee 990/109, Western Carolina 333/21, York 265/53, Carolina State Line, 57/1 Newberry 50/3. Traffic: K4ZN 179, W4ANK 167, W4NTO 140, KA4AUR 108, KE4QZ 83, W4FMZ 71, K4FRX 43, WB4UDK 40, KA4LRM 34, KE4WC 30, K4ZB 23, WD4FJP 12, W4DRF 8.

VIRGINIA: SCM, Phil Sager, WB4FDT — ASCM: K3RZR. STM: KY4K. SEC: WB4UHC. Chief OBS: K3RZR. Chief OO: W4HU.

VNTN	7260 kHz	Noon	WD4FTK
VSBN	3947 kHz	6:00 P.M.	W4NWM
VSN	3680 kHz	6:30 P.M.	K4VWK
VN early	3680 kHz	7:00 P.M.	K4JST/W3ATQ
Va RTTY Net	3630 kHz	7:30 P.M.	TTh
VN late	3680 kHz	10:00 P.M.	K4JST/W3ATQ
VLN	3947 kHz	10:15 P.M.	WD4ALY

A total of 4717 traffic points were accumulated by Virginia amateurs during Sept. Congrats to WB4PNY on earning BPL during August. VRN manager KA4ERP reports the first 6 sessions of the RTTY net had 19 QNI and 2 QTC. SVEN had 42 QTC and 533 QNI, and STARES reported 38 QTC and 649 QNI. WD4ALY leads the pack this month with a PSHR total of 108, followed by K4JST with a 107 total. Other PSHR were WA4CCK K4VWK NN4I NW4O WA1VRL KA3DTE NT4U W4LXB WB4UHC and KA4ERP. Welcome new DEC N4EXQ, and new ECs N4CFA in Prince Edward, K4IXL in Appomattox, WB4UOI in Henrico, N4EAY in Richmond City, NM4L in Washington, KA4WBW in Nottoway, W4WWD in Cumberland, K4MR in Middlesex, and N4BJX in Chesterfield. The state Office of Emergency Services (OES) and the Red Cross gave high marks to amateur participation in a mock nuclear crisis at the North Anna power plant Sept. 18th. The Virginia ARC celebrated its fifty-third anniversary with a banquet on Nov. 12th. WB4NNO says he lives in New York, has two kids, and his new call is KU2N. The Virginia State Convention, also known as the Tidewater Hamfest and Computer Show, was host to a very large group of traffic net members. Traffic: W3ATQ 453, WA4CCK 390, WD4FTK 306, K4JST 267, WB4PNY 245, WA4LJI 235, WD4ALY 217, K4KDJ 154, KA3DTE 151, NN4I 141, AA4AT 135, N4EPO 102, W3BBN 87, WB4FLT 87, W4NWM 85, N4YQ 84, KB4PW 74, W3BBQ 70, NW4O 67, K3RZR 64, W4UQ 64, KY4K 61, NT4U 54, NT4S 51, K4VWK 49, WD4CNG 44, KA4IUM 43, WB4UHC 34, KC4HN 32, W4NFA 32, KA4JXZ 27, KB4OG 27, W4PVA 26, KI4W 26, KA4ERP 26, WB4FDT 25, N4FNT 25, WA1VRL 22, K4JM 17, K4MLC 17, WB4ODZ 15, WB4DOZ 14, WB2OMZ 14, N4LE 10, W4LXB 10, W4KXE 9, NC4B 8, WB4KIT 8, WA4TVS 8, N3RC 7, N4BJX 6, W4TZC 6, W4OKN 4, K@JH 3, W4DM 2. (Aug.) WB4PNY 507, N4NFA 9.

WEST VIRGINIA: SCM, Karl S. Thompson, K8KT — STM: KD8G, SEC: K8QEW. Rptr coordinator: WD4KHL. Congrats to KA8QDO new ham at Bridgeport. WB8VAZ and KA8GHF are new OBS. Nice attendance at state radio council mtg. on Oct. 16. WV hams assisted the CAP with their annual exercise on Oct. 2. K8BS K8QEW N8AJC and KB8ZM coordinated statewide activities. WB8YJJ, EC Nicholas Co, was on the air at the crash site. As usual the hams did a bang up job. Seasons Greetings to all from K8BT and myself, and thanks to all for the cooperation during 1982.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVFN	3990	6:00	759	76	29	N8AJC
WVN	3567	7:00	98	21	25	W8LYV
Midday	7235	Noon	335	38	28	W8FZP
KARC	28/88	8:30 Sn	73	4	4	N8DTN
KFC	87/47	8:30 M	95	1	4	WD4KHL

Traffic: KA8GHF 70, K8KT 65, N8AJC 53, K8QEW 33, KQ8CR 26, KD8G 26, N8DTN 25, WA8KCJ 25, KV8T 12, K8JQ 8, N8CFY 7, WB8ZMX 6, W8CAL 5.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Lawrence E. Steimel, W@ACD — SEC: K3PUR. STM: WD@AIT. NMs: WD@AIT W@HXB W@LAE WA@RYL. Emergency coordinators use various ways to test their units for emergency capabilities, response time and ability to handle large volumes of traffic. The Eagle Co. EC N@ACW chose to see if the

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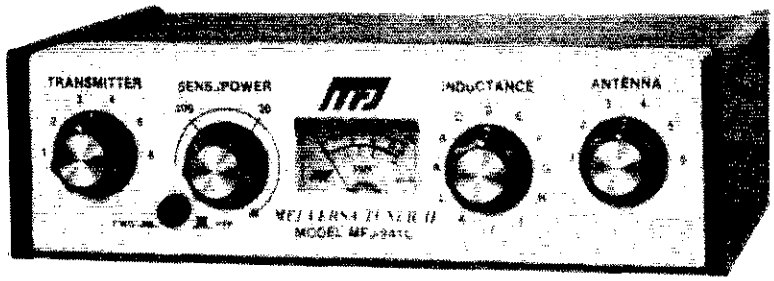
MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.



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Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

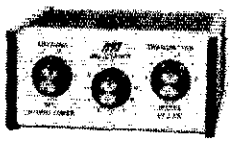
Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+ $4), like 941C less balun. **MFJ-945, $79.95** (+ $4), like 941C less antenna switch. **MFJ-944, $79.95** (+ $4), like 945, less SWR/Wattmeter. **MFJ-943, $69.95** (+ $4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER



MFJ-900

$49.95 (+ $4)

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $59.95 (+ $4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+ $4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B

$139.95 (+ $4)

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962

$229.95 (+ $10)

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+ $10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV

MFJ-984

$329.95 (+ $10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

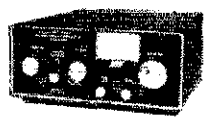
18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $239.95 (+ $10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+ $10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+ $10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V



MFJ-989

$329.95 (+ $10)

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf 6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

Built-in lighted 2% meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

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amateurs could cope with a large volume of traffic. He organized thirty amateurs, and used the Jerry Ford Golf Tournament in Vail on 13 & 14 Sept. to generate the high volume of traffic. This turned out to be 2400 messages in two days, all handled on one two-meter rptr in the local area. It was a very well conducted exercise under the strict discipline of NØACW as net control and the excellent operating practices of the thirty operators. This proves that a group of amateurs can band together and do a fine job. As there were not enough amateurs in Eagle Co. for this project they came from the four corners of the section. This was a real test of cooperation among all amateurs in the section. Thanks fellows and gals. Colombine sess. 26, QNI 954, QTC 76, Inf 213, QNF 998. CWN sess. 29, QNI 215, QTC 206, QNF 788. HNN sess. 26, QNI 1586, QTC 104, Inf 246, QNF 1358. Traffic: NØBQP 2360, WAØHJZ 1304, WØACH 862, WØACD 744, NØCXI 284, KØDJ 274, WØEJD 205, WDØAIT 152, WBØNHA 111, WØLAE 102, WØNFW 47, KAØNLI 42, KØTIV 38, ADØJ 26, WØLQ 25, WØGW 10. (Aug.) WDØAIT 114, WØNFW 44, KØTIV 31.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. STM: KV5U. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 3.583 at 1930 local and handled 182 msgs with 230 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 at 0100 UTC and handled 97 msgs with 979 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 89 msgs with 828 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 10 msgs with 876 checkins. Caravan Club 2-Mtr Net 66/06 handled 11 msgs with 148 checkins. Abq. ARC enjoyed a nice picnic at K5CQH's. Santa Fe ARC held a swapfest at Hyde Park. FB newsletter from the Mesilla Valley RC. K5BN home fm hospital. Traffic: W5DAD 204, KV5U 175, W5JOV 169, W9OBV 165, W5ENI 71, KB5LI 44.

UTAH: SCM, L. M. Norman, W7PBV — SEC: WB7BZJ. STM: W7OCX. Utah VHF Society voted to convert to 20 kHz spacing over a period of the next two years. N7DBU handling TWN traffic. W7JBW K7QEQ WB7VWA and N7EFV operated a solar-event station. Kessler Peak rptr was on 84/24, now 146.38/146.98. Ogden autopatch was on 47/87, now on 146.08/.68. UARC's 01/61 now on 146.02/62. WA7YZR advises his 147.81/21 does not has autopatch. N7DBU is CHOP of the Orem HS club station. W7YAI is on RTTY. Traffic: WA7KHE 109, WA7JJL 78, WA7MEL 67, WB7UJP 53, KN7U 20, W7RO 16, W7OCX 14, WB5TJP/7 14, W7PBV 12, KO7H 11.

WYOMING: SCM, Dick Wunder, WA7WFC — SEC: WB7EIN. STM: WØOGH. Those interested in volunteering for any of the Leadership positions in this section, please contact your SCM for information. Recent upgrades include WB7WVO to ADV. & KA7AIT to GEN. KA7OJD is new Novice. Congrats to all. WB7NHR reports the Wyo. Cowboy Net held 22 sessions with 684 QNI & 20 QTC. WAØPFJ reports the Wyo. Jackalope Net held 24 sessions with 476 QNI & 0 QTC. The Wyo. Traffic Net should be in full swing and is looking for checkins and traffic. Seasons Greetings and best wishes to you all from Sandy and myself. Traffic: WB7NHR 191, W7SQT 45, K7SLM 28.

SOUTHEASTERN DIVISION

ALABAMA: SCM, H. H. Wheeler, W4IBU — STM: WA4PIZ. SEC: N4DMA. ASCM: KA4WVU. W4IBU will, on the basis of a second medical opinion, continue as SCM. WA4RNP will be appointed as ASCM as of 10/11/82. WA4RMP retires as Operations Mgr, United Airlines, Huntsville on 10/8/82. Happy retirement! The Anniston hamfest was a pleasure to attend. Many upgraded at the FCC exams. Congrats to all. K4VIZ now an Extra Class! SEC N4DMA is printing a newsletter, quarterly, to be sent to all DECs and ECs as well as to cd officials. Lend a hand! New ECs appointed are WD4JNL for Calhoun Co. and N4HTG for Shelby Co. Special Service Clubs may be activated as early as 1 January. Is your club ready to qualify? Alabama cw nets looking for checkins. With establishment of Section Manager several new appointments will be available. If you can help let me hear from you. Please! Some who hold appointments are failing to make monthly reports. Contact your SEC and STM regularly! Watch for NPRM from FCC concerning maximum power reduction. Watch *QST* for new Field Organization rules and regs. Alabama represented on CAND 100% by W4CKS. Also represented 100% on DRN5 by WA4JDH W4CKS W4IBU KC4GS W4WJF W4YRO & KD4KT. Traffic: WA4JDH 708, W4CKS 123, WA4LXP 60, W4IBU 30, NW4X 25, KA4IJT 24, WA4JPK 22, WB4IXA 15, K4GXS 12, N4HIR 12, W4DGH 8, WA4HRV 8, K4HJX 6, KE4WF 6, WA4SLZ 5, WB4TVY 4, K4UMD 4.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM: K4VHC. SEC: WB4HXE. ASEC: K4SWJ. STM: W4WXA. Chief OBS: W4BIA. First of all, I want to thank all in the section for the very fine cooperation given me during the past year. Our emergency system throughout the state can be activated immediately, our state & local nets have good participation and mainly the fellowship amongst all you hams makes it all possible. The Atlantic ARC elected: WA4PNY, pres.; W4ZUE/WA4WKC (YL — OM team), v.p.; KB4XO, secy.; KC4MJ, treas. The GSSB Assn election at Warner Robins elected: KF4EH, pres.; K4DNH, v.p.; W4NKL, treas.; W4GH & WB4LBM, dirs. The GCN reelected W4HON as NM & WA4IQU as Sec/Treas. The 1982 hamfest season is over. Again I remind all who are planning one in 1983 to please send all the info a.s.a.p. to W4RH, our S.E. Director, so if there's any conflict you will be made aware of it. W4GH spends almost all of his retired time recording for the blind amateurs. He was written up in *Worldradio* for his many endeavors. Congrats. I have no idea on how many public service events were put on in the section during 1982, but there many. I wish that each club or organization would send me a report next year so we can total them up. The citizens of Georgia know that they can rely on the radio amateur during emergencies. 1982-83 officers for BGMRC (Newnan) are: WD4PAG, pres.; K4VHC, v.p.; KA4YGY, secy./treas.; WD4PTH, act. mgr. One of the most important items during an emergency is some sort of identification besides your ticket. See your local police, sheriff, cd director or other officials so they can issue an ID card or badge that will let you into an emergency area. As we close this year the "best of Season's Greetings" to all. Traffic: W4WXA 153, K5TF 130, WB4NTW 120, K4EV 48, K4NM 47, W4PIM 44, K4JNL 43, W4FIZ 40, KA4ATM 33, W4HON 18, W4BIA 11, W4IZI 10, N4BIM 9, K4PIK 6, AA4EI 2, K4BAI 1.

NORTHERN FLORIDA: SCM, Billy Williams, N4UF — SEC: W4UEA. STM: WD4HIF. ASEC: KE8O. N4ADI has been appointed as ARRL Affiliated Club Liaison for NFL. N4PL got a write-up complete with picture in the Ormond Beach *News & Observer*. Showed him handling

messages at his stn. New officers of Jax RANGE Assn. are: KE4QV, pres.; NO4A, v.p.; WB4EEK, sec.; WA4HGO, treas.; WD4PFN NF4L N4UF, dir. KA4WMX chosen VP for OARC. OARC now has tfc & emgy net. That group also had a Sept. picnic. KC4EO organized the event. GCARC to run Novice classes in Land O' Lakes soon. Contact KE8O for more info. HCARC has moved meeting nights to 1st Thurs. of each month at Hernando Co. CD Hq in Brooksville. N4EBH & KB9LT have new Ten Tec Argosies. Hernando Co. CD had successful emergency drill linking 9 different agencies within 18 minutes. New BARS roster published with over 64% ARRL members. OPARC planning many activities, including twice yearly auctions, more club breakfasts, and rptr work. Contact KD4CG for membership info. NOFARS held Homebrew Contest at Oct. meeting and has 5th Thurs. dinner meetings quarterly. Regular NOFARS meetings are 2nd Thurs. monthly at Ed White Community School. W4PTT WA4RQT & WA4EYU rcvd ARRL Certificates of Merit for their activities. New OO in C. Fla is AB6I. N4GIY is now KF4EU and very active as OO. KB4LB reports much activity on Seminole VHF Tfc Net. LMARS FD Chmn NS4K had nice article in club paper and issued awards in 27 categories. Cypress Chapter 10-X held annual picnic at QTH of NS4J. KA4VNS finished with nice score in 10-10 Novice cw test. DBARA had annual picnic in Holly Hill. WB4FKL did nice job as honcho for it. In Tally, N4GCB upgraded to General. KA4DCD subject of news article. WB4GTY interim editor of TARS newsletter. New TARS Novice is KB4BZY. New ORSs are N4ESM KD4QZ KA4RBY & W4WGR. WD4HIF doing fine job as usual rep Fla. into RNS. He's also TCC member. Traffic: N4EDQ 5,212, WD4HIF 582, N4PL 356, WA4OXT 266, WA4EYU 194, W4MGO 158, W4WGR 149, WD4HBP 131, N4ADI 122, KB4LB 121, WB4TZR 120, KD4QZ 116, KF4HA 111, WB4GHU 104, KF4EU 78, WD4RIO 77, WD4IIO 76, KF4GZ 67, KF4U 67, W4KIX 53, KA4OPG 52, WD4MLQ 48, KB4T 37, WB4DTS 33, W4DTV 26, W4GUJ 25, WB4FJY 22, N4ESM 21, KA4RBY 21, N4UF 20, WA4STZ 17, WD4ORO 12, KA4VXT 7, KA4HGH 4, WD4GUZ 3, WD4FAB 2, WA4ZTS 2. (Aug.) KA4MGR 110, W4GUJ 14, WD4GUZ 11, KA4RVG 6. (July) WA4ZTS 2.

SOUTHERN FLORIDA: SCM, Richard D. Hill, WA4PFK — SEC: KB4OW. STM: K4ZK. The Melbourne Hamfest was a special one for Woody Huddleston, K4SCL. At the Traffic Handlers Breakfast Sunday morning, his long time friend, K4TH, presented a plaque to K4SCL on behalf of the Southern Florida traffic handlers. K4TH also gave a brief history of K4SCL's accomplishments during his years as SCM, ending with the following resolution: "WHEREAS: Woodrow Huddleston, K4SCL, has served faithfully and loyally, as Section Communications Manager of the Southern Florida ARRL Section for 8 years, and; WHEREAS: He has withstood the slings and arrows of outrageous fortune, with steadfast forebearance, and; WHEREAS: Such service should not go unrecognized; THEREFORE, BE IT RESOLVED; That the Southern Florida traffic handlers express their sincere thanks, and appreciation, of his Leadership, and, that a plaque be presented as a lasting token of their appreciation. And — SO SAY WE ALL." Incidentally, K4SCL bought a Kenwood TR 7850 2-meter rig while in Melbourne. At the SEC forum in Melbourne, it was decided that the statewide SET will be held October 9 and 10 because of the Clearwater Convention October 16 and 17. KA4GDV bought a TRS-80 PC1 computer while in Melbourne, and his mom, KA4FZI, is now pursuing a Master's Degree in computer education. Congrats to W4ROA, who was recently appointed as assistant director for the Broward Co. area. W4ROA and AA4EE gave a program on Amateur Radio and emergency communication at the Country Squires Homeowners Assn. W4ROA, who also coordinated communications for the Ft. Lauderdale Jaycee Fifth Annual New River Raft Race for the American Diabetes Assn., reports the following amateurs supporting the event: WA4LZR (Motorola rptr), N4GDV (BARC rptr), WB4YUC KA4ZLS KE4OP WB4YQZ KD4KXZ WD4PHG N4BDZ KB4ME K4ELX WA4YLH N4FHF WB4WZJ WA4JBQ K4GNP WB4AIS WB4TTA W8LLL KA4NXF WB4KOB WA4TWD WD4MRS W1SL W1RNT WA4BZJ WB4THP WA4RJT WD4BWC. It's a most impressive list. WA4MJI reports that she gave a talk on "The Fun of Amateur Radio" to the Plantation Friends of the Library. Congrats to K4ZK, who assumed the position of section traffic manager this month. W4ESH is now manager of the Florida Medium Speed Net. Congrats to both W4ESH and to NY4E, who did a FB job as the previous manager. 73 de WA4PFK. Traffic: W3CUL 2956, W3VR 631, WA4PFK 314, K4SCL 280, WD4AWN 253, WD4COL 246, K4ZK 210, K4IA 182, K4EUK 178, KA4GUS 169, WA4TWD 151, W4GPL 140, WA4EIC 137, W4YCL 136, W4DL 122, W4NFK 122, KY4U 108, KE4DA 107, WA4HXU 100, N4ET 95, WB4AID 86, KA4ASZ 85, KE4O 80, W4ESH 77, KA4FZI 68, WB4MPJ 68, W3TLV 55, N1BIR 54, NJ4O 52, KC4FL 48, W4ROA 47, K5IHH 39, W4IRA 30, KA4AMC 29, W1DLP 29, KB4OW 27, N2WX 27, NC4H 26, KD4SF 25, W4WYR 25, WB4GCK 24, W4PKP 24, WB2OUK 23, KC4OT 22, WB4WYG 19, AA4BN 15, W4LVA 14, W4KLY 13, W4SMK 13, WD9AEP 6, W4JM 2.

WEST INDIES: SCM, Julio Negroni, KP4CV — Upon assuming professional duties in HC-land (Quito, Ecuador), KP4CV is now quitting ham duties in KP4-land. Already resigned editorship of ONDA TERRESTRE, and will soon give way to new SCM. How about nominations!! Spot news: KP4DQP has new ICOM 720A and Ten Tec Argosy. KP4FFW joining Air Force as communicator. KP4EFX (Dr. Davila) recently retired from dental practice. WI section getting readied for SET. KP4AHX is new frequency coordinator for PRARC. Traffic: WP4AOH 115, KP4DJ 56, KP4AMA 37, KP4ABK 25, NP4L 10.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Erich J. Holzer, N7EH — STM: W7EP. NMs: WA7KQE WA7FDN. September has already passed, the kids are back at school and many ARCs in the section are preparing for their fall activities, i.e. bikathons, marathons, balloon races, air shows, etc. Many ARES groups are preparing for SET. KC7MG operated as a special event station from the "OK Corral" in Tombstone on Sept. 4-6. I have appointed N7CVT as DEC for Gila Co. W7KAX, DEC for Mohave Co., has selected WB7BVV as EC for Kingman and KA7BTC as EC for Lake Havasu City. I have endorsed these appointments. Superstition ARC reports that the Slow Speed Net on 28.135 MHz at 1930 MST may resume in October. W7EP and K7NTG made PSHR this month. Do you handle a moderate amount of traffic? Check into traffic nets? You may qualify for PSHR. Information can be found elsewhere in *QST*. Check it out and report your totals to me. The new ARRL field organization will go into effect January 1 in Arizona. I feel there is a place for you in this

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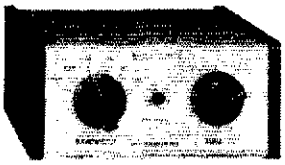

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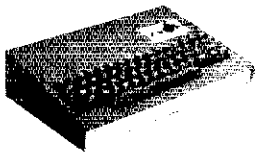

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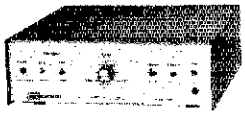

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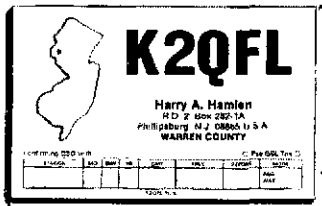

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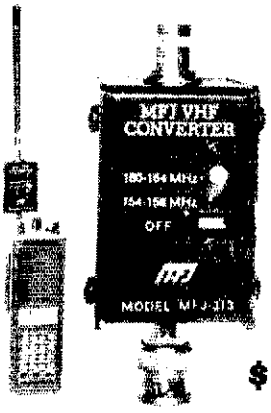

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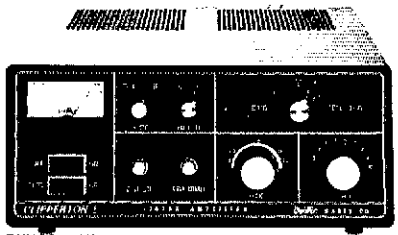

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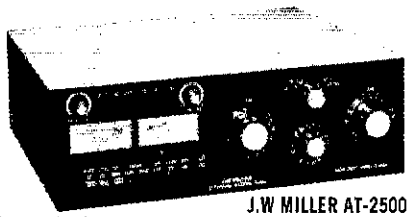

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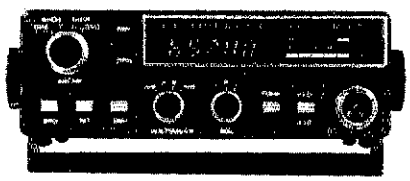

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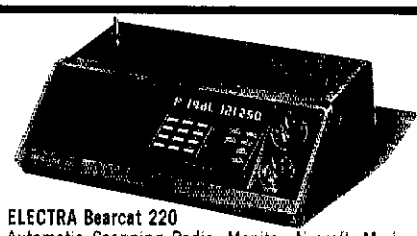

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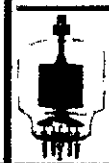

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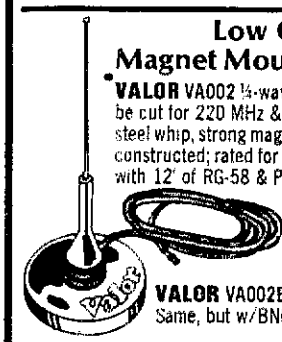

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new structure. Please contact me. Keep your club newsletters coming. ATEN: QNI 803, QTC 207. Tonto Emercom Net: QNI 94, QTC 6. Traffic: W0GMO 211, W7EP 204, KC7MG 148, K7NTG 140, W7AMM 116, K7UXB 69, WA7KQE 34, K7NMQ 31, N7EH 24, WA7NXL 16, W7LBW 12, N7CQY 9, N7CVT 8, KE7W 8, WA7YUL 4, N7AUX 2, N7EAQ 2, K7RZU 2.

LOS ANGELES: SCM, Stan Brokl, N2YQ — SEC: N6UK. STM: W6INH. Unfortunately K5DY had to step down as NM SCN and STM for LAX. He will be missed by all. W6INH, STM 1979-1981, willingly agreed to be STM effective immediately. Congrats W6INH and thank you. ERROR in report for Oct. 1982 QST page 140, the call WB5BYC should be WB5BYK. Any inquiries should go to WB5BYK. KI6Z recently got his Apple computer hooked up to his radio gear to work RTTY. W6NAZ is leading a PR net weekly Wed. 7:30 P.M. on the K6QQN/R rptr, 147.705 down 600. Everyone welcome. Owing to lack of interest and checkins, my net on Thursday evenings at 8:00 P.M. is discontinued. If someone in the section wishes to have a weekly contact with a League official check in on Sunday evenings on 3.910 MHz at 6:00 P.M., starting with the end of Daylight Savings Time. Starting Jan. 1, 1983, this section will have an SM and 5 new positions of leadership to fill: 1) OO and RFI Coordinator; 2) Public Information Official; 3) Technical Assistant; 4) State Government Liaison; 5) Bulletin Manager. Traffic: K6UYK 549, KT6D 148, WA6OCM 115, N6DZQ 108, W6INH 78, AD0A 51, WA6LVO 19, K6CL 18, W6NKE 15.

ORANGE: SCM, Fred Heyn, WA6WZO — ASCM: WA6WZN. SEC: W6UBQ. STM: KN6C. DECs: K6GGS W6LKN WB6JBI WB6YZY. NMs: WB6AKR W6CPB K6JT WA6QCA WA6WZO. At the time of this writing many ARES members, headed by DEC WB6JBI with EC WB6GUC, are assisting Orange Co. Red Cross and OC Fire Dept with communications in their battle with fires that started in Gypsum Canyon. The fires have already burned over 18,000 acres and 20 structures. Congrats to Coachella Valley ARC on their ARRL affiliation. Their certificate was formerly presented by SEC W6UBQ and EC AE6N. ARES very active in many public service activities, including the "Bike Ride Against Diabetes," plus various simulated tests by hospitals, state government, etc. Anyone interested in helping with "Operation Santa Claus," which enables children in many hospitals to talk to Santa, contact W6AOP or WB6VUY. So. Calif ATV club officers are: WB7AJC, pres.; WA6SVT, v.p.; N6ZT, secy/treas; W6RVP, editor; N6WQ, freq. coord. So. Calif Chapter of Quarter Century Wireless Association (QCWA) has largest membership in nation with officers: W6AM, pres.; W6HS, v.p.; W6IL, secy/treas. They have four nets on Sunday: 8 A.M. 3917 kHz (W6INH), 9 A.M. 3917 kHz (W6FO), 10 A.M. 146.205/805 (W6ZRZ), and 11 A.M. 3965 kHz (K6BA). Current swap nets: Catalina Rptr Assn (147.69/09 WR6AAA) 8 P.M. Mondays, Mt. Wilson Rptr Assn (146.400/147.435 WA6KOS/R) 7 P.M. Thursdays, and informally on Saturday and Sunday approximately 1 P.M. 7265 kHz.

Net	Freq.	Time	QTC	QNI	NM
SCN/1 (>20)	3598 kHz	7 P.M. Dy	328	207	K6UYK
SCN/2 (<13)	3598 kHz	8:15 P.M.	12	172	K6HAP
SCN/V (FM)	146.045/6459	P.M. Dy	254	411	WA6QCA

Traffic: N6GIW 225, WB6QBZ 160, AI6E 133, KS6T 130, WA6QCA 87, KA6BNW 67, W6NTN 41, W6CPB 36, W6RE 35, WA6PNS 26, K6CZE 20, W6TKV 16, WA6WZO 5, N6BVU 4, K6WS 4.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW. SEC: W6INI. ECs: N6CQW (Eastern), WD6CSS (Southern), WA6EYX (Northern), W6INI (Central), WA6LAW (Imperial), WA2NNT (Tri-City). Area code for San Diego and Imperial Counties is now 619. The "Tri-City" District is new ARES district in northwestern San Diego Co. Included are the cities of Carlsbad, Del Mar, Oceanside & Vista. WA2NNT is EC. Communications for hydroplane races on Mission Bay were organized by KM6S. Tnx! Over 100 amateurs provided communications for the Diabetes Assn bikeathon in early Oct. San Diego city's disaster plans divide the city into a number of "self-help" areas, each with a Community Operations Center. The program is headed by WA4SHP. Volunteer operators are need. Contact W6INI (273-1120). K6SQ conducts Advanced class study group weekdays at 0700 on 3965 kHz. Upgrades: to Tech-KA6SPM KA6UST; to Gen-KA6IDX. New call for KA6SPM is N6HHI. North County Tfc Net held 29 sessions, handled 133 msgs. New ARES member: KA6VTR. Traffic: KT6A 684, KM6I 252, K6HAP 233, KU6D 157, KB6AI 32, N6AT 32, N6NR 28, N6GW 21. (Aug.) KB6AI 76, N6NR 7.

SANTA BARBARA: SCM, Robert N. Dyruff, W6POU — State quake exercise used amateur comms for 6 hrs between 5 So. Cal. counties and Sacramento OES. RACES/ARES ops from sctn incl. N6MA, Ventura, W6MSG W6POU at Disaster Support Area, Los Alamitos military base. Former SEC WB6HJW now back in Arroyo Grande. He sees significant growth in ham public service comms recent yrs. P.S. comms include: Ventura Street Fair led by N6ZR WB6RVA; SLO PG&E nuclear plant siren test led by WB6IIY N6BUY incl. coords: WB6TXP W6ECY KR6I W6MSG NK6G NM6W. Total 67 ops monitored 89 sirens over 3-hr test. SBAR Fiesta Parade led by N6CJL and 20 ops. Increasing use of rptrs for business calls in violation of rules. WA6EJO works 1296 MHz via 10.5 GHz Ventura rptr plus laser demo at VCARC mtg. Vhf contesters: K6ELQ-Frazier Mtn, K6TZ-SBARC-Diablo Peak on S.C. Island. KA6V edits monthly DX column for *VCARC KEYER*. K6YD issues monthly *ZERO BEAT* bulletin of SCN family of tfc nets. W6ZZN edits excellent club bulletin for Conejo VARC. KV6J uses QTH for CVARC swap fest. Circuit Board Specialists donated VOX p.c. board to WB6POP to overcome handicap. K6LHA/WA6QKC hosted ZL hams, Simi Settlers ARC new rptr K3HZP 147.165/765. Traffic: K6YD 135, W6ZRR 102, KD6ZM 19, W6JGS 11.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — ASCM: WA5QFD. STM: W5VMP. SEC: W5GPO. NMs: KC5FX AA5J WD5JYI AE5I. W5GPO and I attended the Lubbock and San Angelo swapfests on Oct. 3rd. Lots of interest in ARES in west Texas, and many contacts made to try to increase activity in emergency preparedness in the area. We thoroughly enjoyed the hospitality and fellowship! There will be a major ARES meeting in Dallas for all DECs and ECs on Feb. 12, called "Stormcom." More on this later, as all ECs will receive a mailing from the Wx Service later on. This will be a major forum on emergency communications, and a film will be produced from the meeting to be used by ARES as a major training medium. Texoma Hamarama another huge success under the direction of pres N5WB. Congrats to you and your staff, for a job well done! Panhandle ARC of Amarillo just graduated 10 new Novices in Sept., with another class scheduled soon. WB5CIC takes the helm as EC for Dallas Co. P6HR: KA5AZK N5FDL KC5NN N5EZM N5BT KK5B WB5CIC & KC5FX. Traffic: WB5CIC 272, KA5AZK 213, N5BT 156, KC5NN 73, W9OYL 60, KC5FX 54, N5FDL 46, W5ERT 38, K5PC 11, K5HGX 8, N5EZM 7, N5FCZ 5.

OKLAHOMA: SCM, Leonard Hollar, WA5F6N — ASCM: W5REC. SEC: W5ZTN; NMs: WA5ZOO KV5X WA5OUV WD5IFB, W5EDZ, director of West Gulf Division, and XYL visited Tulsa and Enid ARCs. Excellent attendance and good time was had by all. Fine training classes in Fairview, Mooreland and Shawnee with KD5RL KD5JR N5CCV K5KXL and KI5P teaching. Newest net is the Eufala Area Traffic and Weather Net operating on 144.77/145.37 at 1830 local time, with WB5FLV managing. Enid ARC, W5HTK/R, has a new rptr operating 444.40 MHz out and 449.40 in, using 5 watts, with plans for higher power. W5QMJ and K5CAY report fantastic results! W5VOR doing a great job as Official Bulletin Station for the Sooner Traffic Net. Thanks to each OBS for keeping us informed. May God grant each of you a blessed Thanksgiving and a joyful Christmas season. Traffic: W5REC 302, KB5EK 240, KV5X 229, W5RB 203, W5AS 195, K5CXP 153, WD5IFB 105, KA5CXW 99, WB5ELG 95, WA5OUV 90, W5VXU 56, W5SUG 34, W5VOR 31, WB5EAY 29, WA5OGC 29, W5VLW 27, K5CAY 20, WD5JCE 18, WA5ZOO 18, W5FW 12, WB5LSW 9, KC5OU 9.

SOUTHERN TEXAS: SCM: Arthur R. Ross, W5KR — ASCM/TM: N5TC. SEC: WA5RVT. BPL: W5SHN WB5YDD W5CTZ. Final OVS report received from N5AF: he wants other appointments. CAND manager W5KLV reports STX represented 100% by K5QWK KD5KQ KD5JX W5TFB N5AMH W5URN N5CRU W5SHN N5DFO WB5YDD & W5KLV. EC K5HGB has been busy with ARES drill in July and ARRL VHF QSO Party in Sept. & reported vhf activity light. DRN5 manager WB5YDD reports 100% representation by STX by W5FBI KD5JX WA5RVT W5MTO N5CRU W5KLV W5TUK N5AMK N5DFO K5KJN K5WOB W5URN W5TFB W5SHN W5CTZ KD5KQ WB5YDD EC KD5JD moved to Texas City, and upgraded to Extra. Great Going. OBS W5KLV kept up his hectic pace with 129 readings of 13 bulletins on 10 nets. ORS KA5KRI helped out in Fort Bend Co. ARES SET, and conducted Amateur Radio demonstration at local school for about 400 students. The West Gulf Division Convention in Houston was an unqualified success. About 1900 amateurs and other radio enthusiasts attended. New officers of Hill Country ARC (Kerrville): KY5B, pres.; N5AIA, v.p.; KA5ORX, secy.; KC5ZW, treas. Traffic: W5SHN 743, WB5YDD 527, W5CTZ 508, W5KLV 465, N5DFO 203, W5TFB 143, N5EFG 126, N5TC 126, WB5MMI 114, N5CRU 67, KA5KRI 54, K5HZR 40, W5KR 32, W5BGE 30, WD5GKH 21, WA5RVT 20. (Aug.) N5AMH 196, N5CRU 82.

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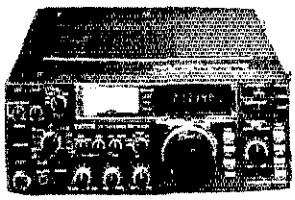

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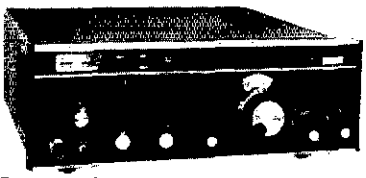

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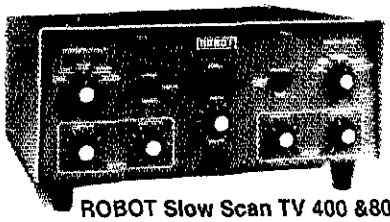

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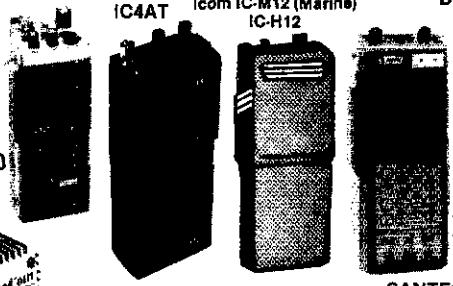

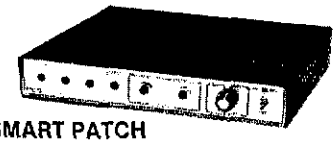

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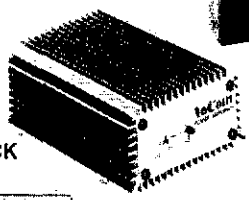

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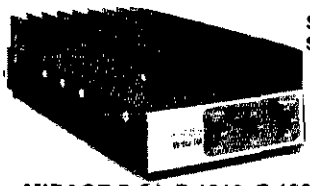

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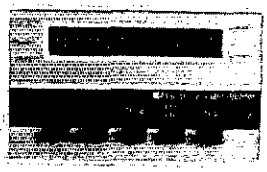

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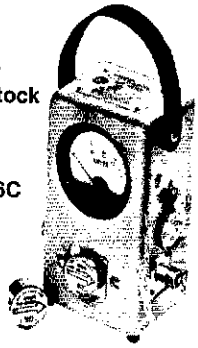

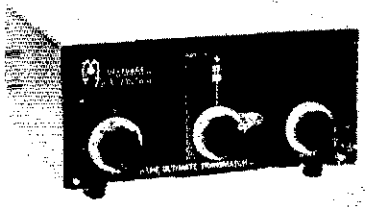

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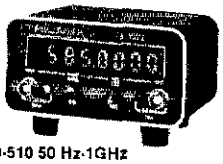

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RS20A 16 amp cont-20 amp ICAS. . $87
RS20M above w/meter $105
RS35A 25 amp cont-35 ICAS . . . $134
RS35M above w/meter $145
RS50A 37 amp cont-50 ICAS . . . $186

BENCHER
BY-1 Key Paddles. $35
BY-2 Keyer Paddles, Chrome $45
Other B

BENCHER
BY-1 Key Paddles. $35
BY-2 Keyer Paddles, Chrome $45
Other Bencher products. Call.

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76A 2-8874 tubes for 2KW $1590
76PA 3-8874 tubes-runs cooler . . $ Call
76CA 3-8874 tbs-hprcil XFMR . . $ Call
374A 2-8874 tbs-broad band . . . $ Call
78 3-8874 tbs- broad band. . . . . $ Call
77DX 1-8877 tb-runs real cool . . $ Call
We'll play the same price games everyone else does on Alphas.

HAL COMMUNICATIONS
CT2100 RTTY TERMINAL. . . . $689
KB2100 Keyboard for Above . . . $141
CWR 6850 Telerdr. Terminal . . . $849

HAL

CWR-6850 Telereader -- $849.00

Sorry, we don't accept personal checks for mail orders, and don't ship C.O.D.

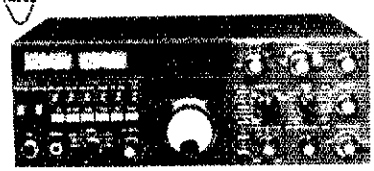
The people who sell these things to us change their prices from time to time. When they do, our prices are subject to change without notice or obligation.

The WATS line may not give you a busy signal. That's 'cause we've got more phone lines than people. Try again later; we're here for the duration!

CK2 — The Serial Number Memory Keyer

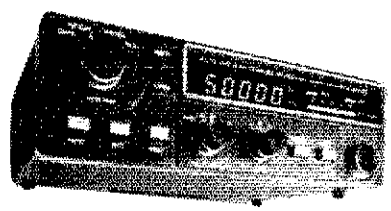
SPECIAL!

FT-102



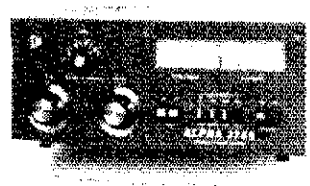
Yaesu's newest high performance HF Transceiver.

NEW!! KDK FM-2030



2m Fm — 25 Watt XCVR with TTPAD

ETO ALPHA 374A



No Tune-Up with 2-8874 Tubes

FT-230 now with TT MIC

NEW!! Matching FT-730 450mhz Transceiver Available Soon!

ICOM
IC2AT . . . . . Special. $233
IC 740 160-10m HF XCVR $945
IC 720A/PS15 combo $1255
IC 25A 2m XCVR/w TT mic . . . $299
IC 251A 2m all mode. $569

ICOM IC-720A

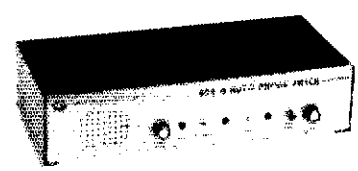
with PS-15 — $1255

MIRAGE COMMUNICATIONS
B23 2 in 30 out Talkie Power . . . $ Call
B108 10 in 80 out 2m Amp . . . . $ Call
B1016 10 in 160 out 2m AMP . . . $ Call
B3016 30 in 160 out 2m AMP . . . $ Call
D101N 10 in 100 out 450 mhz Amp. $ Call
MP1 meter. . . . . $ Call
MP2 meter. . . . . $ Call

VOCOM PRODUCTS
5/8 wave 2m HT ant $18
Power Pocket for IC 2AT $174

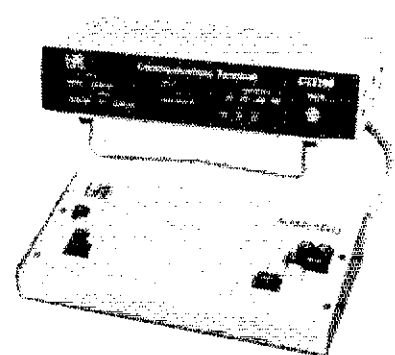
YAESU ELECTRONICS
FT102 new 160-10 XCVR. 3 6146's! $ CALL !!
FT101ZD 160-10 XCVR. $749
FT902DM 160-10 XCVR . . . . . $ Call
FT707 . . . . . Most Popular HF Mobile We Sell. . $ Call
FT-ONE . . . . . Aptly named, because it is Number One . . . $ Call
FT 280R 2m handheld. . . . . $ Call
FT 708R 450 mhz handheld . . . . $ Call
FT 230R 2m 25 wt mini xcvr . . . $ Call
FT 480R 2m all mode . . . . . $ Call
FT 780R 430 mhz all mode . . . . $ Call
FT 290R 2m portable all mode . . $ Call
Complete Yaesu line with Accessories normally in stock.

NEW!! COMMUNICATIONS PRODUCTS
824-6 SIMPLEX AUTO PATCH



$675.00

HAL CT-2100



with Keyboard $830.00

CALL TODAY 1-800-527-3418

In TEXAS — Call 1—214—699-1081

or visit us at 13929 North Central Expressway, Suite 419 • Dallas, Texas 75243

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.
(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.
(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.
(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*.
(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permited in *QST* advertising.
(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.
The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

CQ and QST 1950-1982 also 73 and Ham Radio issues for sale. Two dollar minimum order. Cost 50 cents each 1976 and later issues, all other 30 cents each including USA shipping. Send SASE, chronological order and payment to W6LS, 2814 Empire Avenue, Burbank, CA 91504. Available issues and refund sent within one month.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a nonprofit organization of communications people founded in 1925, invites your inquiries and application for membership. Write V.W.O.A., 118 River Drive — Bay Ridge, Annapolis, MD 21403.

CINCINNATI ARRL '83 - Hamilton County ARPSC invites all hams to participate in the third annual Ohio State Convention. Two full days of amateur activities; forums, meetings, exhibits, Wouff Hong, flea market, and much more. This all-indoors activity will take place on Saturday & Sunday, February 26 & 27. For further information contact Cincinnati ARRL '83, Committee for Amateur Radio, P.O. Box 46311, Cincinnati, OH 45246. Dealer and exhibitor inquires invited. Registration $4, Flea Market $3.

SAROC Annual Prestige Convention, Aladdin Hotel, Las Vegas, January 13-14-15-16, 1983. Technical sessions, exhibits open Friday and Saturday. Advance registration $17 per person includes admission to meetings, exhibits, ladies to ladies program, Genie Buffet on Saturday and Sunday. Aladdin Hotel room rate $37 plus room tax, single or double occupancy per night call 1-800-634-3424 for SAROC reservations. QSL SAROC POB 945 Boulder City, NV 89005-0945 with registration.

Any used 2-meter FM gear donations wanted to build High School Club repeater. Call 203-667-1905 after 5 or write WB1CRH via Callbook.

PICK a winner? You bet-for "Amateur Of The Year" at Dayton "Hamvention" - free tickets - Write for details -Hamvention P.O. Box 44, Dayton, OH 45401, Attn: Awards.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaroneck, NY 10543 for details.

FOX-TANGO Club Newsletters for Yaesu Owners. Back issue (1980/1981) looseleaf sets $6 each, both for $10 while they last. Fox Tango Club, Box 15744, W. Palm Beach, FL 33416.

MEMORY BACK-UP
AND HIGH SPEED PRINTER OUTPUT*

Never Lose Your Memory Again!

All "Here-is" memories, ID's **and** all keyboard input parameters are retained for 2 weeks by the internal Ni-Cad battery & charging circuit. Load up the memories, carry the ACT-1 out to your field-day site and be ready to go as if you never turned it off! Also included in this option package is the high speed code converted RS-232 serial printer output.

The best gets better at MICROLOG Corp.
8713 Mooney Dr., Gaithersburg, MD 20879
Tel. 301-258-8400 TELEX 908153.

MICROLOG

INNOVATORS IN DIGITAL COMMUNICATION

• SIMPLE DIRECT CONNECTION to your Transceiver. • COMPLETE SYSTEM, built-in Demodulator & AFSK Modulator with keyboard programmable tone pairs from 500 to 3000 Hz. • SPLIT-SCREEN operation with keyboard selectable line location • 1400 character text buffer. • TEN, 40 CHAR. programmable message memories (doubles with BATT. BACKUP), plus ID's WRU & SELCALs. • RANDOM CODE generator & hand key input for practice. • Baudot 60 to 132 WPM. • ASCII 110 & 300 baud. • SYNC-LOC MODE for improved ASCII operation. • RECORDER INTERFACE for "BRAG-TAPE" or recording off-the-air. • CODE CONVERTED printer output in Baudot or ASCII. • SSTV/GRAPHICS transmit. • FULL 63 KEY Computer grade keyboard.

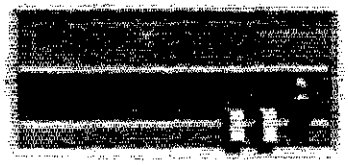
*9" monitor $199. Battery Backup & RS232 print $125.

MISSOURI RADIO CENTER

"CALL TOLL FREE"
1-800-821-7323

AN AUTHORIZED KANTRONICS DEALER

VIC-20 Computer



Kantronics Interface
Hamsoft by Kantronics

A complete Ham computer system for under $500. The VIC-20 computer and Kantronics Interface with software gives CW/RTTY/ASCII send-receive ability from the keyboard of the computer. Features include split screen display, printer compatibility, message ports, and much more.

Don't spend three times as much for a dedicated system. Save money and get a computer for other uses.

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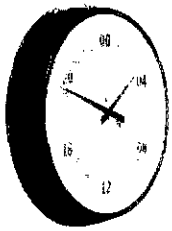
Model 173DM
Dual, independent clocks/Solid walnut case/
Functional and beautiful
$79.95 (plus $3.00 shipping)

Model 173B
Internal backlight/Aluminum and Poly case/Portable
$39.95 (plus $3.00 shipping)



Model 973A
True 24 Hr. Quartz/
Single "C" Battery
(not included)
14" OD **$59.95**
(plus $3.00 shipping)

NEW

Model 173 C
No frills 24 Hr. Digital/Single "AA" Battery (not included)
$29.95 (Add $3.00 shipping)

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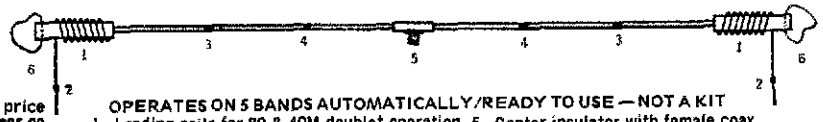
LRL-66 ANTENNA 66' LONG. 80 THRU 10M

Power rating 2 Kw. P.E.P. or over on 80, 40, 15 On 20 and 10 1 Kw. P.E.P. Transmitter input



price **$85.00** In Cont. USA ppd.

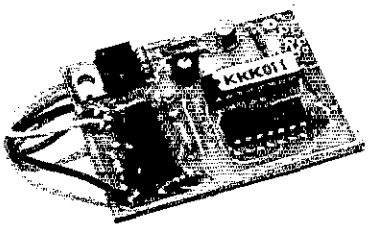
OPERATES ON 5 BANDS AUTOMATICALLY/READY TO USE—NOT A KIT

1. Loading coils for 80 & 40M doublet operation
2. Adjustable ends to set 80 meter resonance
3, 4. Decoupling stubs for 20 & 10 meters
5. Center insulator with female coax connector to take PL-259 plug
6. Fittings on insulators to tie on rope

LATTIN RADIO LABORATORIES • Box 44 • Owensboro, Kentucky 42302

PROUD OF YOUR CALL?
WORRIED ABOUT THEFT?
BUILDING A REPEATER?

Identify your FM transceiver with automatic code on each transmission.



SMALL: 1 3/4" X 2 1/4" X 5/16"
Perfect means of RTTY code ID

PRICE **$49.95** Ppd.
+$3.00 for Calif. address.

Full feature repeater IDer with timer **$79.50** Ppd. +$4.77 for Calif. address.

WARRANTY
Returnable for full refund within ten day trial period. One year for repair or replacement.

Your call sign programmed at factory, please be sure to state call sign when ordering.

Inquire about commercial models.

AUTOCODE
8116 Glider Avenue, Dept. Q
Los Angeles, CA 90045
(213) 645-1892

INDIANA: South Bend Swap & Shop, Jan. 2, at the Century Center downtown, on U.S. 33, Oneway north between St. Joseph Bank Building and river. Half acre on carpeted floor. Industrial history museum in same building. Four lane highways to door from all directions. Talk-in 52-52 & area repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact: Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, telephone 219-233-5307.

ILLINOIS: Wheaton Community Radio Amateurs Hamfest will be held February 6, 1983 at Arlington Park Race Track Expo Center, Arlington Heights, Illinois including computer section. For general info call W9JTO at 312-231-9524. Clear paved parking. Awards. Tickets $3 at entrance, $2.50 in advance. Send S.A.S.E., to WCRA, P.O. Box QSL, Wheaton, IL 60187. Talk-in on 146.01/61 and 146.94. Doors open 8am. — Be there! — KA9KDC.

YAESU Owners — Join your International Fox-Tango Club — now ending its eleventh year. Calendar year dues still only $8 US, $9 Canada, $12 airmail elsewhere. Don't miss out — get top-rated FT Newsletters packed with modifications monthly, catalog of past modifications, free advertisements, technical consultation, FT Net (Saturdays, 17ØØZ, 14.325 MHz), more. 1982 or 1983 sets $8 each; both $15. Send dues to FT Club, Box 15944, W. Palm Beach, FL 33416.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cars, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DELUXE QSLs, Samples 25¢. Petty, W2HAZ, P.O. Box 5237, Trenton, NJ 08638.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: will give quote. Little Print Shop, Box 9848, Austin, TX 78766.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

QSLs with class! Unbeatable quality, reasonable price. Samples $1 refundable. QSLs Unlimited, P.O. Box 27553, Atlanta, Georgia 30327.

QSL cards — Eyeball cards — Rubber stamps — Name tags — Emblems — gift items — free catalog — Rusprint, Box 7575, Kansas City, MO 64116.

QSLs by W7HUL. Samples 50¢ 8511 19th Ave. N.W., Seattle, WA 98117.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

WOODGRAINED QSLs. Beautifully printed. You have to see them. Write for free samples. Ham Graphics, Box 244Q, Camden, NY 13316.

QSL samples — 25¢ Samcards - 48 Monte Carlo Dr., Pittsburgh, PA 15239.

QSL ECONOMY: 1000 for $13. s.a.s.e. for samples. W4TG, Drawer F, Gray, GA 31032.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

QSLs — We feature: (a) The KØAAB collection. (b) Custom designs for railroad employees and railfans. (c) Front side report styles. Specify which samples you want. Please send a self-addressed business size envelope with 37¢ postage attached. Marv WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109.

QSLs Samples 30c (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

RUBBER Stamps return address $4 includes postage. NJ residents add tax. Clinton Hoar, W2UDO, 32 Cumberland Ave., Verona, NJ 07044.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From $240. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

$2.95 PER hundred (1,000 price). New red, white and blue series. Send S.A.S.E. with 20¢ stamp or 40¢ postage only, for catalog. Satisfaction guaranteed since 1934. Bumper Stickers: "I'm A Ham Radio Lover and "I Love Ham Radio" in sparkling red, white and blue. Now only $2. each or $3. for both. Check or money order. VP5QED Press, P.O. Box 1523, Boca Raton, FL 33432.

CLUB Call Pins: 3 lines 1-1/4 x 3-1/4 $1.55 each. Call, first name and club, colors: blue black or red with white letters. Catalog — Arnold Linzner, WA2ZHA, 2041 Lidnen, Ridgewood, NY 11385.

QSLS. Quality and fast service for 22 years. Include call for free decal. Samples 50¢. Ray, K7HLR, Box 331, Clearfield, UT 84015.

3-D QSLs - Increased returns assure users' satisfaction. Samples 25¢. 3-D QSL Co. P.O. Box D, Bondsville, MA 01009.

YAESU FT-404R/TTP

450 MHz Hand-held with factory installed 16-button tone pad. Six crystal channels within a 3 mHz (tx) or 5 mHz (rx) spread; 430 to 450 MHz. 2.5w or 200mw output. NiCad pack, wall charger, flex antenna, case, strap, earphone & 446.0 mHz crystals. 7¼"h × 2⅝"w × 2¼"d, 1 lb ..... *Regular $325*

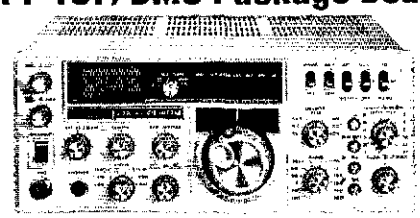
Closeout - $189.95

Crystal Certificates: (2/channel required) are $5.00 each when purchased **WITH** FT-404R/TTP; purchased later, $8.00 each.

FT-404R/TTP accessories:

NC-1A	15-hr drop-in charger	**Sale** $44.95
NC-3A	Drop-in chgr/AC adaptor	**Sale** 79.95
FBA-1	Battery sleeve for NC-1A/3A	8.00
FNB-1	Extra NiCad battery pack	23.00
NC-9B	Extra 15-hr wall charger	10.00
PA-2	Mobile DC-DC adaptor & charger	39.00
YM-24A	Speaker/microphone	39.00
FTS-32E	32 tone CTCSS encoder	40.00
FTS-32ED	32 tone CTCSS enc/dec	75.00
LCC-3	Leather carrying case	38.00
MMB-10	Mobile bracket	15.00

FT-107/DMS Package Deal



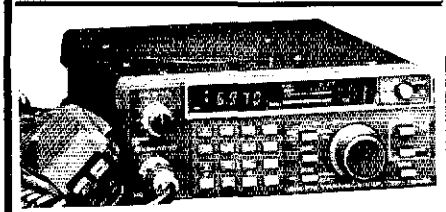
YAESU FT-107M/DMS (WARC) 9-band Dig. Transceiver. Covers 160-10m, incl. WARC bands. 240w DC input SSB & CW; 80w AM & FSK. 12 channel memory circuit with Digital Memory Shift (tunable). 13.5vdc @ 20A. 5"h × 13"w × 10"d, 27 lbs. ..... **Regular $1149.00**

YAESU FP-107 Internal Power supply. 115/230 VAC, for base. Mounts inside FT-107M ..... **Regular $139.00**

YAESU SP-107P Speaker/Patch. Ext. speaker & hybrid phone patch in matching cabinet.... **Regular $65.00**

TOTAL REGULAR PRICE - $1359.00

PACKAGE PRICE - $899.95



KENWOOD TR-7850 2m FM Transceiver. 144-147.995 Mhz; 40 watts; 15 memories; UP/DN mic; 13.8vdc/9A.

Regular $419.95 - ***Closeout $329.95***

DRAKE Theta 7000E/TR-930 Combination Closeout

Theta 7000E (alone) - **$689.95**

DRAKE Theta 7000E Communications Terminal. Complete, automatic send/receive of Morse code CW, Baudot & ASCII code (RTTY) ..... **Regular $1095***

DRAKE TR-930 9" Video monitor..... **Regular 185***

Regular Combination Price - $1280*

Combination Closeout Price - $799.95

*DRAKE'S Suggested List Price

HAL OVERSTOCK SALE

(The Boss ordered too many!)

CT2100 Communications Receive Terminal

Regular $845.00 - ***Special Sale $689.95***

KB2100 Keyboard (companion to CT2100)

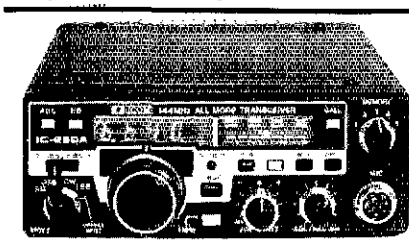
Regular $175.00 - ***Special Sale $149.95***

CWR6850 Telereader Terminal/5" CRT/keyboard

Regular $995.00 - ***Special Sale $849.95***

CWR6700 Telereader Receive only, portable reader

Regular $495.00 - ***Special Sale $429.95***



ICOM IC-290A 2m SSB/CW/FM Mobile Transceiver. 143.8-148 MHz; 10 watts; T/T mic; 13.8vdc/3.5A

Regular $549 - ***Closeout $399.95***

YAESU FT-708R

440 Mhz UHF Hand-Held. 440-450 Mhz; 1 watt output. Keyboard entry of all frequencies and splits for non-standard repeaters. 4-bit CPU, LCD display, Up/Down scanning, priority, memory scan, memory back-up. 16 tone DTMF encoder. Flex antenna and Ni-Cd battery pack.

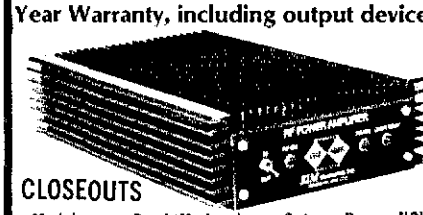
Special - $269.95

FT-708R accessories:

NC-7	15-hr desk charger	$53.95
NC-8	15/4-hr desk chgr/AC ps	89.95
LCC-8	Leather carrying case	35.00
FBA-2	Battery sleeve	6.25
FNB-2	Extra battery	29.00
NC-9B	Extra wall charger	10.00
SSY-32/FTS-32	32-tone encoder	33.00
TS-32/FTS-32AE	Enc./decoder	75.00

KLM VHF/UHF POWER AMPLIFIERS

Factory Sealed, late model units with one Year Warranty, including output devices.



CLOSEOUTS

Model	Band/Mode	In	Out	Reg.	NOW
PA2-25B	2m FM	1-4w	25w	$ 99.95	$ 74.95
MA-35BL	2m FM/SSB	1-4w	35w	129.95	99.95
PA10-170BL	2m FM/SSB	10w	170w	299.95	225.95
PA15-40BL	2m FM/SSB	5-15w	40w	149.95	112.95
PA15-80BL	2m FM/SSB	5-15w	80w	179.95	135.95
PA15-160BL	2m FM/SSB	5-15w	160w	269.95	199.95
MA-25BCL	220 FM/SSB	1-4w	25w	129.95	99.95
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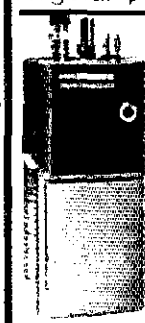

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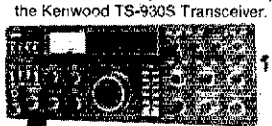

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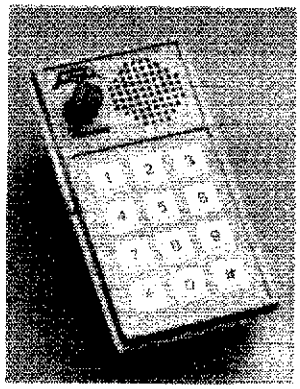

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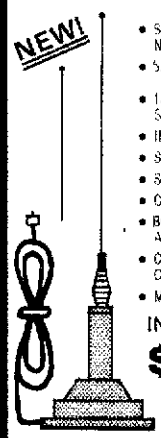

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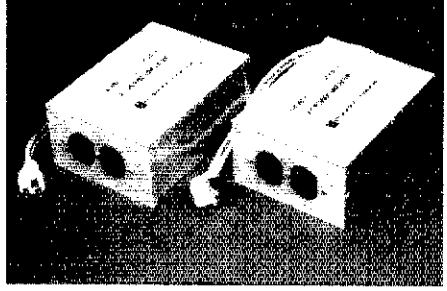

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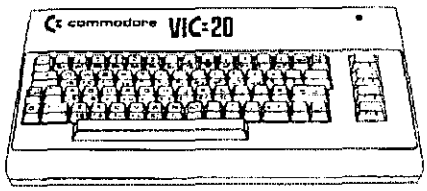

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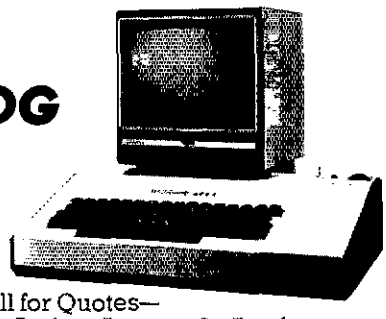

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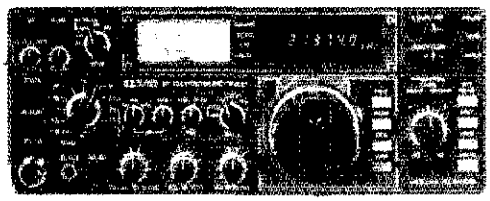

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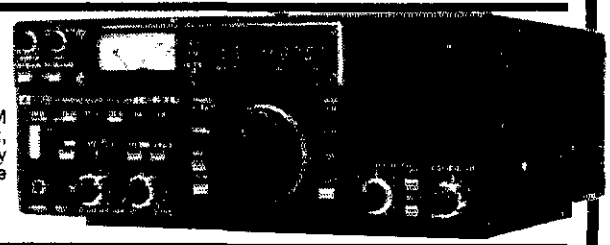

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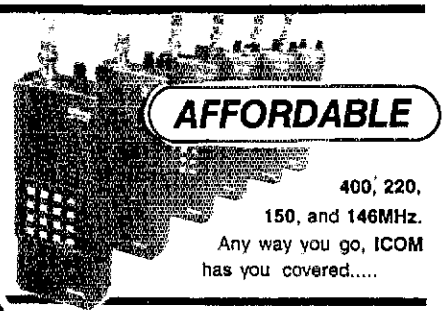

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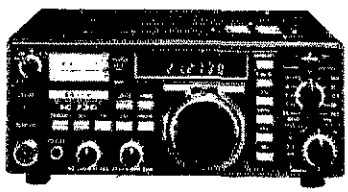

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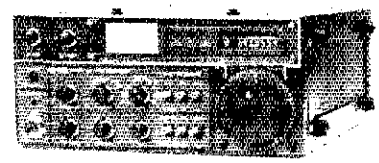

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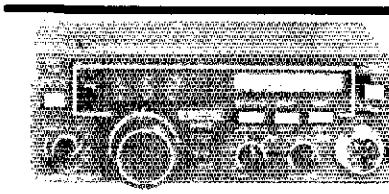

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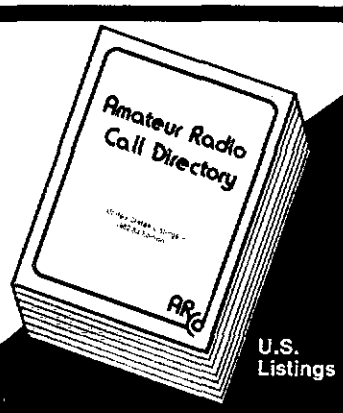

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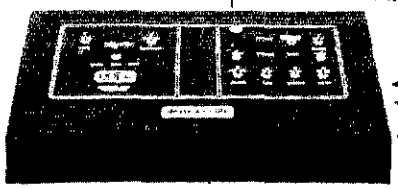

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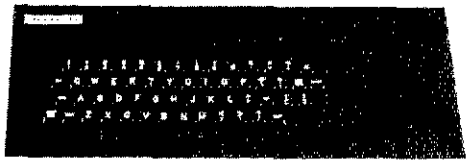

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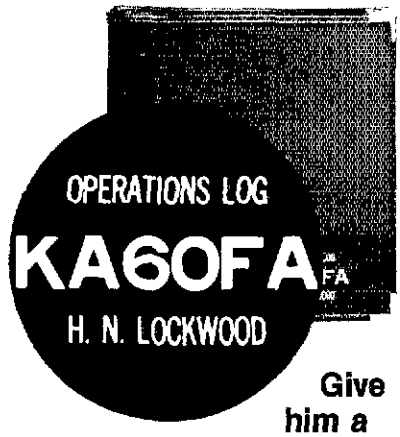

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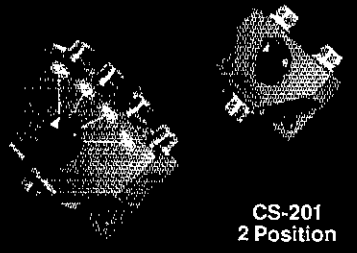

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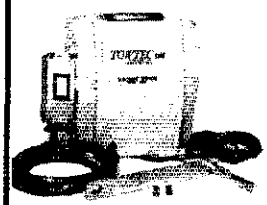

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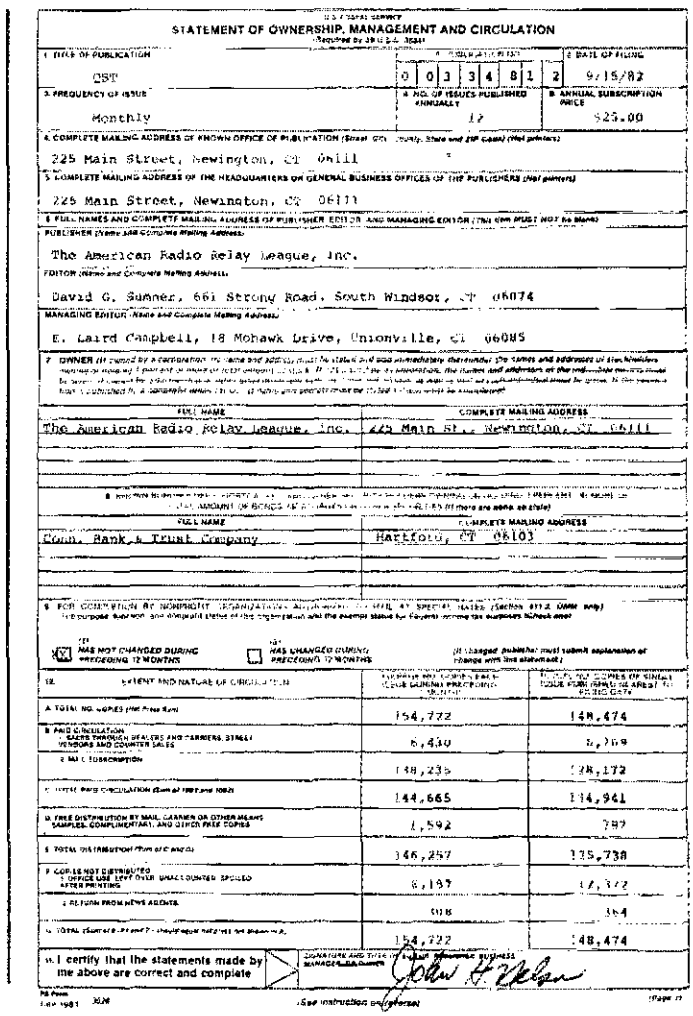

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PS Form 3526 June 1981 (See instructions on reverse) (Page 1)

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WANTED: Callbooks, Handbooks before WW2. State condition and year. Write for my offer. Joe, WB6DOJ, Box 5333, Walnut Creek, CA 94596.

AMATEUR accesories: Our name says it all! "FALL"ing prices - New Azden PCS-4000, $299, Larsen 2m 5/8 wave mobile magnet or trunk lip mount antenna $38, W2AU Balun $13, MFJ 989 3kW tuner w/roller inductor $283, MFJ 816 HF watt/SWR meter $27, Mini Quad HQ-1 $137. Free shipping. Check, m.o., Visa/MC, Amateur Accessories, 6 Harvest Ct. RD 7, Flemington, NJ 08822, 201-782-1551.

HEATHKIT HW-101 with calibrator and CW filter, HP-23B supply, HS-1661 speaker. $400. Mint condition. Bob Ryals, KC4OD/DA1WW, Box 4077, APO NY 09132.

SB-102 transceiver with speaker console and powr supply and all manuals. Not used since tune-up. First $200 takes all. WA4VIG Jim Coffey, 10396 Meadow Wren Avenue, Brooksville, FL 33572 Phone 904-596-9556.

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ATTENTION: Icom & Kenwood owners! Free information! Very informative separate Newsletters. Send S.A.S.E. to Users International Radio Club, 364 Kilpatrick Ave., Port St. Lucie, FL 33452.

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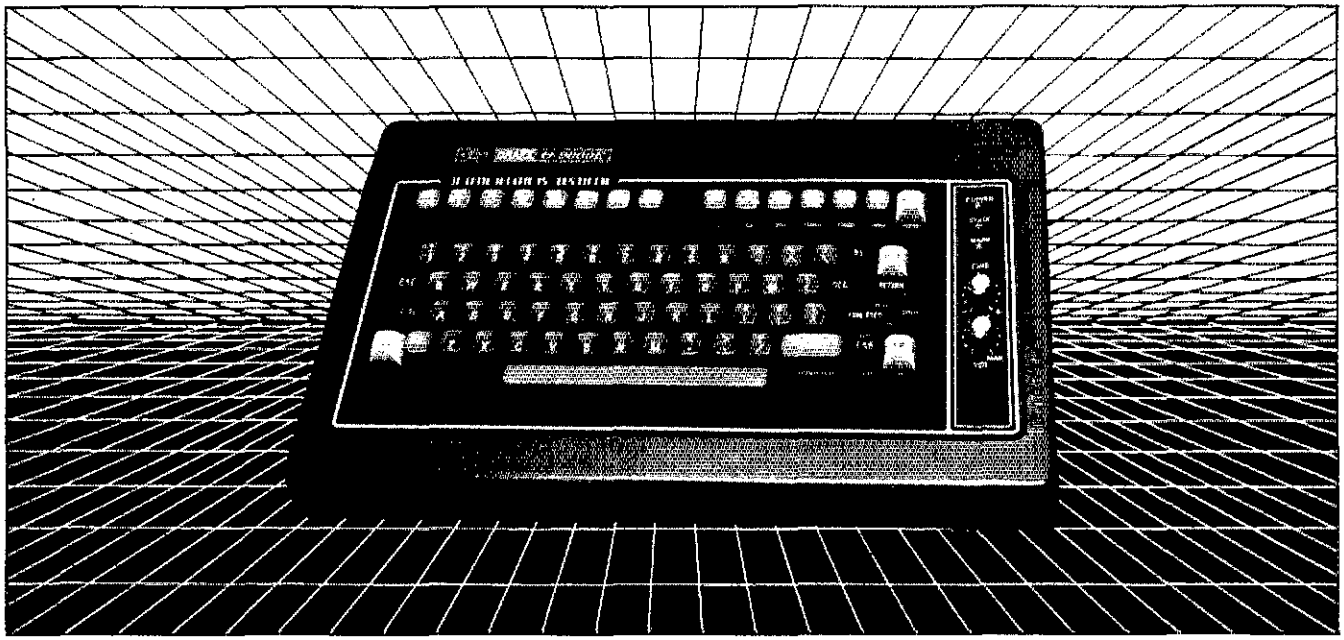


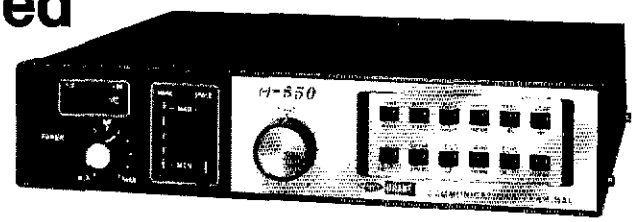
Microprocessor Controlled

Drake Theta 9000E

The ultimate in communications versatility, the **Drake Theta 9000E** provides complete transceive capability of CW (Morse Code), RTTY (Baudot), and ASCII. A full computer RS232 interface, cassette tape storage port, selective calling feature with answer-back, light pen graphics, printer interface and word processing software are all standard.

Seven large 256 character memories are backed up with battery power so there is no need to reload information with each use. Memories may also be partitioned providing up to 29 separate storage locations. A type-ahead buffer of 3120 characters makes it easy to compose your response while still receiving. Operator controlled scrolling permits review of up to 10,720 previously received characters. Line length is selectable at 40 or 80 characters, your choice, and all mode and speed indicators are displayed on the screen for instant status recognition. The 9000E has 3 tone groups and 3 shifts which are all keyboard selected.

You won't buy any other communications terminal once you have studied all the advanced operating convenience built into the **Drake Theta 9000E**. It's complete.



Drake Theta 550

The **Drake Theta 550** is a compact receive-only communications terminal and is designed to demodulate and display the three most popular over-the-air modes of data communications: CW (Morse Code), RTTY (Baudot), and ASCII. Any standard TV monitor can be used.

A full-featured microprocessor controlled unit, the Drake Theta 550 has selective calling, battery backed-up memory, audio monitor, and informative L.E.D. tuning indicators. There is also interfacing to permit the addition of a dot matrix printer for "hard" copy and a keyer paddle input to permit CW transmission with full iambic operation.

CW automatically tracks over a speed range of 5 to 50 words per minute and RTTY modes offer nine selectable standard speeds of transmission. 12 volts DC is required.

This unit is ideal for shortwave listeners and hams who have been missing the increasing volume of data communications over the air.

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Line output, input levels as low as 15 mV rms (47 kilohm) will result in an output of 1 mW nominal into a 600 ohm balanced line. Output level adjustable by internal preset level control. Interfaces low level audio to RTTY terminal unit or phone line that requires a 600 ohm balanced/unbalanced input. One 36" phono to phono cable supplied.

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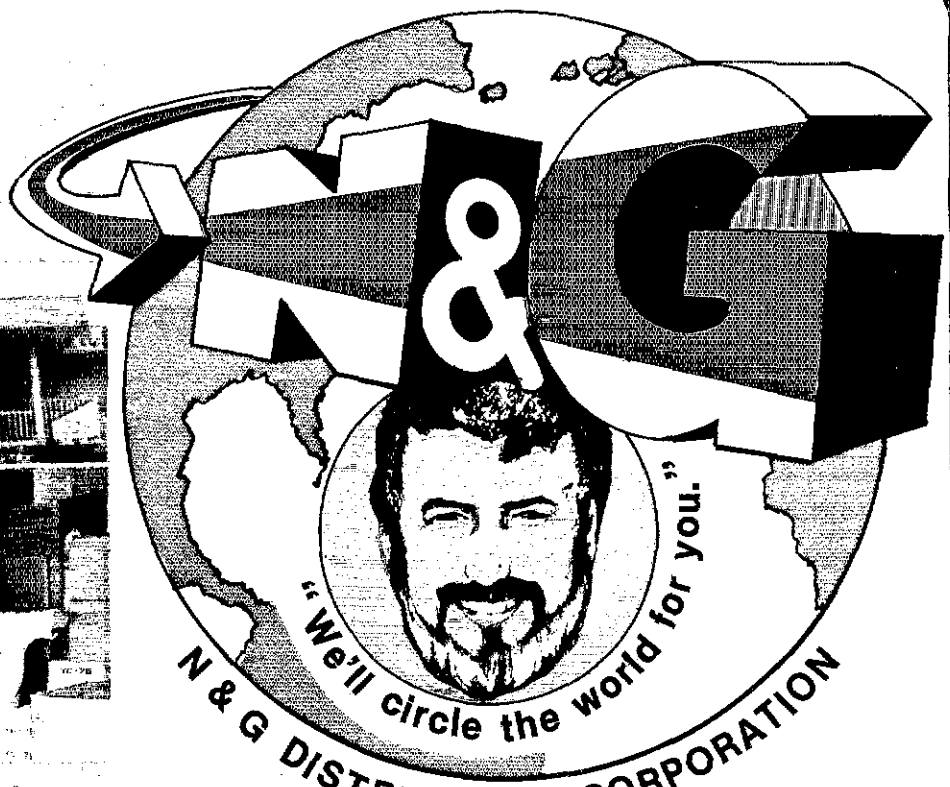

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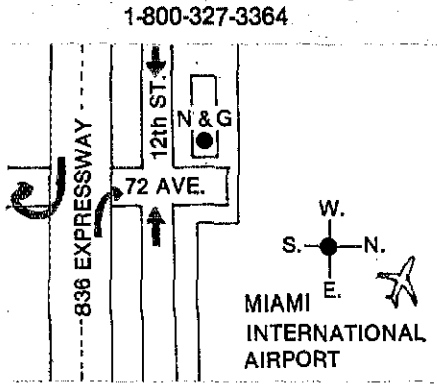

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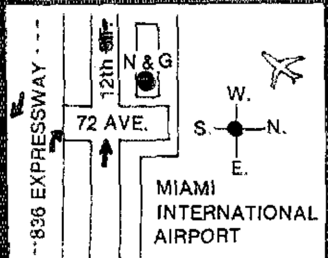

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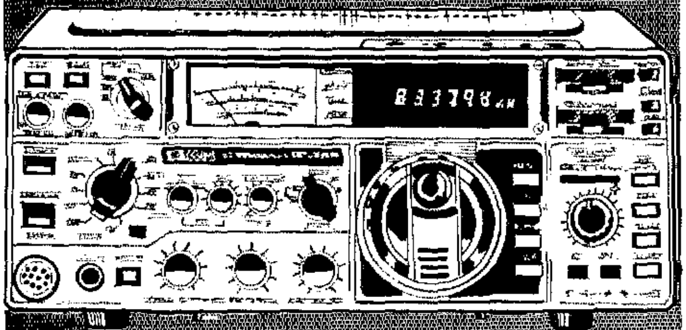

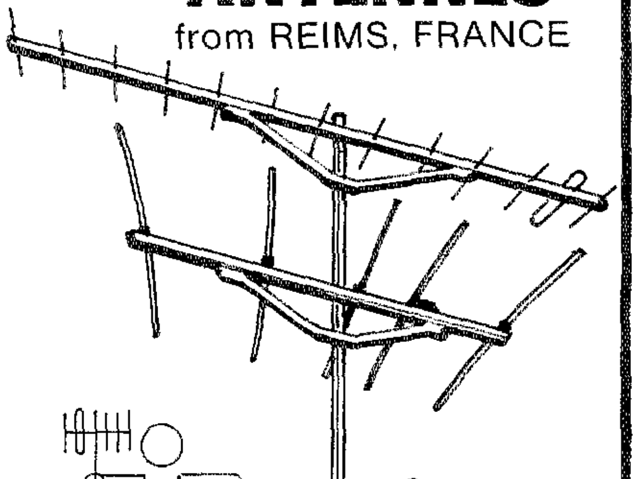

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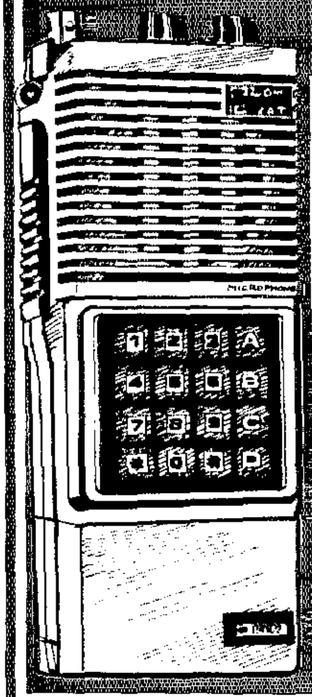

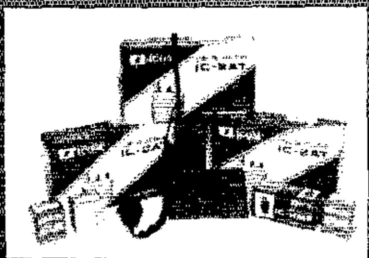

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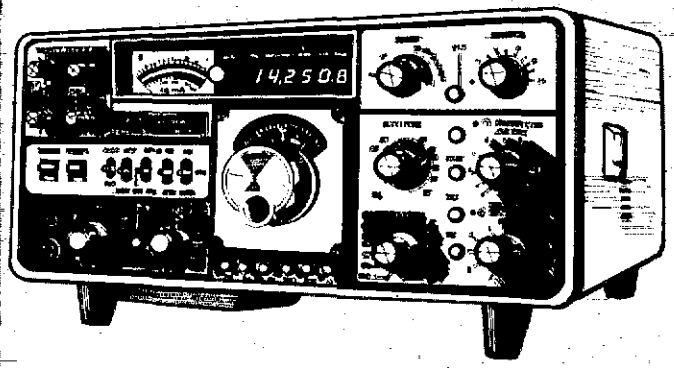

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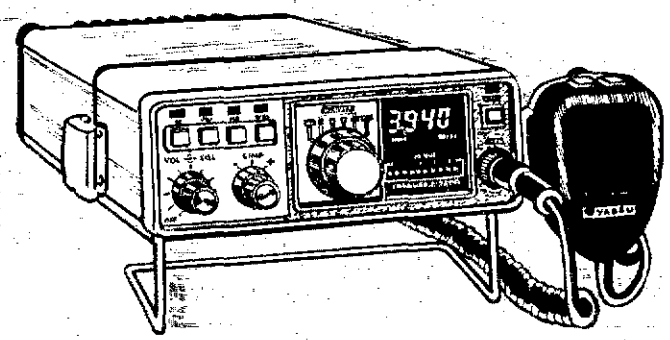

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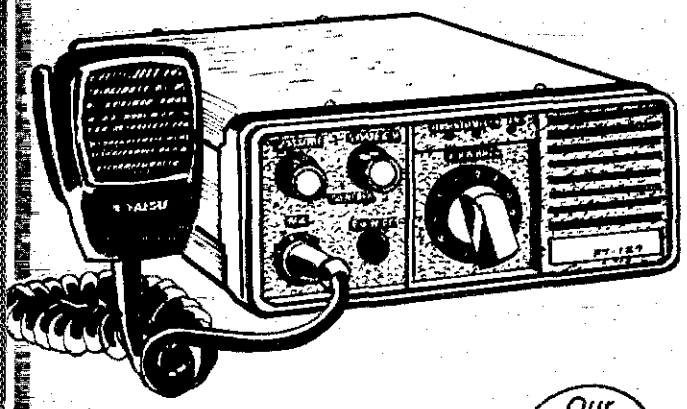

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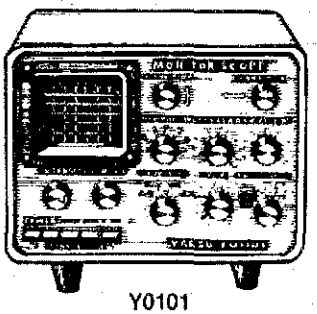
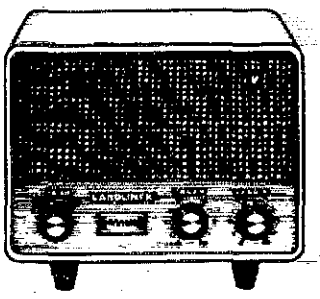


Y0101



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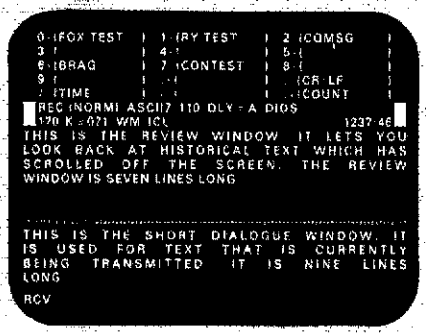
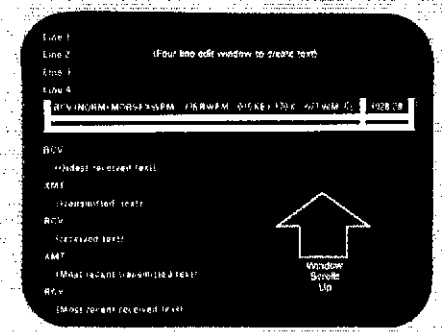


TRS-80 NORMAL DISPLAY



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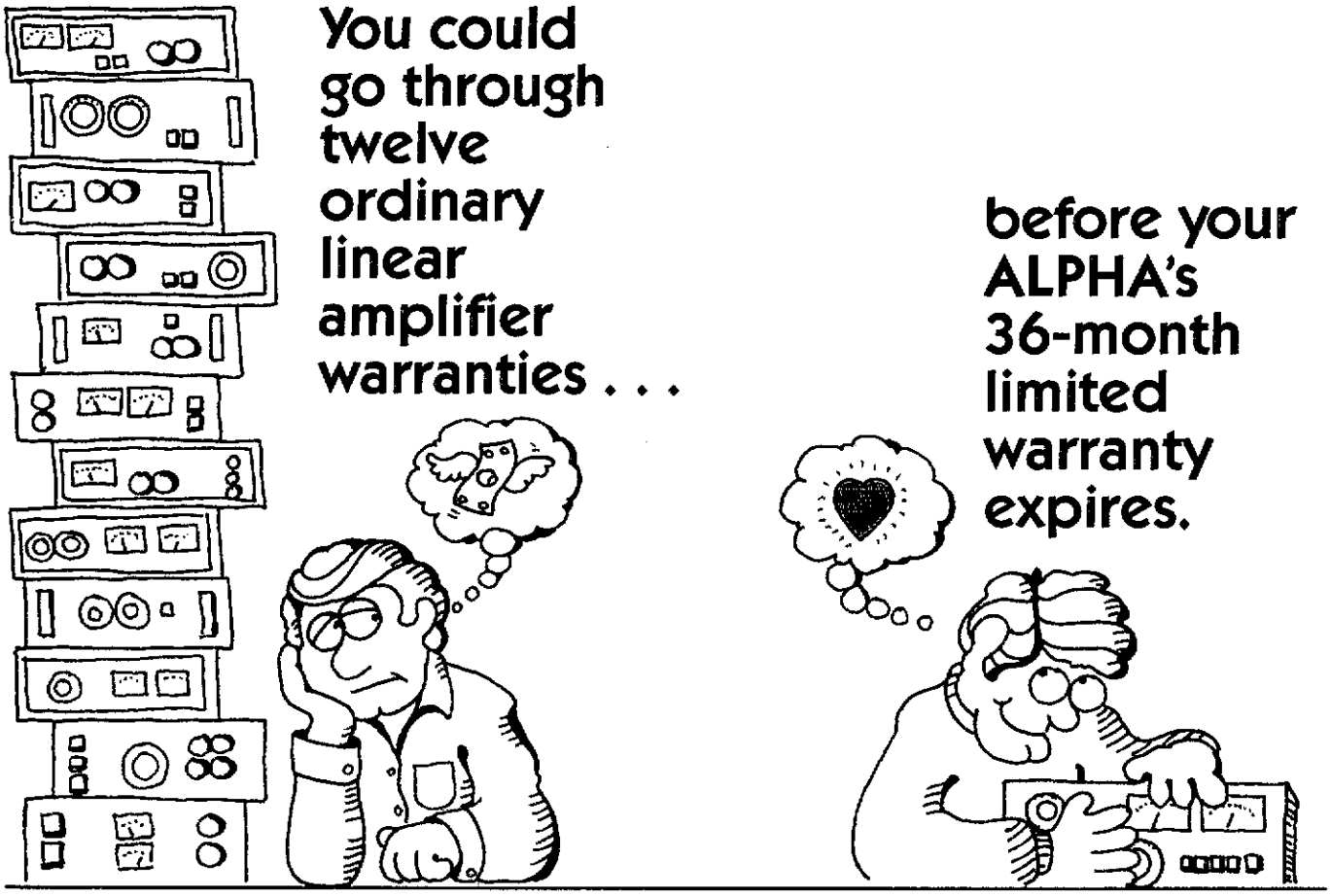

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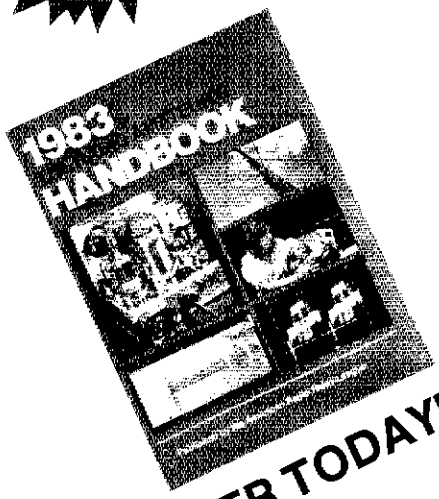

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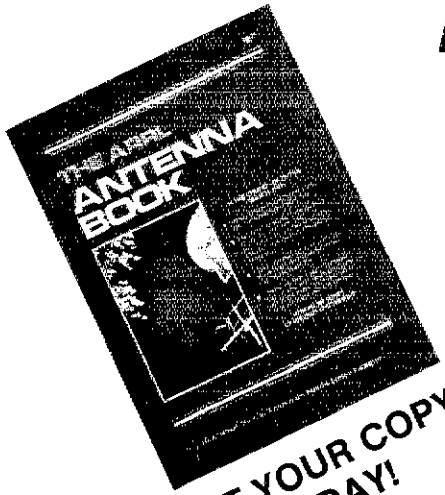

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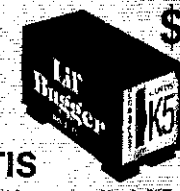

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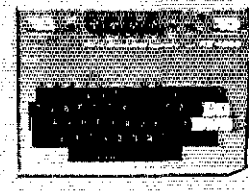

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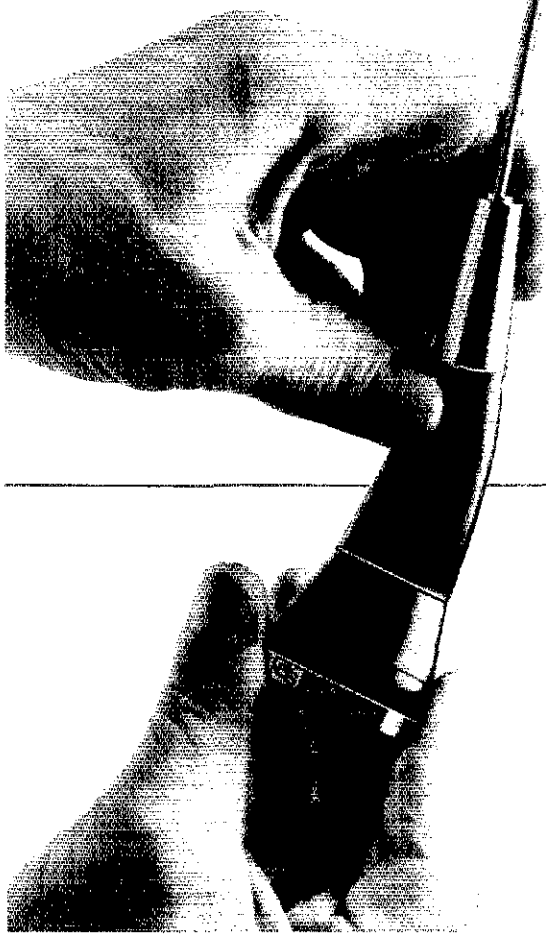

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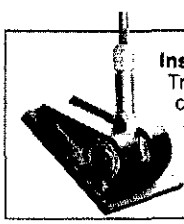

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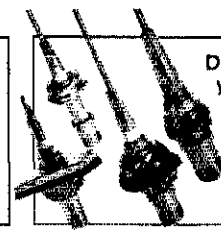

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SINCLAIR 8K/1K Program Book: "Workgrams". Master Program, 5 ham programs, 11 financial and business applications, 9 others, plus 2 motion games. $8.95. K7CD, P.O.B. 753, Hayden, ID 83835.

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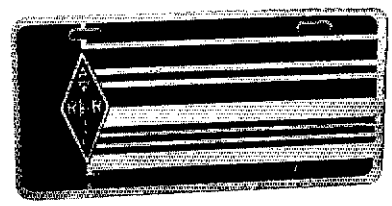

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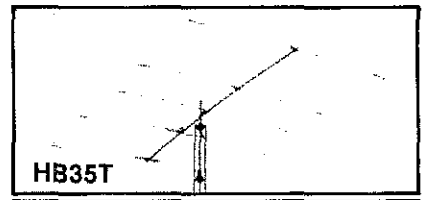

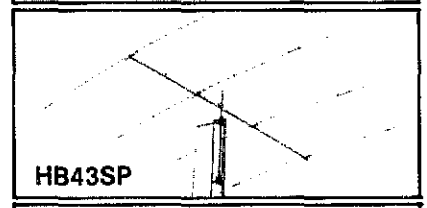

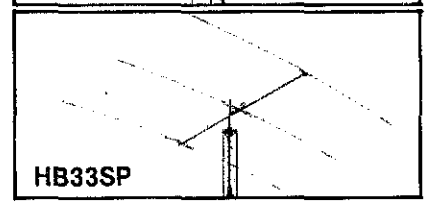

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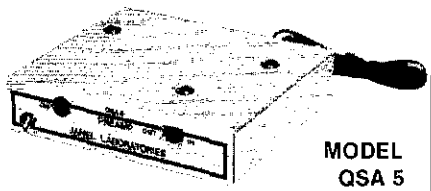

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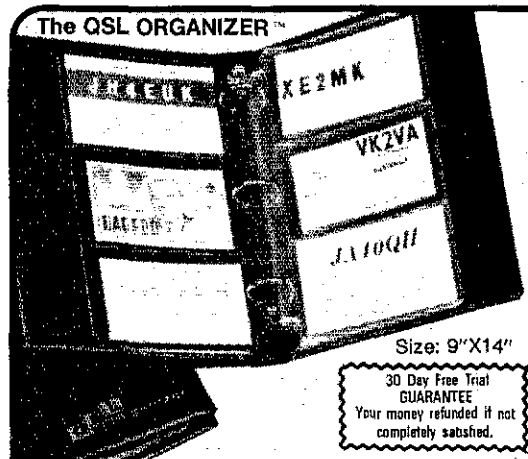

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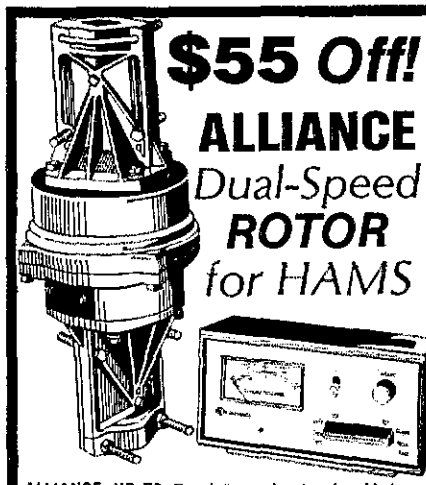

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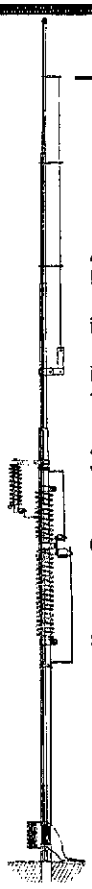

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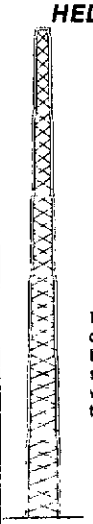

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And – Save even more – include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! Hows that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	269	24	293
HBX48	48 ft	10 sq ft	303	BXB7	349	26	375
HBX56	56 ft	10 sq ft	385	BXB8	419	30	449
HDBX40	40 ft	18 sq ft	281	BXB7	313	26	339
HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429

BUTTERNUT

HF6V	80-10 mtr. Vertical	$129
TBR 160HD	160-mtr. Coil Kit	$ 49
RM KIT	Roof Mount w/Stub Tuned Radials	$ 39
STR KIT	Stub Tuned Radial Kit	$ 20

CUSHCRAFT

40-2CD	2-El. "Broad Band" 40 mtr. Beam	$279
A3	3-El. Triband Beam	$179
A4	4-El. Triband Beam	$229
A743/A744	40 mtr. Add-on Kit for A3/A4 Antenna	$ 69
R3	New Motor Tuned 20/15/10 mtr. Vertical	$229
AV5	80-10 mtr. Trap Vertical	$ 95
20-3CD	3-El. 20 mtr. Beam	$179
20-4CD	4-El. 20 mtr. Beam	$239
15-3CD	3-El. 15 mtr. Beam	$ 99
15-4CD	4-El. 15 mtr. Beam	$109
10-3CD	3-El. 10 mtr. Beam	$ 76
10-4CD	4-El. 10 mtr. Beam	$ 89
A50-5	5-El. 6 mtr. Beam	$ 65
424B	24-El. 432 MHz "Boomer"	$ 63
214B	14-El. 2 mtr. "Boomer"	$ 69
214FB	14-El. 2 mtr. FM "Boomer"	$ 69
228FB	28-El. 2 mtr. FM "Power Pack"	$189
32-19	19-El. 2 mtr. "Super Boomer"	$ 83
220B	17-El. 220 MHz "Boomer"	$ 75
ARX2B	2 mtr. "Ringo Ranger II"	$ 36
ARX450B	450 Mhz "Ringo Ranger II"	$ 38
A147-20T	2 mtr. Vert. & Horiz. 10-El. Beam	$ 63
A144-10T	10-El. 2 mtr. Satellite Antenna	$ 45
A144-20T	20-El. 2 mtr. Satellite Antenna	$ 69
A432-20T	20-El. 432 MHz. Satellite Antenna	$ 45
A14T-MB	Dual Antenna Mounting Assembly	$ 25

MANY OTHER CUSHCRAFT ANTENNAS IN STOCK – CALL!

HYGAIN

V2S	New 2 mtr. Base Vertical	$ 39
TH5MK2S	New Broad Band 5-El. Triband Beam	$319
TH7DXS	New Broad Band 7-El. Triband Beam	$379
TH3MK3S	3-El. Triband Beam	$219
TH3JRS	3-El. Triband Beam	$159
TH2MK3S	2-El. Triband Beam	$139
HY-QUAD	2-El. Triband Quad	$279
402BAS	2-El. 40 mtr. Beam	$199
205BAS	5-El. 20 mtr. "Long John"	$299
155BAS	5-El. 15 mtr. "Long John"	$179
105BAS	5-El 10 mtr. "Long John"	$119
204BAS	4-El. 20 mtr. Beam	$229
203BAS	3-El. 20 mtr. Beam	$139
153BAS	3-El. 15 mtr. Beam	$ 79
103BAS	3-El. 10 mtr. Beam	$ 59
DB1015AS	3-El. 10/15 mtr. Beam	$159
64BS	4-El. 6 mtr. Beam	$ 55
66BS	6-El. 6 mtr. "Long John"	$109
18HTS	80-10 mtr. Hy-Tower Vertical	$339
18AVT/WBS	80-10 mtr. Trap Vertical	$ 95
214	14-El. 2 mtr. Beam	$ 35
2BDQ	80/40 mtr. Trap Dipole	$ 49
5BDQ	80-10 mtr. Trap Dipole	$ 99
BN86	80-10 mtr. KW Balun	$ 19

HUSTLER

3TBA	New 3-El. Triband Beam	$199
4BTV	40-10 mtr. Vertical	$ 79
5BTV	80-10 mtr. Vertical	$ 99
G6-144B	2 mtr. Base Vertical	$ 69
G7-144	2 mtr. Base Vertical	$ 99

HF Mobile Resonators (STD 400 Watt)		Super 2 KW)
10 & 15 mtrs.	$10	$15
20 mtrs.	$12	$18
40 mtrs.	$15	$21
75 mtrs.	$17	$32

BUMPER MOUNTS, SPRINGS, FOLDING MASTS IN STOCK

KLM

CALL!

KT34A	4-El. Tribander	$399
KT34XA	6-El. Tribander	$469
7.2-1	40 mtr. Rotatable Dipole	$159
7.2-2	2-El. 40 mtr. Beam	$299
7.2-3	3-El. 40 mtr. Beam	$449
7.0-7.3-4A	4-El. 40 mtr. Beam	$629
144-148-13LB	13-El. 2 mtr. Long Boomer	$ 79
432-16LB	16-El 432 Mhz. Long Boomer	$ 69
144-150-16C	16-El. 2 mtr. Circular Pol. Beam	$ 99
420-450-18C	18-El. 435 MHz. Circular Pol. Beam	$ 59

CALL FOR OUR LOW PRICES ON OTHER KLM PRODUCTS!

MINI PRODUCTS

HQ-1	Mini-Quad Compact 20/15/10 mtr. Antenna	$139

MOSLEY

CL-33	3-El. Triband Beam	$229
TA-33	3-El. Triband Beam	$199
TA-33 Jr.	3-El. Triband Beam	$149
S-402	2-El. 40 mtr. Beam	$279

ROTORS & CABLES

Alliance HD73 (10.7 sq. ft. Rating)	$ 99
Alliance U100 (For small beams & Oscar Elev. Rotor)	$ 45
Ham 4 (15 sq. ft. Rating)	$199
TailTwister (20 sq. ft. Rating)	$249
HYGAIN HDR-300 (Most HD. Rotor for BIG Arrays)	$439
8 COND (2-#18 GA/6-#22 GA) Rotor Cable	$0.19/ft.
H.D. 8 COND (2-#16GA./6-#18GA.) Rotor Cable	$0.36/ft.

COAXIAL CABLE & CONNECTORS

RG213/U (95% shield - non-contaminating jacket)	$0.29/ft.
RG8X (95% shield-non contaminating jacket)	$0.18/ft.
RG11/U (75 OHM - 95% shield)	$0.35/ft.
½" Aluminum Hardline w/poly jacket	$0.69/ft.
½" Copper Hardline w/poly jacket	$1.10/ft.
½" Alum. H.L. Conn (UHF or N - Male or Female)	$15.00
½" Copper H.L. Conn (UHF or N - Male or Female)	$22.00
Amphenol Silver Plate PL259	$ 1.25
Amphenol Nickel Plate PL259	$ 0.90
Amphenol N Type Male Conn For RG213/U	$ 2.95

HYGAIN CRANKUPS

HG37SS	37 ft. Self Supporting	$669
HG52SS	52 ft. Self Supporting	$949
HG54HD	Heavy Duty 54 Ft. Self Supporting	$1499
HG70HD	Heavy Duty 70 Ft. Self Supporting	$2399
HG50MT2	50 ft. Side Supported	$779

ALL HYGAIN TOWERS FREIGHT PAID! CALL FOR PACKAGE QUOTE ON TOWER, ANTENNA & ROTOR—FREIGHT PAID.

ROHN TOWERS

20G–$32.00 25G–$41.50 45G–$93.50

HBX32	32 ft. Free Standing (rated 10 sq. ft.)	$169
HDBX32	32 ft. Free Standing (rated 18 sq. ft.)	$189
HBX40	40 ft. Free Standing (rated 10 sq. ft.)	$229
HDBX40	40 ft. Free Standing (rated 18 sq. ft.)	$259
HBX48	48 ft. Free Standing (rated 10 sq. ft.)	$289
HDBX48	48 ft. Free Standing (rated 18 sq. ft.)	$319
HBX56	56 ft. Free Standing (rated 10 sq. ft.)	$349
FK2548	48 ft. 25G Foldover Tower	$789
FK2558	58 ft. 25G Foldover Tower	$879
FK2568	68 ft. 25G Foldover Tower	$959
FK4544	44 ft. 45G Foldover Tower	$1099
FK4554	54 ft. 45G Foldover Tower	$1219
FK4564	64 ft. 45G Foldover Tower	$1329

Foldover Towers Freight Paid-10% Higher West of Rockies.
ALL ROHN ACCESSORIES IN STOCK – CALL!

GALVANIZED STEEL TWR. HARDWARE

3/16" EHS Guywire (3990 lbs.)	$12/100 ft.	$111/1000 ft.
1/4" EHS Guywire (6000 lbs.)	$15/100 ft.	$139/1000 ft.
5/32" 7 x 7 Aircraft Cable (2700 lbs.)		$11/100 ft.
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)		$0.30
1/4" CCM Cable Clamp (1/4" Cable)		$0.40
1/4" TH Thimble (fits all sizes)		$0.25
3/8 EE (3/8" Eye & Eye Turnbuckle)		$5.50
3/8 EJ (3/8" Eye & Jaw Turnbuckle)		$6.50
1/2 EE (1/2" Eye & Eye Turnbuckle)		$8.50
1/2 EJ (1/2" Eye & Jaw Turnbuckle)		$9.50
3/16" Preformed Guy Grip		$1.65
1/4" Preformed Guy Grip		$1.85
6" Diam - 4 ft. Long Earth Screw Anchor		$12.50
2" Diam - 10 ft. Long Heavy Duty Steel Mast		$39.00
500D Guy Insulator (5/32" or 3/16" Cable)		$0.95
502 Guy Insulator (1/4" Cable)		$1.95
5/8" Diam - 8 ft. Copper Clad Ground Rod w/clamp		$11.00

ANTENNA WIRE & ACCESSORIES

14 Ga. Solid Copperweld (Multiples of 50 ft.)	$5/50 ft.
14 Ga. Stranded Copper (Multiples of 50 ft.)	$5/50 ft.
14 Ga. Stranded Copper (70 ft. coil)	$ 7.00
14 Ga. Stranded Copper (140 ft. Coil)	$ 14.00
18 Ga. Copperweld (1/4 mile spool)	$30.00
Heavy Duty 8&W End Insulator	$4/Pair
HYGAIN Model 155 Center Insulator	$ 5.95
HYGAIN Model 157 Center Insulator w/SO239	$11.95
450 OHM H.D. Low Loss Ladder Line	$ .14/ft.

MasterCard

TEXAS TOWERS

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VISA

Index to Volume LXVI — 1982

HINTS AND KINKS

INTERNATIONAL NEWS

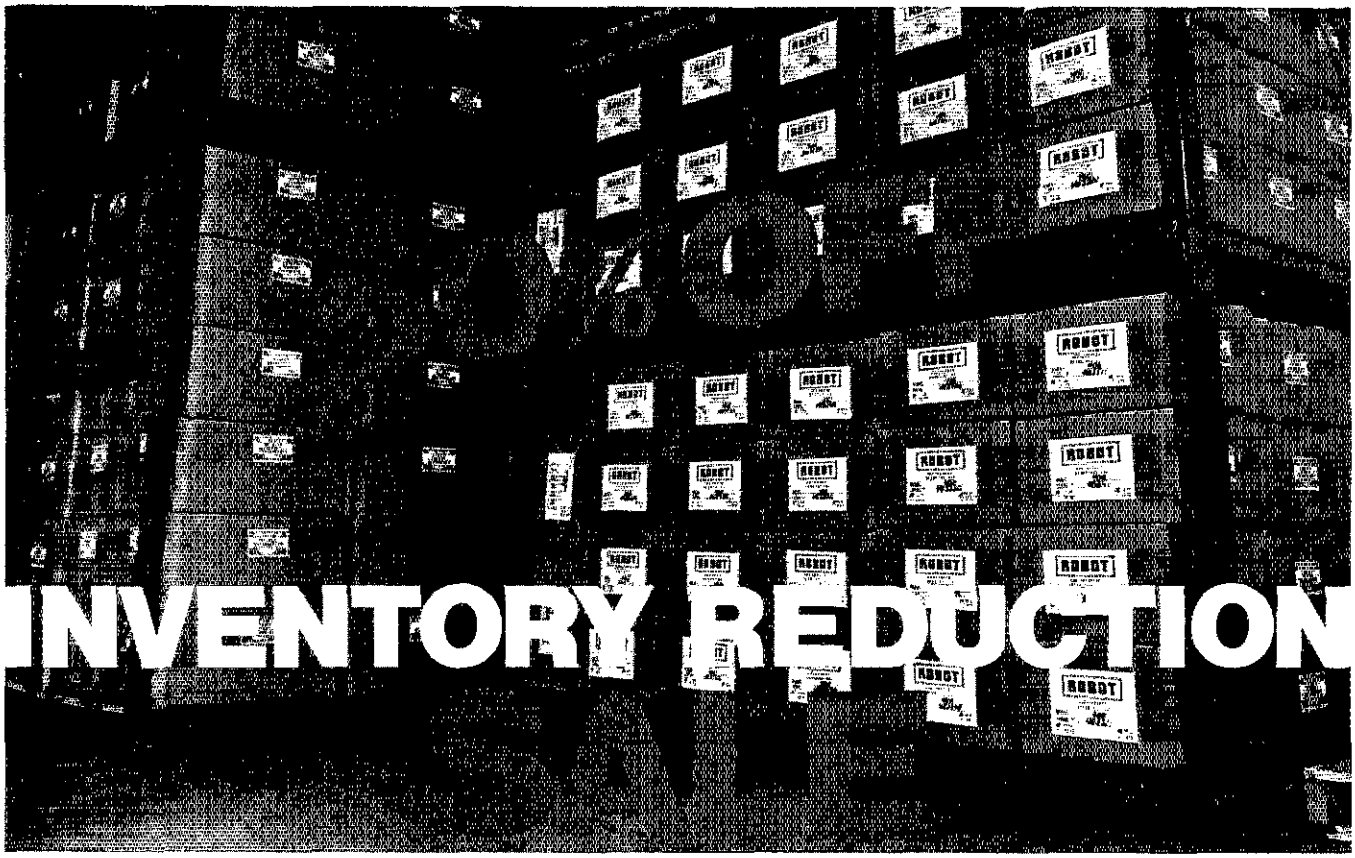
IN TRAINING

KEYING AND CONTROL CIRCUITS

MEASUREMENT AND TEST EQUIPMENT

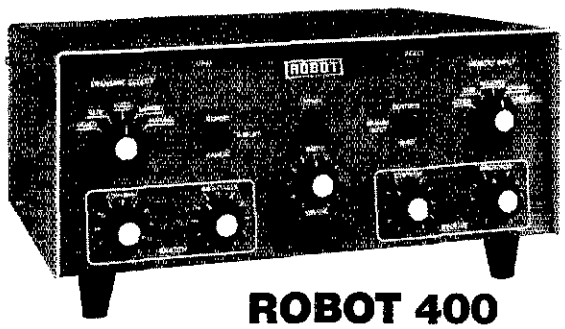
MISCELLANEOUS GENERAL

MISCELLANEOUS TECHNICAL



ON ALL ROBOT 400 SSTV CONVERTERS AND ROBOT 800 SUPER TERMINALS

There has never been a better time to complete your station with SSTV, RTTY, and Machine Morse capabilities than right now. The recent FCC proposal opened up all amateur voice transmission frequencies for SSTV, more hams are operating specialty mode than ever before, and with this half-price sale you can complete your station at tremendous savings. But act now. See your participating dealer today. This half-price sale is limited to units in stock.



ROBOT 400 SSTV CONVERTER

Simple to operate, easy to add to your station. All connections to your transceiver are with ready made connecting cables. NO modifications required.

$397.50

Reg. $795.00

ROBOT 800 SUPER TERMINAL

For Baudot/ASCII, Morse and SSTV graphics. The Robot 800's built-in demodulator equals or exceeds the performance of those found only in expensive stand-alone terminal units.

$447.50

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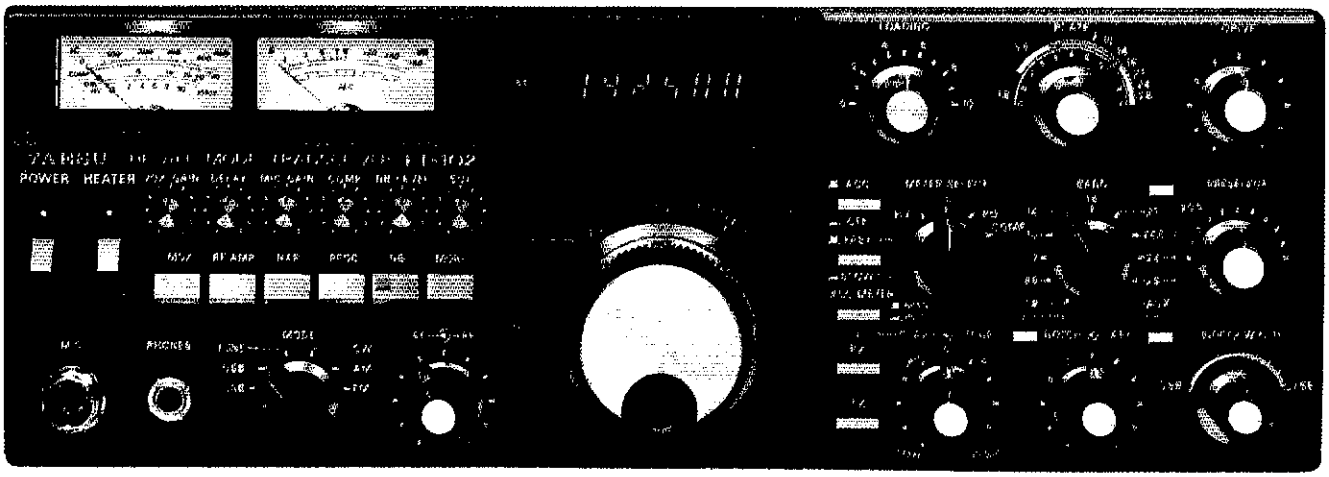
ROBOT

ROBOT RESEARCH, INC. 7591 Convoy Court, San Diego, CA 92111 (619) 279-9430

World Leaders in Slow Scan TV, Phone Line TV and Image Processing Systems.

New Yaesu FT-102 Series

Transceiver of Champions!



The long-awaited new generation of Yaesu HF technology has arrived! New research in improved receiver filtering and spectral purity is brought to bear in the competition-bred FT-102, the HF transceiver designed for active Amateurs on today's intensely active bands!

Unique Cascaded Filter System
The FT-102 utilizes an advanced 8.2 MHz and 455 kHz IF system, capable of accepting as many as three filters in cascade. Optional filters of 2.9 kHz,1.8 kHz, 600 Hz, and 300 Hz may be combined with the two stock 2.9 kHz filters for operating flexibility you've never seen in an HF transceiver before now!

All New Receiver Front End
Utilizing husky junction field-effect transistors in a 24 volt, high-current design, the FT-102 front end features a low-distortion RF preamplifier that may be bypassed via a front panel switch when not needed.

IF Notch and Audio Peak Filter
A highly effective 455 kHz IF Notch Filter provides superb rejection of heterodynes, carriers, and other annoying interference appearing within the IF passband. On CW, the Audio Peak Filter may be switched in during extremely tight pile-up conditions for post-detection signal enhancement.

Variable IF Bandwidth with IF Shift
The FT-102's double conversion receiver features Yaesu's time-proven Variable Bandwidth System, which utilizes the cascaded IF filters to provide intermediate bandwidths such as 2.1 kHz, 1.5 kHz, or 800 Hz simply by twisting a dial. The Variable Bandwidth System is used in conjunction with the IF Shift control, which allows the operator to center the IF passband frequency response without varying the incoming signal pitch.

Wide/Narrow Filter Selection
Depending on the exact combination of optional filters you choose, a variety of wide/narrow operating modes may be selected. For example, you may set up 2.9 kHz in SSB/WIDE, 1.8 kHz in SSB/NARROW, then select 1.8 kHz for CW/WIDE, and 600 Hz or 300 Hz for CW/NARROW. Or use the Variable Bandwidth to set your SSB bandwidth, and use 600 Hz for CW/WIDE and 300 Hz for CW/NARROW! No other manufacturer gives you so much flexibility in selecting filter responses!

Variable Pulse Width Noise Blanker
Ignition noise, the "Woodpecker," and power line noise are modern-day enemies of effective Amateur operation. The FT-102 Noise Blanker offers improved blanking action on today's man-made noise sources (though no blanker can eliminate all forms of band noise) for more solid copy under adverse conditions.

Low Distortion Audio/IF Stage Design
Now that dynamic range, stability, and AGC problems have been largely eliminated thanks to improved technology, Yaesu's engineers have put particular attention on maximizing intelligence recovery in the receiver. While elementary filter cascading schemes often degrade performance, the FT-102's unique blend of crystal and ceramic IF filters plus audio tone control provides very low phase delay, reduced passband ripple, and hence increased recovery of information.

Heavy Duty Three-Tube Final Amplifier
The FT-102 final amplifier uses three 6146B tubes for more consistent power output and improved reliability. Using up to 10 dB of RF negative feedback, the FT-102 transmitter third-order distortion products are typically 40 dB down, giving you a studio quality output signal.

Dual Metering System
Adopted from the new FT-ONE transceiver, the Dual Metering System provides simultaneous display of ALC voltage on one meter along with metering of plate voltage, cathode current, relative power output, or clipping level on the other. This system greatly simplifies proper adjustment of the transmitter.

Microphone Amplifier Tone Control
Recognizing the differences in voice characteristics of Amateur operators, Yaesu's engineers have incorporated an ingenious microphone amplifier tone control circuit, which allows you to tailor the treble and bass response of the FT-102 transmitter for best fidelity on *your* speech pattern.

RF Speech Processor
The built-in RF Speech Processor uses true RF clipping, for improved talk power under difficult conditions. The clipping type speech processor provides cleaner, more effective "punch" for your signal than simpler circuits used in other transmitters.

VOX with Front Panel Controls
The FT-102 standard package includes VOX for hands-free operation. Both the VOX Gain and VOX Delay controls are located on the front panel, for maximum operator convenience.

IF Monitor Circuit
For easy adjustment of the RF Speech Processor or for recording both sides of a conversation, an IF monitor circuit is provided in the transmiter section. When the optional AM/FM unit is installed, the IF monitor may be used for proper setting of the FM deviation and AM mic gain.

WARC Bands Factory Installed
The FT-102 is factory equipped for operation on all present and proposed Amateur bands, so you won't have to worry about retrofitting capability on your transceiver. An extra AUX band position is available on the bandswitch for special applications.

Full Line Of Accessories
For maximum operating flexibility, see your Authorized Dealer for details of the complete line of FT-102 accessories. Coming soon are the FV-102DM Synthesized VFO, SP-102 Speaker/Audio Filter, a full line of optional filters and microphones, and the AM/FM Unit.

Price And Specifications Subject To Change Without Notice Or Obligation

YAESU

The radio.

YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007
YAESU Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 ● (513) 874-3100

NEW

Digital DX-terity...

General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch...COMPACT!

TS-430S

The TS-430S combines the ultimate in compact styling with advanced circuit design and performance. An all solid-state SSB, CW, and AM transceiver, with FM optional, covering the 160-10 meter Amateur bands, it also incorporates a 150 kHz-30 MHz general coverage receiver having a superior dynamic range, dual digital VFO's, 8 memories, memory scan, programmable band scan, IF shift, notch filter, all-mode squelch, and built-in speech processor.

TS-430S FEATURES:

- **160-10 meter operation, with general coverage receiver**
  With 160-10 meter Amateur band coverage, including WARC 30, 17, and 12 meter bands, it also features a 150 kHz-30 MHz general coverage receiver. Innovative UP-conversion digital PLL circuit, for superior frequency stability and accuracy. UP/DOWN band switches for Amateur bands or 1-MHz steps across entire 150 kHz-30 MHz range. Two digital VFO's continuously tuneable from band to band. Band information output on rear panel.
- **USB, LSB, CW, AM, with optional FM**
  Operates on USB, LSB, CW, and AM, with optional FM, internally installed. AGC time constant automatically selected by mode.
- **Compact, lightweight design**
  Measures only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm), weighs only 14.3 lbs. (6.5 kg).
- **Superior receiver dynamic range**
  Use of 2SK125 junction-type FET's in the Dyna-Mix high sensitivity, balanced, direct mixer circuit provides superior dynamic range.
- **10-Hz step dual digital VFO's**
  10-Hz step dual digital VFO's operate independently, include band and mode information. Different band and mode cross-operation possible. Dial torque adjustable. STEP switch for tuning in 10-Hz or 100-Hz steps. A=B switch quickly shifts "B" VFO to the same frequency and mode as "A" VFO, or vice-versa. VFO LOCK switch provided. RIT control tunes VFO or memory. UP/DOWN manual scan possible using optional microphone.
- **Eight memories store frequency, mode, and band data**
  Memories store frequency, mode, and band data. Eighth memory stores receive and transmit frequencies independently. M.CH switch for operation of memory as independent VFO, or fixed frequency.
- **Lithium battery memory back-up**
  Estimated five-year life.
- **Memory scan**
  Scans memories in which data is stored.
- **Programmable automatic band scan**
  Scans programmed band width. Scan speed adjustable. HOLD switch interrupts band or memory scan.
- **IF shift circuit for minimum QRM.**
  IF passband may be moved to place interferring signals outside the passband, for best interference rejection.
- **Tuneable notch filter built-in**
  Deep, sharp, tuneable, audio notch filter.
- **Narrow-wide filter selection**
  NAR-WIDE switch for IF filter selection on SSB, CW, or AM, when optional filters are installed. (2.4 kHz IF filter built-in.)
- **Speech processor built-in**
  Improves intelligibility, increases average "talk-power."
- **Fluorescent tube digital display**
  Indicates frequency to 100 Hz (10 Hz modifiable).
- **All solid-state technology**
  Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Built-in cooling fan, multi-circuit final protection. Operates on 12 VDC, or 120 VAC, or 220/240 VAC with optional PS-430 AC power supply.
- **All-mode squelch circuit, built-in**
- **Noise blanker, built-in**
- **RF attenuator (20 dB)**
- **Vox circuit, plus semi break-in with side-tone**

Optional accessories:

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-130 compact antenna tuner, 80-10 m incl. WARC.
- AT-230 base antenna tuner, 160-10 m incl. WARC.
- FM-430 FM unit.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand microphone.
- MC-60A deluxe desk microphone, UP/DOWN switch.

More information on the TS-430S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220

KENWOOD

pacesetter in amateur radio

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