QST

September 1986 $3.00

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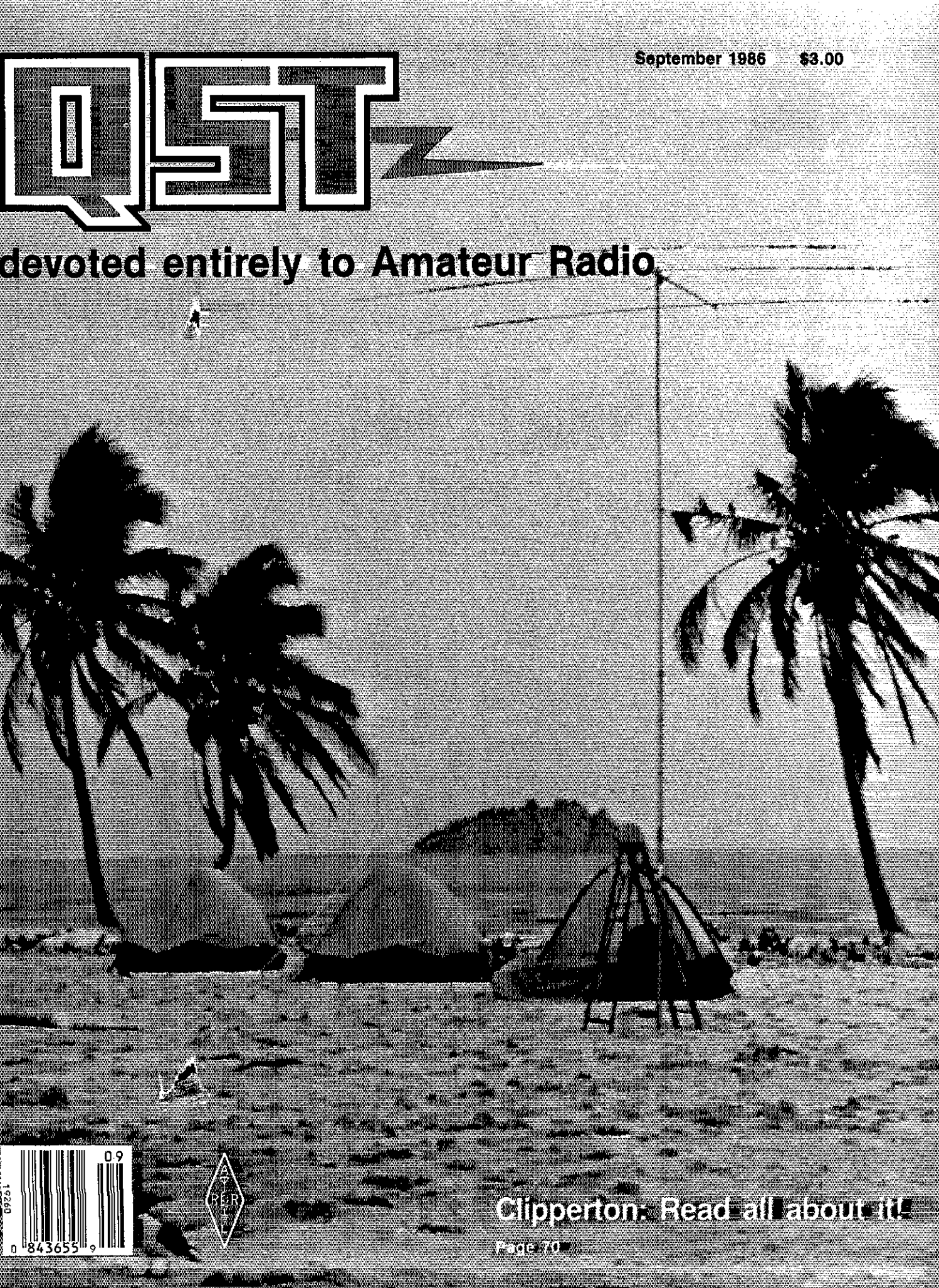

Clipperton: Read all about it!

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...after 58 years, still a leader in the world of amateur radio

THERE ARE A LOT OF GOOD REASONS. WE KNOW THAT WE HAVE PROVIDED THE KIND OF EQUIPMENT AND SERVICE THAT THOUSANDS OF AMATEURS HAVE COME TO EXPECT. THEY KEEP COMING BACK, AND WE'LL DO OUR BEST TO SEE TO IT THAT THEY, AND YOU, WILL HAVE EVERY REASON FOR COMING BACK.

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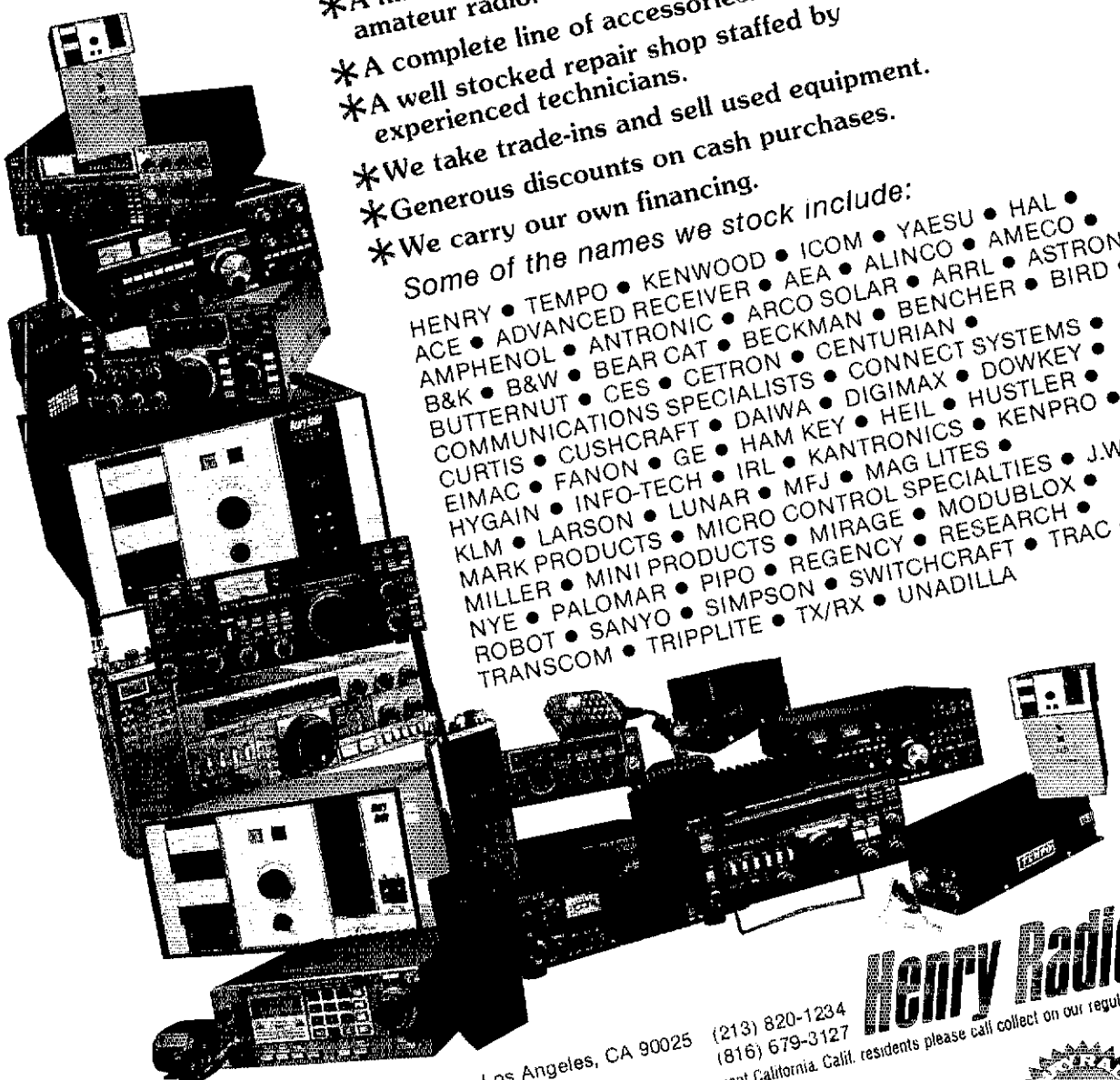

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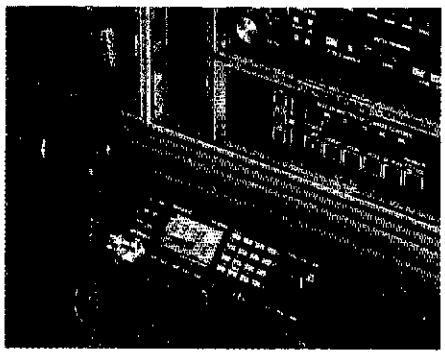
220: Kenwood Style!

TM-3530A

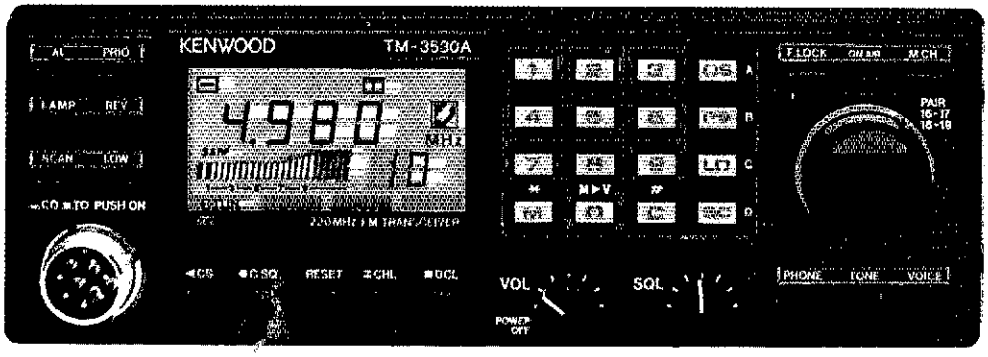
The first comprehensive 220 MHz FM transceiver

TM-3530A—25 watts of 220 MHz FM—Kenwood style! Features include built-in 7-digit telephone number memory, auto dialer, direct frequency entry and big LCD. All this makes the TM-3530A the most sophisticated rig on 220 MHz!

- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit telephone numbers)
- Frequency range 220-225 MHz
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Direct keyboard entry of frequency
- 23-channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Optional front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz**
- Frequency lock switch
- Digital Channel Link (DCL) option
- **Unique** offset microphone connector—relieves stress on microphone cord



- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- **New** 5-way adjustable mounting system
- High performance GaAs FET front end receiver
- HI/LOW power switch (adjustable LOW power)



TM-3530A optional accessories:

- **PS-430** DC power supply
- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DOWN switch
- **MC-42S** UP/DOWN mic.
- **MC-55** (8 pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200B** SWR/power meter
- **SW-100** compact SWR/power meter

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

TH-31AT/31A

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- 1 watt high, 150 mW low
- Super compact and lightweight (about 8 oz. with PB-21!)
- Frequency range 220-224.995 MHz in 5-kHz steps
- Repeater offset:—1.6 MHz, reverse, simplex
- **Supplied accessories:** rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery and wrist strap
- Quick change, locking battery case
- Rugged, high-impact case

TH-31AT/31A optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-9A** StubbyDuk antenna
- **BH-3** belt hook

TH-31AT with DTMF pad shown
Optional RA-9A attached

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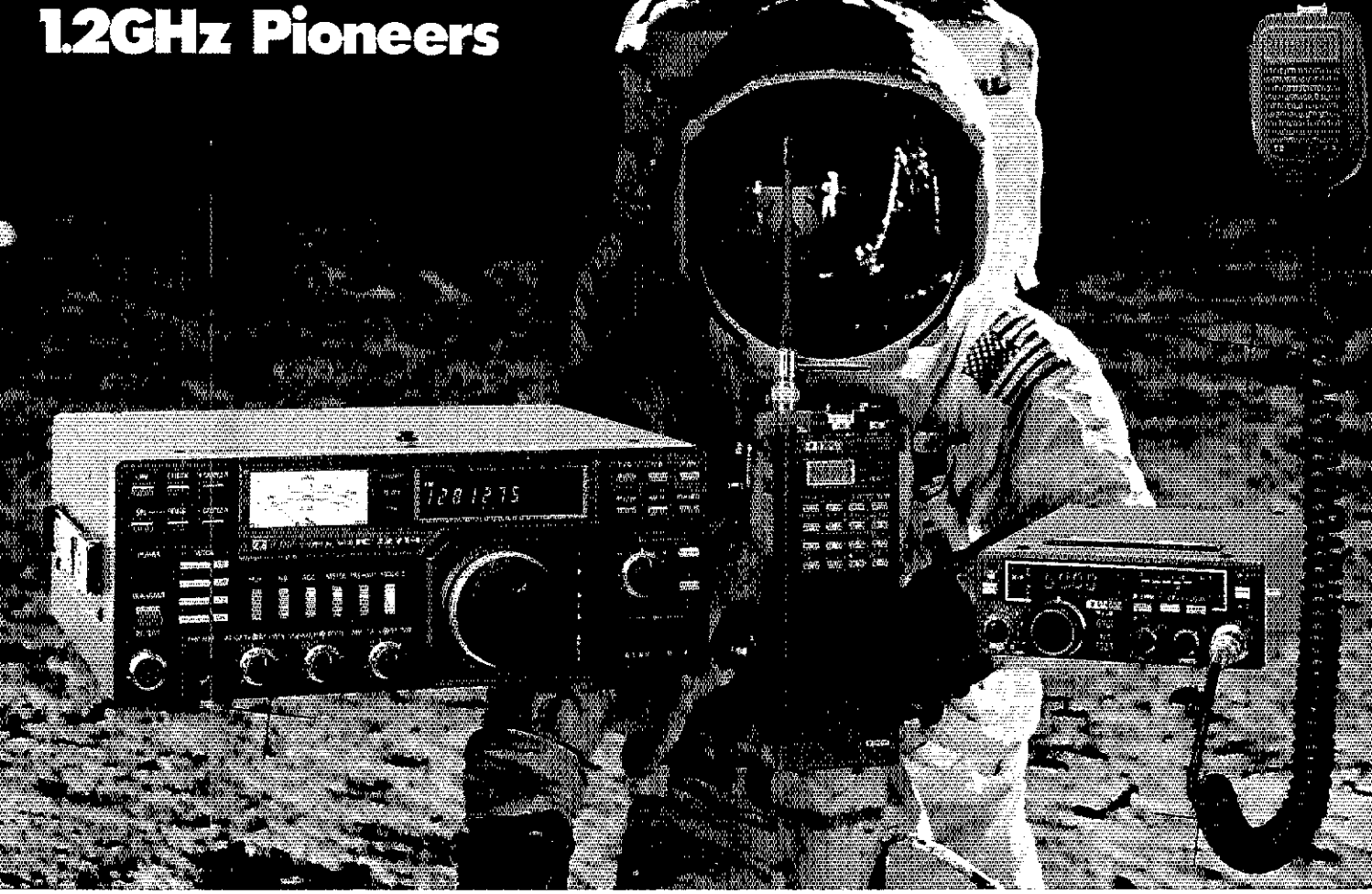


ICOM 1.2GHz

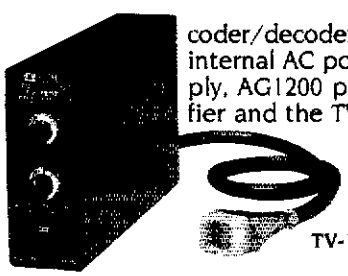
THE ONLY 1.2GHz SYSTEM... ANYWHERE

- **IC-1271A Base Station**
- **IC-12AT Handheld**
- **IC-120 Mobile**
- **IC-RP1210 Repeater**

Explore 1.2GHz with ICOM. Only ICOM offers the most complete line of ham gear for 1.2GHz...the IC-1271A full-featured base station transceiver, the new IC-12AT handheld, the IC-120 mobile and the IC-RP1210 repeater. So, get away from the crowd and be a pioneer on 1.2GHz.

The IC-1271A 1240-1300MHz base station transceiver features 10 watts of RF output power, 32 memories, scanning and multi-mode operation including ATV (amateur TV).

A variety of options are available for the IC-1271A including the IC-EX310 voice synthesizer, UT15S CTCSS encoder/decoder, IC-PS25 internal AC power supply, AG1200 preamplifier and the TV1200 TV interface unit.

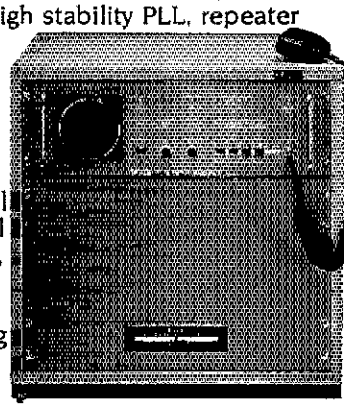


TV-1200

The new IC-12AT covers from 1260-1299.990MHz, has ten memory channels, memory scan, program scan and programmable offset. It also features an LCD readout, RIT and VXO, 32 built-in tones and a DTMF pad.

The IC-120 1.2GHz mobile transceiver has six memory channels, scanning, an HM-14 up/down scanning mic, RIT, LED readout and three tuning rates. Accessories include the ML12 10 watt amplifier and the PS45 slimline external power supply.

The IC-RP1210 completes your 1.2GHz system. It features a field programmable (198 channel, DIP switch), high stability PLL, repeater access to CTCSS, three-digit DTMF decoder for control of special functions, 10 watts, selectable hang time and ID'er.



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OUR COVER

Clipperton Island hasn't lost its allure as a tropical DX paradise. Five US hams heartily attest to that in a first-hand account of their FOØXX operation that appears in the How's DX? column, beginning on page 70. The cover photo was taken by W6RGG.

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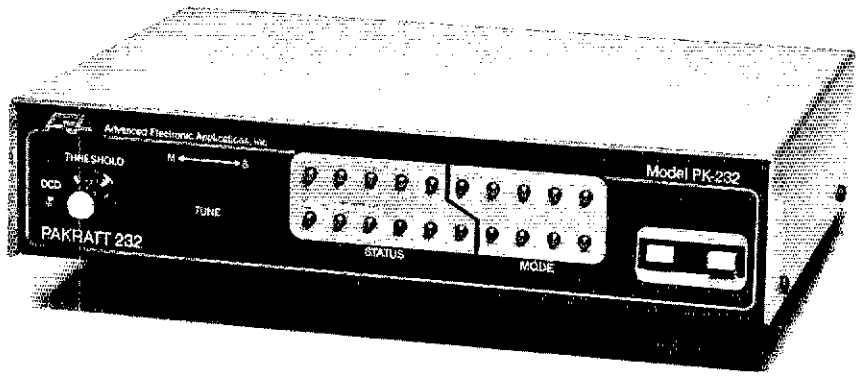


PAKRATT ™
Model PK-232

Late last year AEA broke new ground by introducing the first five mode amateur radio computer interface with Morse, Baudot, ASCII, AMTOR, and Packet...the PK-64. Now AEA has another breakthrough....the PK-232.

Five Mode Versatility

The PK-232 makes any RS-232 compatible computer or terminal the complete Amateur digital operating position. By using a simple terminal program any computer with a standard RS-232 I/O can connect directly to the PK-232 and be ready for operation in minutes. The internal autobaud program allows 300, 1200, 2400, 4800, and 9600 baud communication between the computer and the PK-232. All decoding, signal processing, and protocol software, for Morse, Baudot, ASCII, AMTOR, and Packet, is on ROM in the PK-232. The PK-232 is a Z-80A based system and has hardware HDLC using the Zilog 8530 SCC. The internal modem of the PK-232 can transmit Packet at baud rates of 300 and 1200, with the option of using an external modem for 2400, 4800, and 9600 baud.

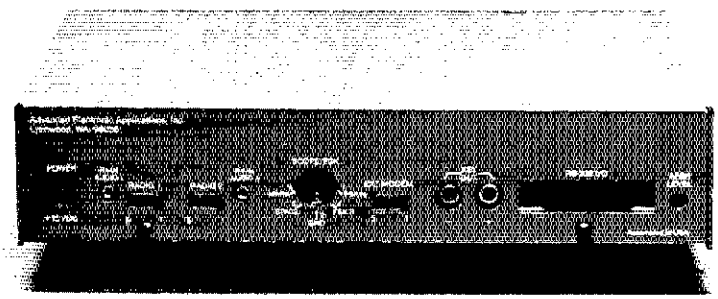
Prices and specifications subject to change without notice or obligation

An Operators Dream

With twenty-one front panel indicators it's easy to monitor operation. Separate indicators show operating mode, current operating status, and data carrier detect. A front panel switch allows selection of two separate radio connectors, no more switching cables when jumping from HF to VHF. The front panel threshold control adjusts squelch for both HF and VHF. The AEA standard discriminator style tuning indicator makes tuning easy in any mode and on any band.

Serious VHF/HF/CW Modem

The PK-232 also includes a no compromise VHF/HF/CW modem with an eight pole bandpass filter followed by a limiter discriminator with automatic threshold correction. Once the operating mode is selected the modem automatically selects the proper bandwidth, 200 hz for CW, 450 Hz for HF, or 2600 Hz for VHF. Transmitter tones are low distortion sine wave phase continuious AFSK. The PK-232 will receive wide shift RTTY signals, but only transmits 200 Hz shift on HF.



AEA Quality and Price

All this plus the high quality you expect from AEA. An easy to read and understand manual, most cables and connectors included, and a service department to answer your questions. The PK-232 is the one unit that does it all with your IBM, Apple, Radio Shack, or almost any computer. With an Amateur Net price of $319.95 you can't wait any longer. Call your local AEA dealer and order the new PK-232 today.

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Brings you the Breakthrough!

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NEW! Computer Interface!

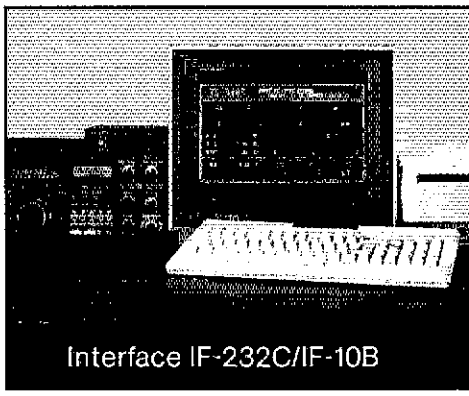
"DX-cellence!"

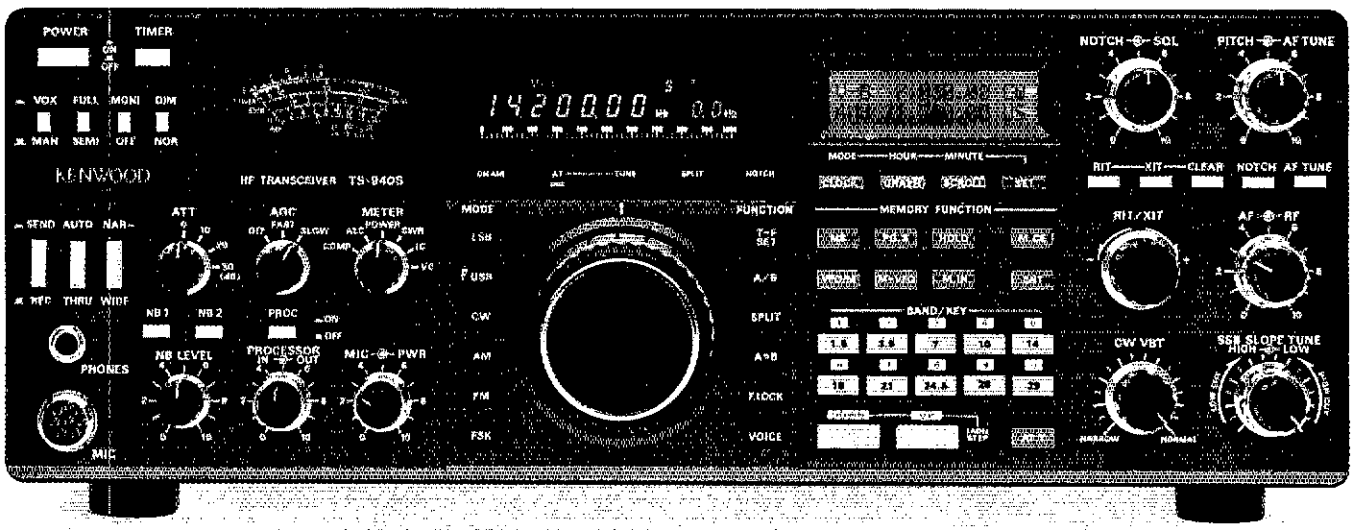
TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT- 940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.





Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

More TS-940S information is available from authorized Kenwood dealers.

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Handy Handful...

TR-2600A/3600A

Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

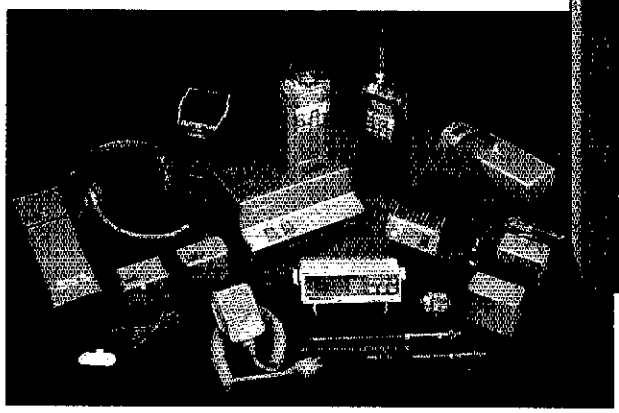
- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.
- **Extended frequency coverage**
  Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz. (TR-3600A covers 440-450 MHz.)
- **Programmable scan**
  Channel scan or band scan, search for open or busy channels.
- **SLIDE-LOC battery case**
- **10 Channels**
  10 memories, one for non-standard repeater offsets.
- **2.5 watts high power, 350 mW low**
  TR-3600A has 1.5 watts high or 300 mW low.

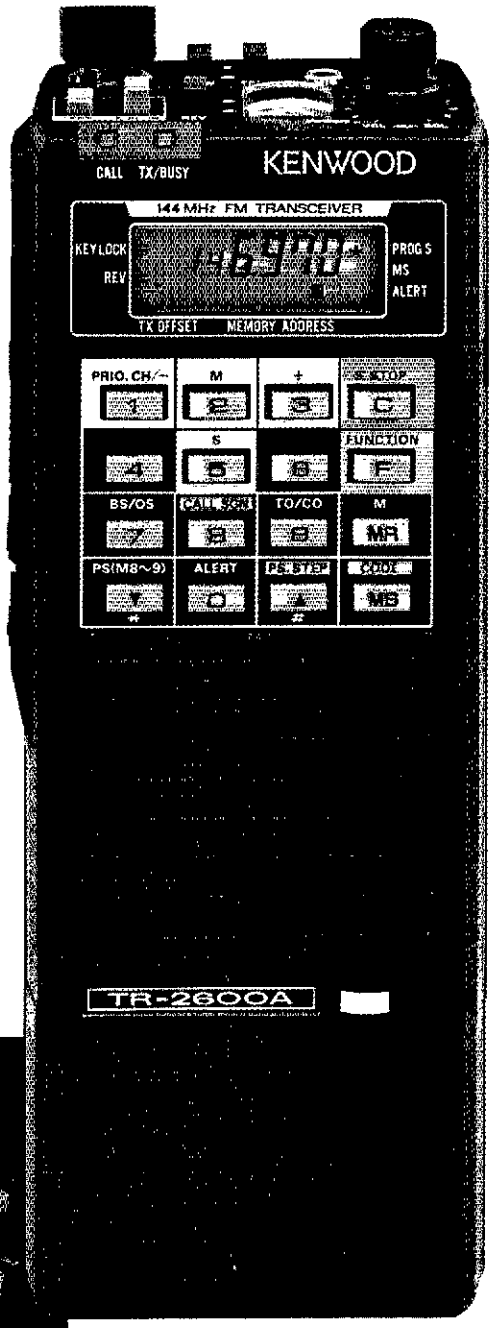
The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handful"!

Optional accessories:

- TU-35B built in programmable sub-tone encoder
- VB-2530 2-m 25 W RF power amp.
- ST-2 base stand/charger
- MS-1 mobile stand/charger
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.





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TR-2600A shown. TR-3600A is available for 70 cm operation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
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Western Pennsylvania — Otto Schuler, K3SMB, 3732 Colby St, Pittsburgh 15214 (412-231-6890)

Central Division

Illinois — David E. Lattan, WD9EBQ, RR 1, Box 234, Makanda 62958 (618-529-1578)
Indiana — Ronald J. Koczor, K9TUS, 2512 Glenwood Ave, Fort Wayne 46805 (219-483-1365)
Wisconsin — Richard R. Regent, K9GDF, 5003 South 26th St, Milwaukee 53221 (414-282-0312)

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Minnesota — George E. Frederickson, KCØT, RR #2—Box 352, South Haven 55382 (612-558-6312)
North Dakota
South Dakota — Roland Cory, WØYMB, 1010 7th St, W, Mobridge 57601 (605-845-2400)

Delta Division

Arkansas — Joel M. Harrison, Sr., WB5IGF, Star Rte 3—Box 306, Judsonia 72081 (501-729-3301)
Louisiana — John M. Wondergem, K5KR, 600 Smith Dr, Metairie 70005 (504-837-1485)
Mississippi — Paul Kemp, KW5T, 3581 Beaumont Dr, Pearl 39208 (601-939-7612)
Tennessee — John C. Brown, NO4Q, PO Box 37, Eva 38333 (901-584-7531)

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Michigan — James R. Seeley, WB8MTD, 21615-29½ Mile Rd, Springport 49284 (517-857-2013)
Ohio — Jeffrey A. Maass, K8ND, 9256 Concord Rd, Powell 43065 (614-873-3234)

Hudson Division

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NYC-Long Island — John H. Smale, K2IZ, 315 Kensington Ct, Copiague 11726 (516-226-4835)
Northern New Jersey — Robert R. Anderson, K2BJG, 69 Page Dr, Oakland 07436 (201-337-9644)

Midwest Division

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Kansas — Robert M. Summers, KØBXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Missouri — Benton C. Smith, KØPCK, 3301 Sinclair, Rte 3, Box 196-A, Columbia 65203 (314-443-5168)
Nebraska — Vern J. Wirka, WBØGQM, 3106 Vinton, Omaha 68105 (402-341-4572)

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Eastern Massachusetts — Luck Hurder, KY1T, PO Box LL, North Eastham 02651 (617-255-2029)
Maine — Clevis O. Laverty, WB1RWG, 17 Fair St, Norway 04268 (207-743-2353)
New Hampshire — William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-882-0021)
Rhode Island — John Vota, WB1FDY, 41 Brookside Ave, Centerdale 02911 (401-231-1934)
Vermont — Frank I. Suitor, W1CTM, 727 North Ave, Burlington 05401
Western Massachusetts — R. Donald Haney, KA1T, RD 1—Box 237, Myrick La, Harvard 01451 (617-772-4126)

Northwestern Division

Alaska — James L. Moody, Jr., NL7C, PO Box 102841, Anchorage 99510 (907-694-4077)
Idaho — Lemuel H. Allen, W7JMH, 1800 S. Atlantic St, Boise 83705 (208-343-9153)
Montana — L. C. "Les" Belyea, N7AIK, PO Box 327, Belgrade 59714 (406-388-4253)
Oregon — William R. Shrader, W7QMU, 2042 Jasmine Ave, Medford 97501 (503-773-8624)
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Nevada — Joseph D. Lambert, W8IXD, PO Box 1201, Boulder City 89005 (702-294-0505)
Pacific — Army Curtis, AH6P, PO Box 4271, Hilo, HI 96720 (808-935-8893)
Sacramento Valley — Robert H. Watson, W6IEW, 10994 Clinton Bar Rd, Pine Grove, CA 95665 (209-223-0
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San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711 (209-431-2038
Santa Clara Valley — Glenn Thomas, WB6W, 554 Simas Dr, Milpitas, CA 95035 (408-263-9450)

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South Carolina — James G. Walker, WD4HLZ, Rte 1, Box 5395, Marion 29571 (803-423-3645)
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Wyoming — Richard G. Wunder, WA7WFC, Box 2807, Cheyenne 82003 (307-634-7385)

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Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave, Columbus 31909 (404-322-2856)
Northern Florida — Royal V. Mackey, N4ADI, 161 Shell Point W, Maitland 32751 (305-644-5905)
Southern Florida — Richard D. Hill, WA4PFK, 3800 SW 11th St, Ft. Lauderdale 33312 (305-583-6932)
West Indies — Alberto L. Valldejuli, WP4CSG, V-11 19 St, Berwind Estates, Rio Piedras, PR 00924

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Santa Barbara — Byron W. Looney, K6FI, 6540 Buckley Dr, Cambria, CA 93428 (805-927-8733)

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Northern Texas — Phil Clements, K5PC, 1313 Applegate La, Lewisville 75067 (214-221-2222)
Oklahoma — Dave Cox, NB5N, 1812 S Umbrella Ct, Broken Arrow 74012 (918-250-2285)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La, Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC

The American Radio Relay League, Inc, is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1954. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US and Canada.

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA

Telephone: 203-666-1541 Telex: 650215-5052 MCI.
MCI MAIL (electronic mail system) ID: 215-5052

Canadian membership inquiries and correspondence should be directed to CRRL Headquarters, Box 7009, Station E, London, ON N5Y 4J9, tel 519-225-2188.

"It Seems to Us . . ."

A Home for Our History

On this page we often speak of the need to look to the future. Promoting healthy growth in the ranks of radio amateurs and League members, defending our radio spectrum allocations and operating privileges, pushing the state of the art ahead so we can offer ever more effective public service communications—these are our usual preoccupations, as well they should be.

But even as we look ahead, there is much to learn from the past. And as we look ahead to the League's Diamond Jubilee celebrations, less than three years away, we can look back on nearly three-quarters of a century of organizational accomplishment. We can and should look even further back, to the experimenters of the 19th century—men like Faraday, Maxwell and Hertz—for Amateur Radio has every right to claim them as its forebears.

It is a proud history, and one that must be passed on to future generations if the traditions of Amateur Radio are to be kept alive. But it is also a history that is fading from our institutional memory as our pioneers join the ranks of Silent Keys. As each month goes by, the accurate re-creation of the formative years of Amateur Radio history becomes ever more difficult.

It is with these thoughts firmly in mind that the ARRL Board of Directors, at its July meeting, approved in principle the construction of an Amateur Radio Museum and Visitors' Center on the League's property in Newington, to be opened in conjunction with our 75th anniversary in 1989. In terms of scope, importance and cost, the project would rank as the largest capital project ever undertaken by the League—equivalent in significance to the construction of the present administrative headquarters building in the early 1960s.

The Board's action could not have been more timely. The possibility of relocating the League's Headquarters to another part of the country was put to rest at the January meeting, so it is now appropriate to make long-range plans for the development of the existing property. The building that houses the Maxim Memorial Station, W1AW, is nearing its 50th birthday and is in need of some renovation to offset the ravages of as many winters. Recent communications emergencies in which we have gotten national media attention have revealed a need for a suitably equipped room, preferably adjacent to W1AW, that can be used as a command center during such crises. We've come to the realization that suitable space must be found for an Amateur Radio archive, to protect our early written history for future researchers. Finally, as much as visitors tell us they enjoy their visits to Headquarters, they deserve more than we are now able to provide: a tour of the office building, the chance to meet a few staff members, a browse through the display cases of pre-World War II equipment in our present Museum of Amateur Radio and a visit to W1AW. When they come to Newington not only long-time League members, but also their family members, newer hams and potential hams should be able to participate in an enriching educational experience.

If the new Museum and Visitors' Center becomes a reality, future visitors to the Headquarters site will pull into the driveway to find W1AW flanked on two sides by, and connected to, a larger but unobtrusive building housing the new facilities. The entrance to the new building and to W1AW will be opposite the entrance to the administrative headquarters, creating a courtyard effect; staff parking will be moved to the rear of the property, with visitors' parking convenient to both buildings. Inside the Museum and Visitors' Center will be some 6500 square feet of exhibit space in which eight or more typical Amateur Radio stations from as many decades will be depicted. Other exhibits will document the contributions made by radio amateurs to the development of electronic communications—a story well worth telling, since it includes innumerable illustrations of how the work of one individual can make all the difference. Who can estimate the value of the inspiration that young visitors may gain, when they see that those who have left a mark on history were just like themselves?

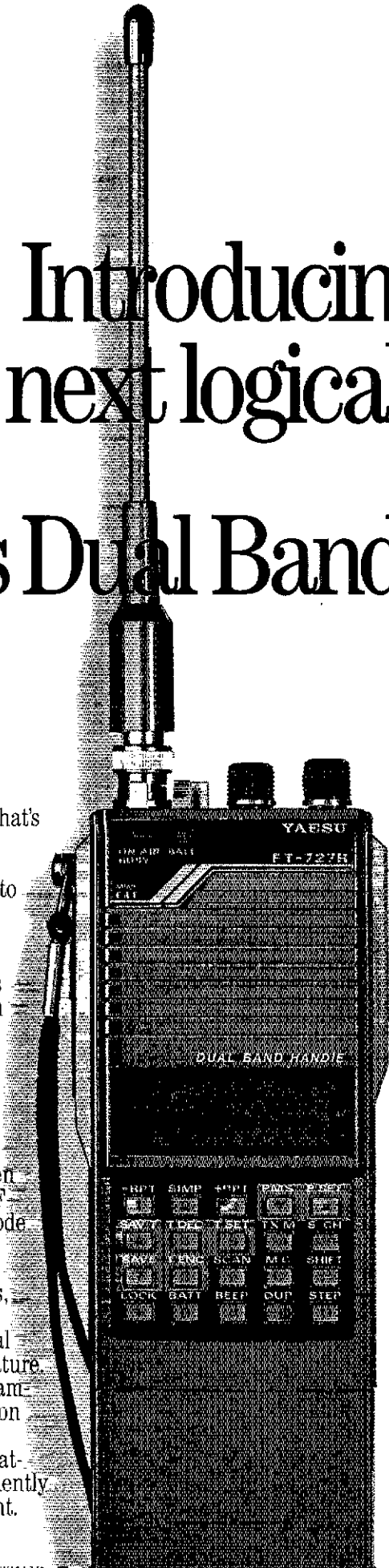
Plans include a members' library and lounge, where the more serious visitor can leaf through an extensive library of publications at his or her leisure; a renovated W1AW with four guest operating positions, each easily observed by other visitors; ample exhibit space for the display of artifacts on loan from other collections; a small gift shop; a room where several dozen visitors at a time can view films, videotapes and slide shows, and which can be converted into a command center when the need arises; and ample space for the storage and restoration of artifacts that may come into the League's possession—14,000 square feet in all. The plans show a fine building, one in which all League members could take pride: not elaborate, but built to endure.

The next step is to answer the all-important question of funding: Is adequate financial support available for such an ambitious project? The cost of the entire project could run as high as $2.7 million. Will members provide support equivalent to what built the Headquarters some 25 years ago? If so, correcting for inflation and for a larger number of members today, this would account for about 55% of the necessary funds. We'll be addressing this question through a survey, and will be seeking commitments from other sources, in the coming weeks. We'll also be working with the town of Newington to answer the myriad questions that arise in connection with any construction project.

In January, the Board will know whether the dream of an Amateur Radio Museum and Visitors' Center can be turned into reality. With your help and support, the answer will be YES.—*David Sumner, K1ZZ*

Introducing the next logical step.

Yaesu's Dual Band Handie.



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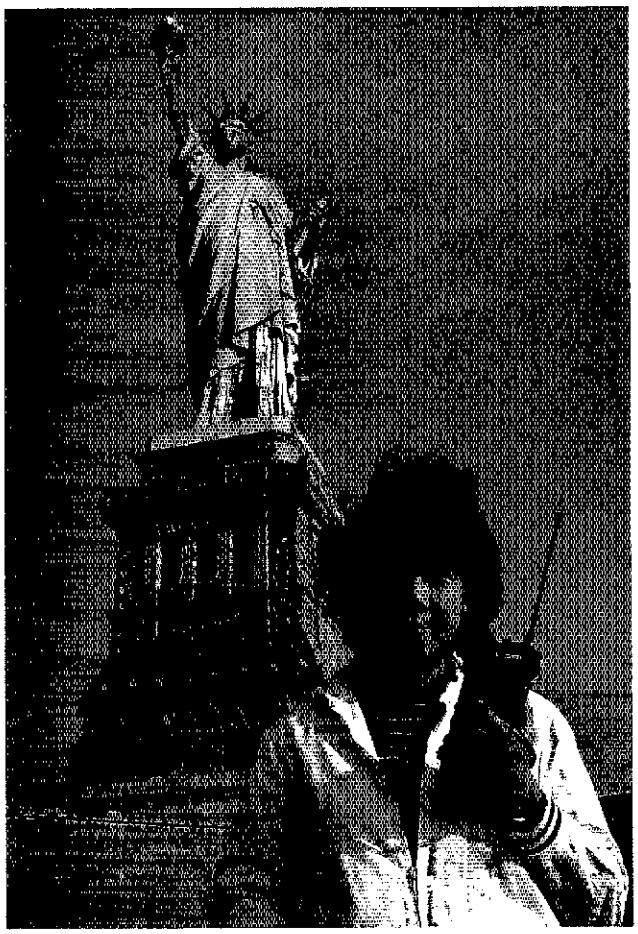
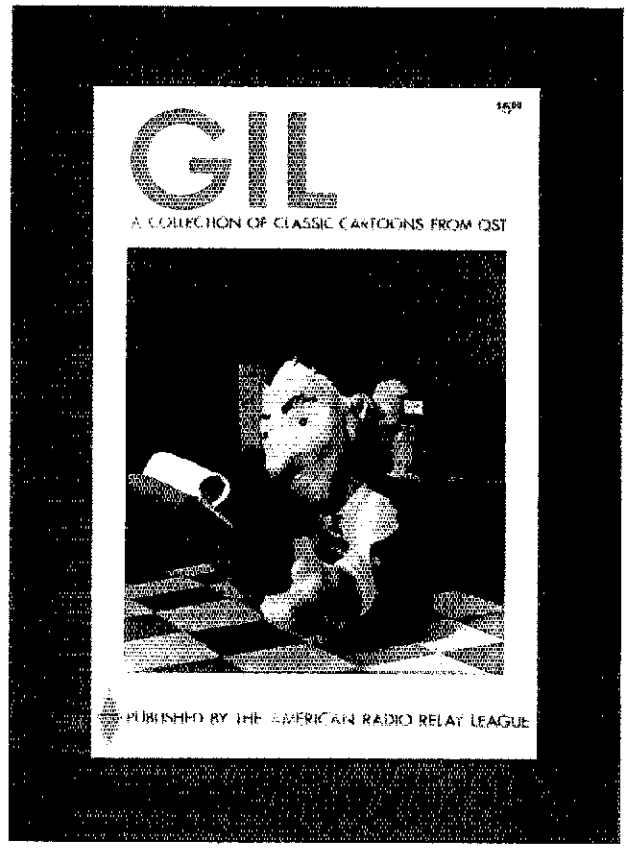


Operation Sail: As an international parade of Tall Ships sailed majestically up the Hudson River on the Fourth of July, Amateur Radio helped ensure that everything went smoothly. During Operation Sail, part of this nation's celebration in honor of the Statue of Liberty's 100th birthday, radio amateurs helped officials monitor the progress of the parade as well as handled emergency medical traffic while stationed among the crowd of thousands who viewed the event. Shown here is Linda Sau, KA2VVS, one of more than 100 hams who took part in the amateur operation. The Lady in the background needs no introduction. *(WB2ZTH photo)*

OSCAR 10 Makes Comeback!

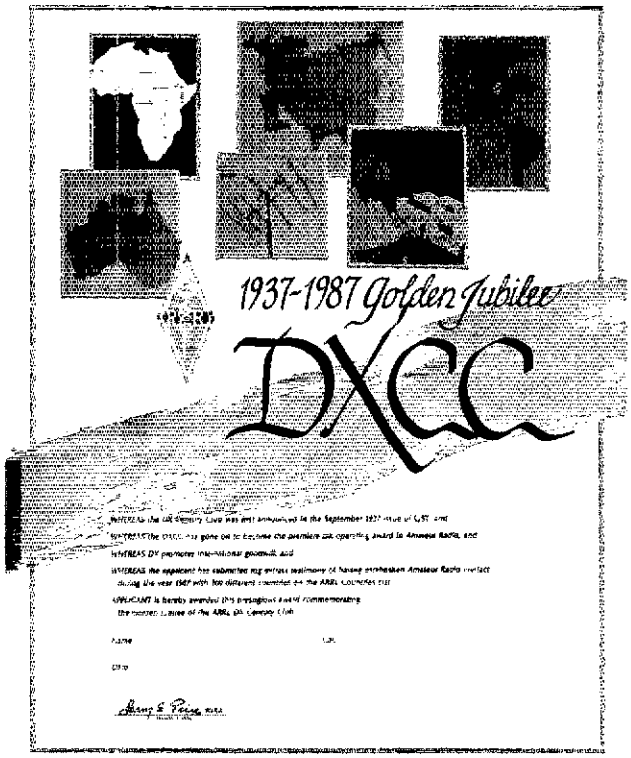
After being nearly put out of service for good by radiation damage while in orbit May 17, AMSAT-OSCAR 10 is back on the air. Thanks go mainly to AMSAT DL engineers, who were able to locate and reprogram the affected areas in the satellite's on-board computer. Use of the Mode B transponder is limited, but will serve to help extend the life of AO-10 until the launch of the Phase 3C amateur satellite, scheduled for sometime in late 1987. See this month's Happenings for details.



Story Behind the Cover: We're all familiar with the story between the covers of the new ARRL book, *Gil: A Collection of Classic Cartoons from QST*—about 40 years worth of Amateur Radio as seen by Philip Gildersleeve, W1CJD. But there's also a story behind the cover. It's not of a self-portrait, but a caricature of the cartoonist sculpted with newspaper and plaster. Credit goes to ARRL Assistant Production Supervisor Debbie Strzeszkowski, whose handiwork adds just the right touch to a very enjoyable trip down memory lane. Jeeves would be proud.

ARRL Comments on Novice Enhancement

The 220-MHz band needs to be made available to Novices immediately, and there should be two, not one, examiners giving Novice class exams. To date, these are the League's recommendations to the FCC concerning Novice Enhancement. As a result of the July Board Meeting, the ARRL will also request that the Novice segment in the 1240-MHz band be changed to 1270-1295 MHz to conform with the existing band plan. See this month's Happenings for details.

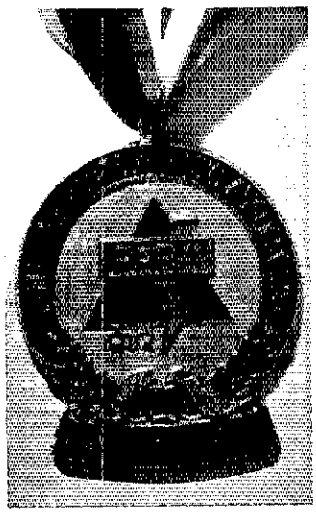


Happy Golden, DXCC: The DXCC award, which has been a measuring stick of success for serious DXers for years, will reach a special milestone in 1987—its 50th anniversary. To celebrate the event, the ARRL Board of Directors has proclaimed a year-long opportunity for DXers worldwide to earn this Golden Jubilee of DXCC Award. For details on how you can get involved, see the article on page 60.

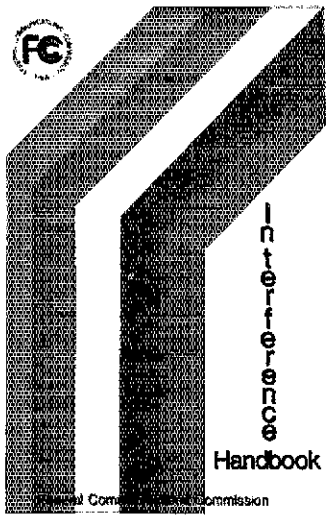
Young People: This Award's for You!

One way to attract youth is to recognize the accomplishments of those who already are amateurs. To that end, *The Westlink Report* has created the Young Ham of the Year Award, to be given each year to a US licensed ham 18 or under who has contributed to the community and to Amateur Radio. This year's nominations **must be received no later than September 30.** For details, write to Young Ham of the Year, c/o Westlink Report Editorial Office, 28197 Robin Ave, Saugus, CA 91350.

ATV Comes to Omaha: Some Nebraska hams have designed and built a repeater that not only repeats what it hears, but also what it sees. Mounted atop a television station tower, about 900 feet off the ground, the 420-MHz repeater operates like any other repeater—with a few added features. For instance, the repeater's remotely steerable fast-scan camera gives a panoramic view of the Omaha area, providing up-to-the-minute weather pictures that can help alert residents of impending storms. The repeater group also has other plans for the repeater in the future, such as helping in damage assessment for the Red Cross. Amateurs with portable television gear could do a windshield survey of a disaster site and relay the video information via the repeater. Here, one of the repeater's designers, John Gebuhr, WBØCMC, enjoys a view of the area from aside the camera, mounted in a weatherproof, glass enclosure. *(WBØHEU photo)*



The Golden Touch: Like any contester, Pete Peterson, K6EDV, knows the rigors of competing. But he also knows the thrill of victory—by earning this Gold Medal of Achievement and the UN-DU Award, both sponsored by the Philippine Amateur Radio Association. Pete won the Gold Medal in 1980 by becoming the first to have a QSO with 150 of the member-countries of the United Nations. The UN-DU Award is given to any radio amateur confirming contact with 100 of these countries. He visited Manila in 1984 to receive the Medal from PARA officials. The Gold is gone, but what about the Silver and Bronze?



Help for the Asking: If you're looking for some help in resolving an interference problem, look no further. The FCC has published a new edition of this comprehensive handbook on locating and solving the most common sources of interference. Included is an exhaustive list of equipment manufacturers you can contact for alternative solutions. The FCC sends the publication to interference complainants and radio amateurs asking for help. Copies are also available for $2.50 from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. The order number is 004-000-00450-7.

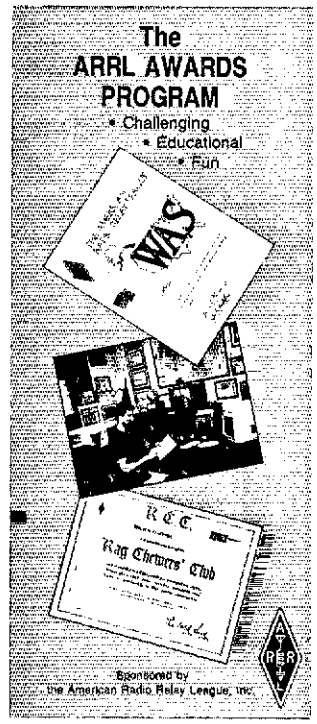
Trivia Quiz

We all know (or should know) what The Amateur's Code is. But how many of us know *who* authored the Code and what two positions he held with ARRL? Stand by until next month for the answer.

Never Too Late: Fred Hird, KCØRX, has been intrigued by Amateur Radio since high school, but it wasn't until his retirement that he decided to become a ham. At age 69, the Minneapolis resident set his sights on—and earned—the Technician license, figuring the Advanced class would be his ultimate goal. But the deeper Fred got into Amateur Radio, the higher his aspirations became. Seven years after he first began, Fred earned his Extra Class ticket, at age 76. Fred didn't stop there, though. He has since become an active Volunteer Examiner in his area, which he says is a "very rewarding endeavor," and he likes to experiment with antenna designs and to practice copying CW in his head.

Good in any Language: Teaching English as a second language requires a special kind of communication. So, occasionally, George Kerasiotis, N2DCB (center), uses Amateur Radio as a tool to teach English to these students in the Adult Basic Program at the Dr. White Community Center in Brooklyn, New York. With radio gear set up in the classroom, the students can practice their English and learn about the US through conversations with hams across the country. In one QSO, one of the students, who is from Egypt, and a ham in Youngstown, Ohio, swapped cultural and culinary information about their respective countries.

Certifiable Fun: Aside from the fun of operating itself, awards chasing is a good way to get maximum performance from your station, to become better acquainted with propagation, and even to learn about the geography, history and culture of peoples around the world. And what better decorations are there for the walls of your ham shack than an attractive certificate or plaque? From the Rag Chewers' Club to A-1 Op, there's an ARRL award waiting just for you. Find out more by sending for a copy of this pamphlet, available for an SASE from the Awards Branch, ARRL.



License Manual Available on Tape

The *ARRL Technician/General Class License Manual* has been recorded on cassette tape by Recording for the Blind, Inc, and is available on loan for free to persons registered with the organization. To use the tape, it is necessary to have a cassette player of the type distributed by the American Printing House for the Blind, Inc: GE Model 3-5194. For more information, write to Recording for the Blind, Inc, 20 Roszel Rd, Princeton, NJ 08540.

League Lines

A new visitor's center/museum at headquarters? This is one of the possibilities arising from the second 1986 meeting of the ARRL Board of Directors. A summary of actions taken, together with the complete minutes, can be found beginning on page 61.

Junior High School Teachers: We've got what you need to promote Amateur Radio among your students. ARRL and the Amateur Radio industry are offering a new publication targeted especially for students, a comic book that introduces them to many of the more exciting aspects of Amateur Radio. For details, see Happenings, page 67.

Have you ever considered writing for *QST* or *QEX?* If you have an article in mind—or on paper or on disk—***we've got the publications that will give it the best exposure*** to the Amateur Radio community. And now there's still another reason to think first of *QST* or *QEX:* The ARRL Board of Directors has now authorized payment for articles published in either of these two periodicals.

Want more information? Write ArtInfo, Dept SR, ARRL HQ, 225 Main St, Newington, CT 06111.

Headquarters will close Thursday, September 4 at noon EDT because of our annual office picnic.

ARRL 10-GHz Cumulative Contest enthusiasts are reminded that the contest will be held on September 26-27 (note slight correction to June *QST* announcement) and October 10-11. Contest periods begin at 1800 *local* on Friday and end at 2100 *local* on Saturday. Be sure to send your registration information to HQ.

An F9FT 4-element Yagi array for 1296 MHz has been installed as part of the antenna system at W1AW, as have 144- and 432-MHz Cushcraft boomers. Also on the VHF front, W1AW code practice was heard on 6 meters in Great Britain during a major opening on the afternoon of July 21.

The ARRL Technical Information Service is alive, well and living in the ARRL Field Organization! If you have technical questions on anything from Amplifiers to Zepp antennas, or if you're suffering through a thorny RFI problem with your neighbor, contact your ARRL Section Technical Coordinator for assistance. The name, address and phone number of your TC is available from your Section Manager (see page 8, this issue), or check the new ARRL publication ***Amateur Radio Field Resources Directory*** ($10 plus $2.50 USPS shipping from ARRL HQ). Your ARRL Technical Coordinator will more than likely have the answer!

A reminder: ***Extra Class certificates are available from the ARRL HQ Awards branch*** for $3. Just enclose a photocopy of your Extra Class license. Why continue to hide your Extra Class status in your wallet? Hang this certificate on your wall for the world to see.

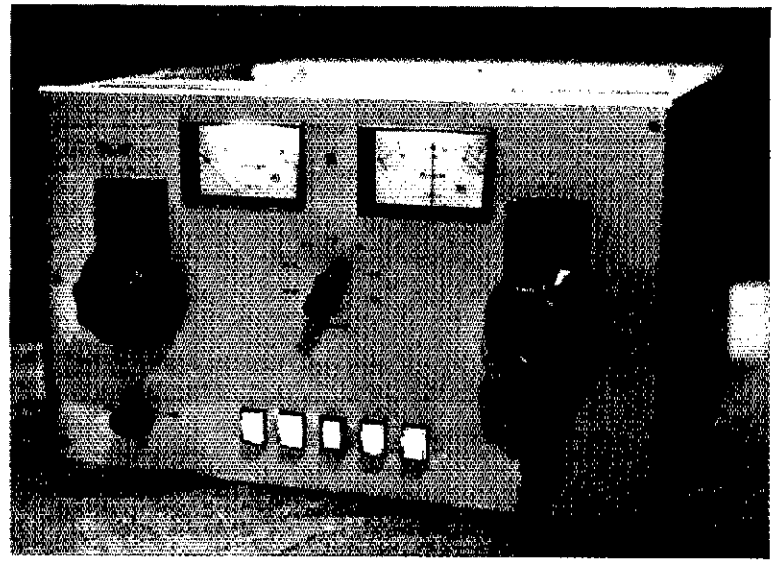
Attendance at ***Friedrichshafen '86,*** Europe's major Amateur Radio convention, was estimated to be over ***15,000.*** Amateurs attended from all Western and many Eastern European countries, as well as the Middle East and Japan. The US was represented by ***ARRL President Larry Price, W4RA,*** and ***ARRL Executive Vice President Dave Sumner, K1ZZ,*** who attended meetings with representatives of IARU Region 1.

The cover article of September *Popular Communications* is a close-up on W1AW! The article, written by Chief Operator Chuck Bender, W1WPR, gives a complete history of the station, along with an explanation of Amateur Radio and the work of the ARRL.

The Club Services Department is looking for an ***Affiliated Club Program Manager.*** This full-time staff position guides the HQ administration of the ARRL's over 2000 affiliated clubs. The position includes the opportunity for creative writing on a wide range of Amateur Radio subjects. An Extra Class license and word processing experience preferred. Salary range from $18,226-25,506 depending on experience. Contact Curt Holsopple, K9CH, Manager, Club Services Department, ARRL HQ.

An All-band, 1500-Watt-Output 8877 Linear Amplifier

Part 1: This rock crusher, rated for continuous full-legal-limit output, can be built at home. It is, however, a major project requiring dedication and commitment.



By Jerry Pittenger, K8RA
2165 Sumac Loop South
Columbus, OH 43229

This article is the result of a 10-month project to build a legal-limit linear amplifier. The amplifier uses the popular EIMAC 8877 (3CX1500A7) high-mu power triode that can provide a continuous RF output of 1500 W to the antenna.

In recent years, I have built several different linear amplifiers, and I must admit that this previous experience was necessary to obtain the results achieved with this project.[1-4] I hope that by sharing this experience, others will benefit from it. Any amplifier design depends on the various components used and individual preferences. Therefore, you may not want—or be able—to duplicate this amplifier exactly.

The comment I receive most often from the amateur fraternity is about the high cost to build an amplifier like this. The criticism is valid. This amplifier is not inexpensive to build. Plan to spend from $1000 to $1200 for the RF deck, and another $500 to $600 on the power supply. If you really think about it, though, these costs are a bargain when you consider the performance and quality of the final product and the cost of an equivalent commercial unit.

This article is presented in two parts. In this part, I will describe the RF deck and power supply in general terms. Schematic diagrams and parts considerations are included. Part 2 gives detailed instructions for constructing the two units and considerations for the final testing and operation.

[1]Notes appear on page 21.

Table 1
Recommended Tools

- Drill press or drill fixture (with set of high-speed bits)
- Band saw capable of cutting 1/16-inch-thick metal
- Chassis punches (5/8 inch to 1 inch)
- Fly cutter, 2-inch radius
- Vise
- Set of taps
- Common handtools (screwdrivers, pliers, soldering iron and gun)
- Volt-ohmmeter
- Variable power supply (5-28 V, 1 A)
- Dip oscillator

Preliminary Thoughts

Finding Parts

Finding parts can be a big task. Even the most difficult parts to find, such as the vacuum variable capacitors, vacuum relays and door-knob capacitors are available, however, and appear for sale in the ads (*QST* Ham-ads and the Yellow Sheets), or at hamfests and flea markets.[5] Probably the best source of parts is other hams who are actively building equipment. Go talk to these people and let them know what you are looking for. It's amazing how others will help, and even let you into their personal stores. There are people, like myself, who like to build amplifiers. Once you learn who these individuals are, keep in touch with them. They can help find the key parts.

Parts that are not available in the surplus market can be purchased new. This will be necessary for some parts, such as cabinets, etc. Just remember that when you buy a new commercial amplifier, you pay the new price for every component.

Tools

A good assortment of hand tools, as well as some power tools, are necessary to complete this project. Table 1 shows the tools I recommend. In particular, I recommend that a drill press and band saw be available. You can do the job without all of the tools listed, but the job will be much more difficult.

Time

Time is probably the most valuable resource for most of us, and the one that may prove hardest to find. This project took well over 250 hours to complete. The key is to do each step right, and not hurry. Build the amplifier in a place where you can leave the project on the table and walk away. Plan each step and build in discrete modules. Work an hour or so whenever possible, and slowly, but surely, the modules will take shape. It is amazing how much you can accomplish using these small time segments. Also, great strides can be made on a Saturday or a Sunday. Commitment and consistency are the virtues required to finish the job.

RF Deck Circuit Description

The RF deck is designed to be a table-top unit (see title photo). The power supply is remotely controlled and can be located almost anywhere. The amplifier design is based on proven circuitry. Included are all circuits required to provide a clean signal as

well as adequate protection devices for the metal-ceramic 8877 tube.

Control Circuitry

Fig 2 shows the schematic diagram for the amplifier control circuitry and low-voltage power supply. The 117-V ac input from the high-voltage power supply enters the RF deck through a 5-conductor interconnecting control cable. Each control line is terminated in a pi-section filter as it enters the RF deck, to prevent RF from getting into the control cable and power supply. The pi-section filters are constructed as an independent module.

The amplifier is powered up by the FIL ON/OFF switch, S1. Engaging S1 turns on the blower, filament power and 26-V dc power supply. The current inrush to the tube is limited by R1, in series with the filament transformer primary. After approximately 1 second, K1 energizes and K1A shorts R1 thus providing full filament voltage to the tube. The K1 delay is controlled by R2 and C1 across the relay coil. R3, in series with the other leg of the filament transformer primary, is adjusted to provide the proper filament voltage (4.85 V ac) to the tube under load.

The 8877 requires a 3-minute warmup period to reach proper operating temperature. A solid-state timing circuit, formed by Q1 and Q2, locks the amplifier out of operation until the warmup period has elapsed. When the 26 V dc comes on, C2 charges through the 500-kilohm time-delay adjust and 1.2-megohm resistors. Q1 and Q2 form a high-impedance Darlington circuit, and the emitter of Q2 follows the voltage rise on C2. The high-impedance Darlington circuit is required to prevent the capacitor charge from draining through the transistors. After approximately three minutes, the potential at the emitter of Q2 reaches 18 V at which point the 4PDT relay, K2, engages. K2A applies 26 V dc to the K2 relay coil, removing the relay current load from Q2. The voltage also turns on the TIME pilot light located on the amplifier front panel to indicate that the warmup period is over. The same line also applies 26 V dc to S2B of the HV-ON push-button switch, which, when engaged, sends 26 V dc to the RF input/output relay circuits. K2B connects a 100-kilohm resistor across C2 to drain the charge from C2. This resets the 3-minute timer should the amplifier be turned off and immediately back on.

K2C and K2D are wired in parallel and apply 117 V ac to HV-ON switch S2A to energize the high-voltage power supply. The high-voltage power supply can't be turned on even if the HV-ON switch is engaged until after the 3-minute warmup period has ended. IN/OUT switch S3 allows the amplifier to be put in the standby mode with the amplifier turned on. Both HV-ON and IN/OUT front-panel push-button switches must be engaged to key the amplifier, thereby making it impossible to operate the amplifier without high voltage on the tube.

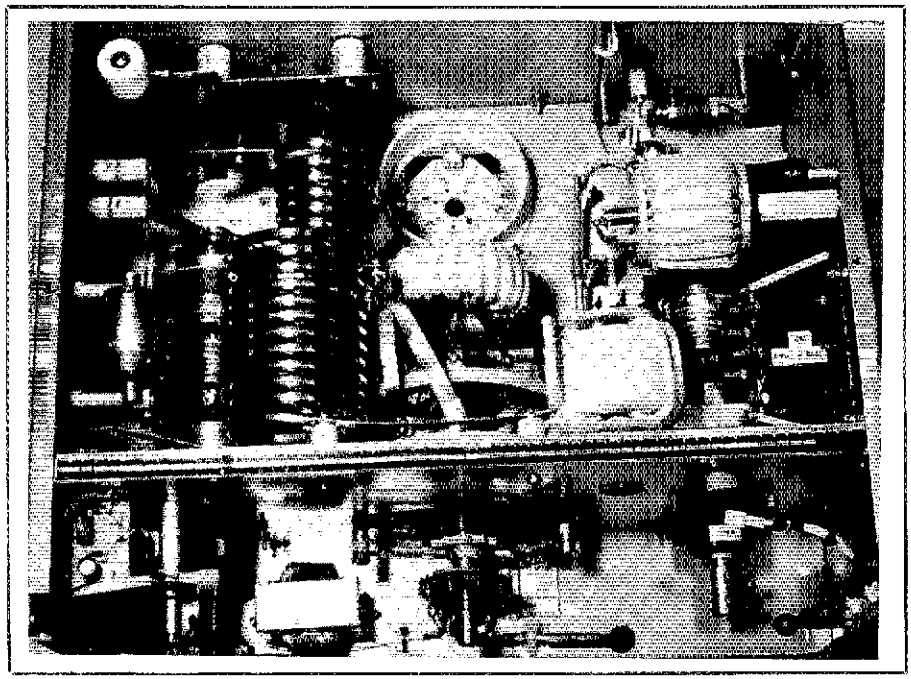


Fig 1—Top interior view of the 8877 linear amplifier RF deck.

The amplifier is keyed by grounding the base of Q3 through the exciter TR-relay contact. A transistor is used to limit the current switched by the exciter VOX relay. This avoids a potential problem if the exciter VOX relay sparks on closure, which could damage the relay contacts. The "grid trip" break in the relay line causes the relays to drop out if the grid trip circuit actuates from too much grid current (approximately 120 mA). During normal operation, the grid trip break is shorted by a normally closed set of contacts on K3 (see Fig 3).

When the amplifier is keyed, the output RF relay must be closed before drive is applied to the tube—otherwise the tube will transmit for a brief period without a 50-ohm antenna load. This would not only be harmful to the tube, but also cause the grid-trip circuit to actuate. Therefore, a timing circuit, comprised of a 50-ohm resistor and 100-μF capacitor, is included across the RF input relay K4 to allow vacuum relay K5 time to close. The capacitor value depends on the relay used. Do not make the delay too long, since during the delay time, the exciter does not have a proper 50-ohm load. Check the time delay by placing a low voltage across the relay contacts and monitoring the contact closure on a dual-trace scope. I used a delay of about 20 ms.

RF Amplifier Circuit Design

The RF amplifier circuit is shown in Fig 3. The amplifier uses a tuned input network to minimize distortion products and provide a proper impedance match between the exciter and the tube. The input network is remotely switched, using small DPDT relays, to connect the correct pi-section for the selected band. A homemade switch deck is mounted on the band-switch shaft, in front of the subpanel, to ground the 12-V dc line for the proper input relay as selected by the main band switch. On 160 meters, the switch also controls a solenoid relay to add a 160-pF capacitance in parallel with the TUNE vacuum variable capacitor.

An effective ALC circuit, adjustable from a front-panel control, is included to avoid overdriving the tube. This feature is essential in this amplifier because the drive requirement is only about 80 W for 1500-W output. The ALC circuit samples the RF drive level through a 27-pF mica capacitor to generate a dc voltage that is fed back to the exciter for drive-power control.

The grid-trip-protection circuit shuts down the amplifier if grid current exceeds 120 mA. This protects the tube from tuning errors or other problems such as losing the antenna, or a tube flashover during operation. Although grid current flows through all paths from ground to the B– line, most of the grid current goes through R1. The current passing through R1 develops a voltage drop. For example, if 100 mA of grid current is drawn through R1, 1 volt is developed ($E = IR = 0.100 \times 10$). This voltage is used to turn on the transistor switch, Q1. When Q1 turns on, the grid-trip relay, K3, energizes and opens the grid trip break in the RF relay control line to shut the amplifier down. R2 sets the current level at which Q1 turns on. The front-panel GRID TRIP lamp goes out if the trip circuit is activated. The switch is reset by pressing S3.

The plate tank circuit uses a pi-L configuration because this design provides approximately 20-dB better harmonic suppression than the conventional pi design. The TUNE and LOAD capacitors are vacuum variable types to minimize space requirements and also optimize performance on 12 and 10

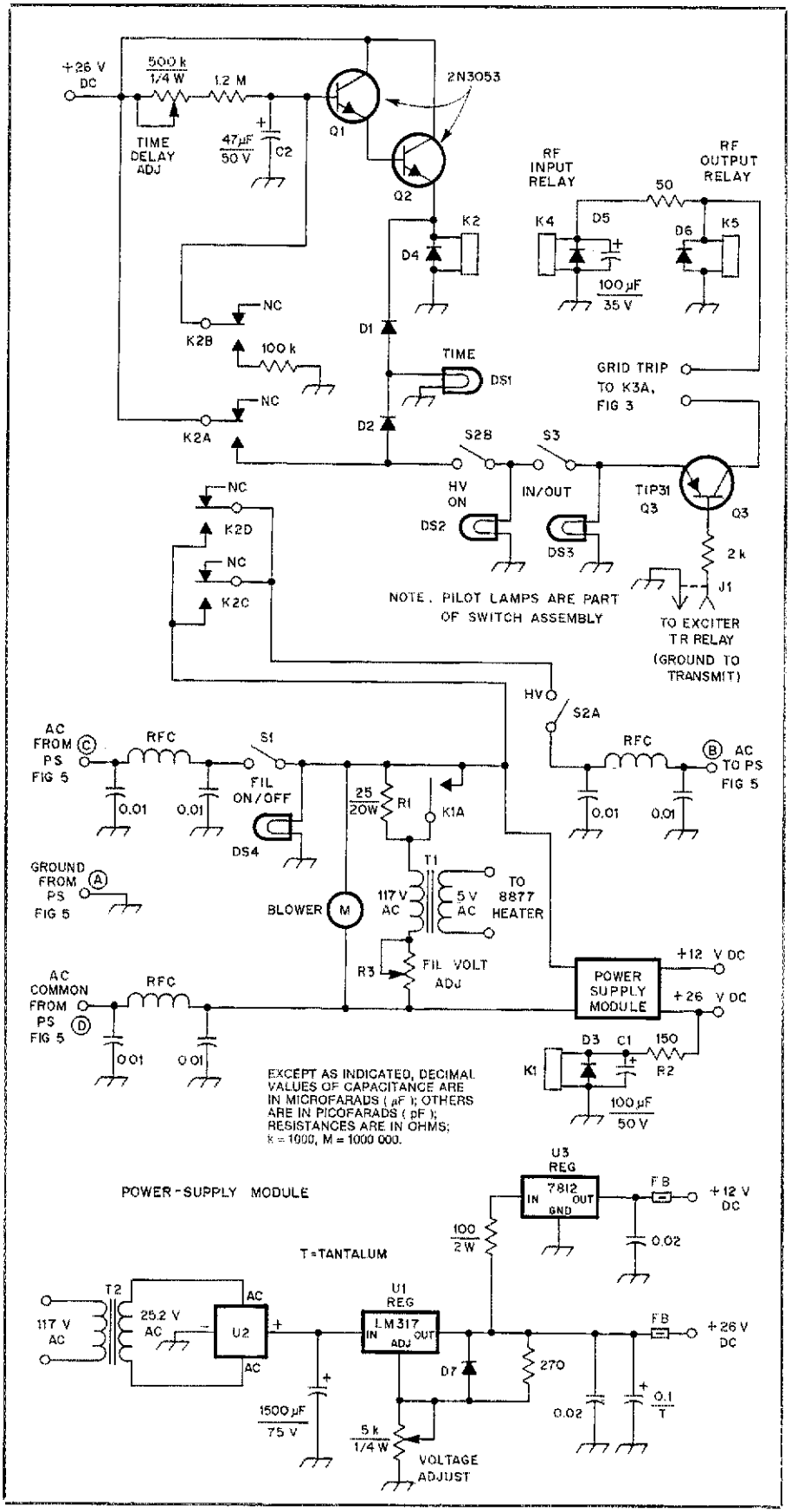


Fig 2—Amplifier control circuit and low-voltage power-supply schematic diagram. Part numbers shown in parentheses are Radio Shack.

B—Blower, Dayton 4C004-1.
D1-D6—Diode, 1 kV, 2.5 A.
FB—Ferrite bead.
K1-K4—4PDT 24-V dc relay, Potter & Brumfield KHU17D11.
K5—SPDT vacuum relay, 26-V dc coil.
Q1,Q2—2N3053 NPN transistor.
Q3—TIP31 NPN transistor (276-2017).
R1—25 Ω, 20 W.
R2—150 Ω, 2 W.
R3—25 Ω, 25 W variable.
RFC—10 turns no. 14 enam wire on ¼-in-diam ferrite rod.
S1,S3—Alco 16TL5-11 SPST.
S2—Alco 16TL5-22 DPDT.
S4—Alco 16TZ pilot light.
T1—Filament transformer, 5.0 V ac, 10 A, Peter Dahl Co.
T2—25.2 V ac, 1.0 A, Stancor P6469.
U1—50-V, 4-A bridge rectifier.

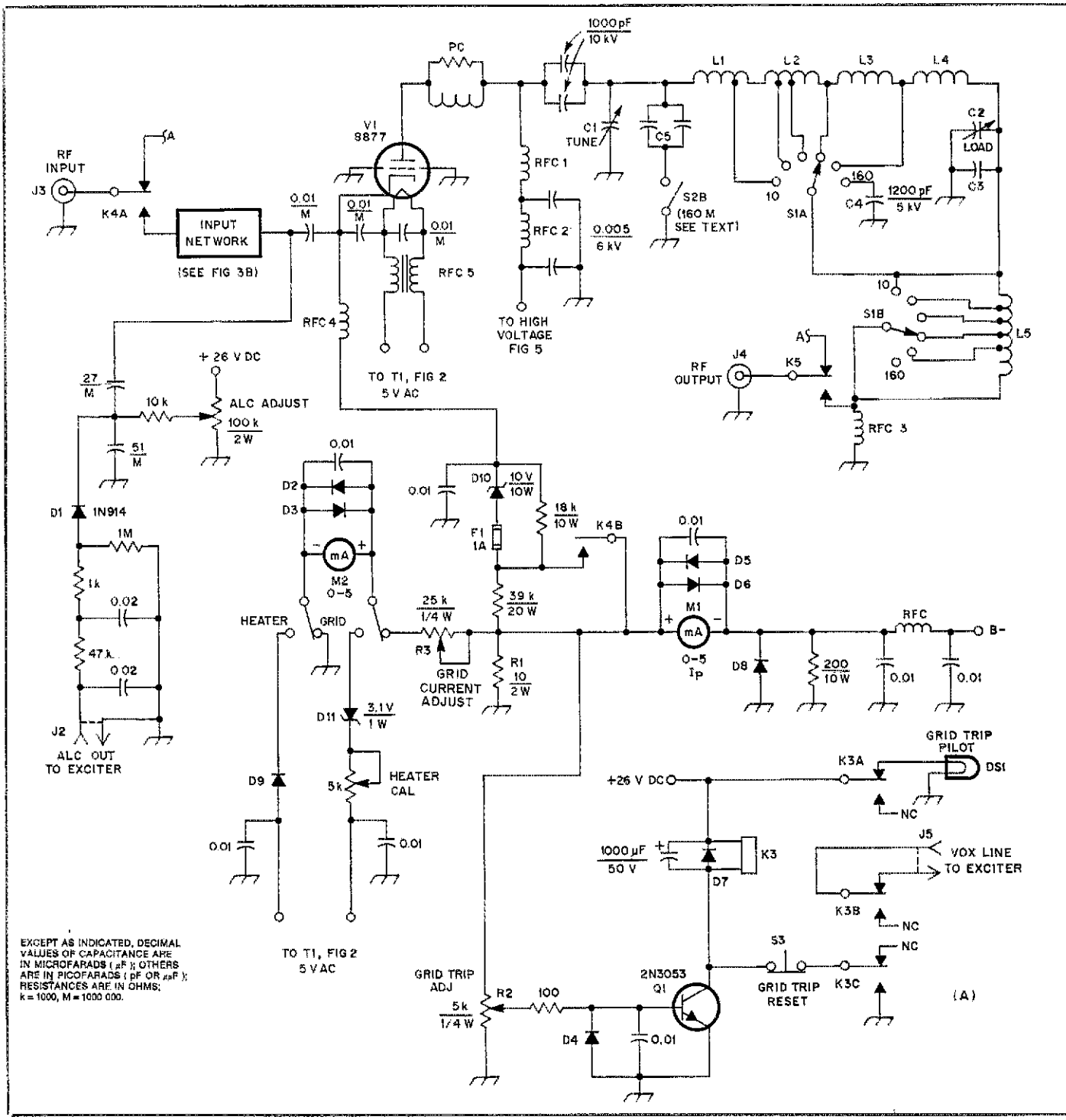
meters where small capacitance values are needed to achieve an acceptable tank-circuit Q. The 10- to 40-meter tank coil is homemade from ¼-inch copper tubing that is silver plated to minimize skin resistance. The 80-meter, 160-meter and L-coils are toroid designs to minimize space. Using a toroid for the L coil also helps isolate the L network from the rest of the tank circuit because of the toroid's self-shielding characteristics.

Metering circuits monitor plate and grid current, as well as filament voltage. Plate current is monitored by placing a meter in series with the B− line. Therefore, only a small dc voltage is across the meter. An additional position can be included on the FIL/GRID meter for plate voltage, but one is not shown in this design because a separate high-voltage meter is included in the power supply. It would be a good idea to include a high-voltage scale on the meter in case the RF deck is ever used with a different high-voltage supply. Grid current is monitored by measuring the voltage drop across R1. R3 is adjusted to give the correct grid-current meter reading. Filament voltage is measured by converting the ac voltage to dc and displaying the dc voltage on M2. The 3.1-V Zener diode expands the meter scale by not allowing conduction until the voltage reaches 3.1 V.

A vacuum relay is used for the amplifier output. The relay is small in size, quiet and capable of handling large RF currents.

RF Deck Parts Selection

Finding all the parts for the RF deck is a major task. If you are planning to build an amplifier, begin collecting parts as soon as possible. It is the first step because the physical layout of the amplifier will depend on the components available. Don't try to *exactly* duplicate the components I used. For example, vacuum variable capacitors come in many different shapes and sizes, with different mounting provisions. Actually, the parts you find may be better than the parts used in my RF deck. As an example, a 1500-pF vacuum variable LOAD capacitor would be much better than the 1000-pF unit I used. Therefore, use whatever resources you have available to acquire the parts—but a word of caution! Do not compromise too much when gathering components. If



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF); OTHERS ARE IN PICOFARADS (pF OR µµF); RESISTANCES ARE IN OHMS; k = 1000, M = 1000 000.

Fig 3—RF amplifier schematic diagram.

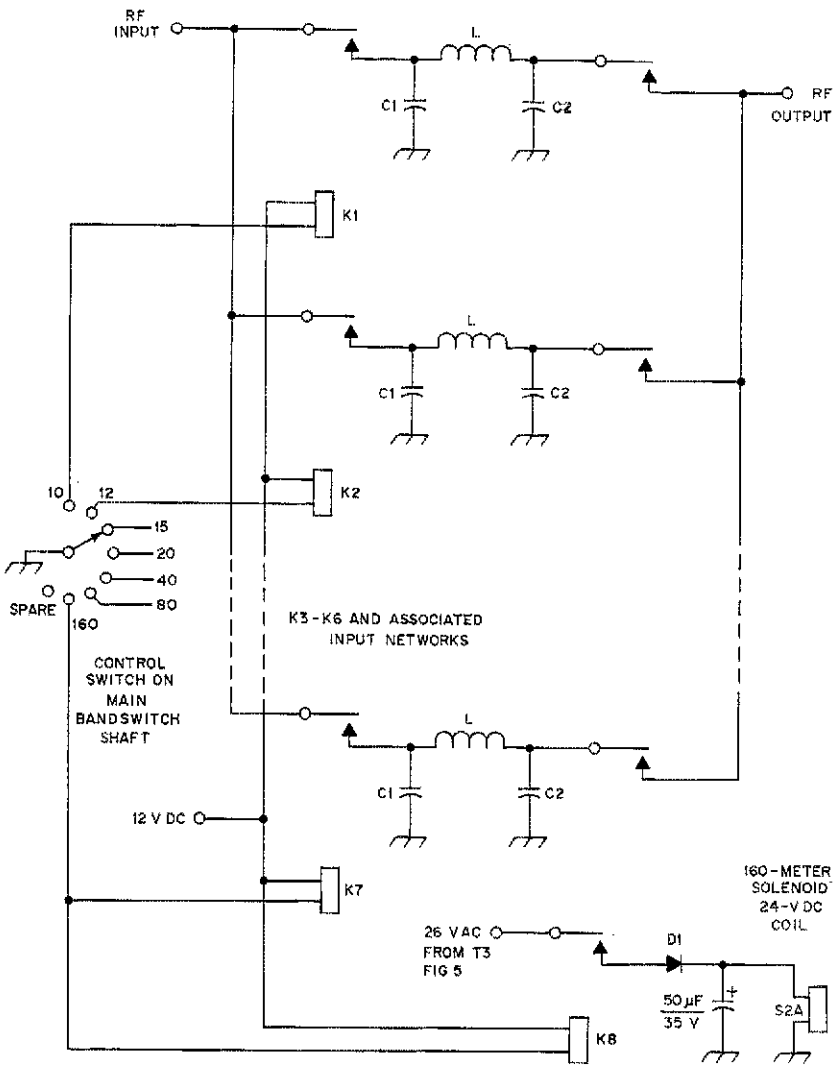
C1—Vacuum variable capacitor, 375 pF, 10 kV.
C2—Vacuum variable capacitor, 1000 pF, 10 kV.
C3—Mica transmitting capacitor, 100 pF, 5 kV.
C4—Mica transmitting capacitor, 3 × 400 pF, 5 kV.
C5—Fixed vacuum capacitor, 2 × 80 pF, 20 kV.
D1—Diode, 600 V, 1 A.
D2-D9—Diode, 1 kV, 2.5 A, HEP 170.
D10—Zener diode, 10 V, 1 W.
D11—Zener diode, 3.1 V, 1 W.
K1-K7—DPDT 12-V dc DIP relay (275-213).
K8—SPST 12-V dc relay (275-241).
RFC—10 turns no. 14 enam wire on ¼-in-diam ferrite rod.
RFC1—Plate choke, 2 A, Peter Dahl Co.
RFC2—Air-wound coil, 15 turns, ½-in diam.
RFC3—Choke, 1 mH, 800 mA.
RFC4—110 turns no. 20 enam wire on ½-in diam fiber rod.
RFC5—Filament choke, 18 bifilar turns

you cannot find what you need on the surplus market, buy the parts new. It may cost a little more, but if the project is not done right, you will never be happy with the final result.

Vacuum Variable Capacitors

Vacuum variable capacitors are often difficult to locate at reasonable prices. Plan to spend about $50 for the TUNE capacitor and $75 to $100 for the LOAD capacitor if vacuum capacitors are used. The TUNE capacitor should be at least 300 pF at 7 kV, and the LOAD capacitor should be at least 1000 pF at 3 kV.

An air variable capacitor can be used for



(B)

BAND	C1 (pF)	L (µH)	C2 (pF)	Q	CORE	NO. OF TURNS	WIRE SIZE
160	4000	3.31	4000	2.35	T94-2	19	22
80	1240	2.06	1240	1.50	T94-2	15	22
40	680	1.03	680	1.67	T68-2	14	18
20	390	0.50	390	1.80	T68-2	9	18
15	270	0.32	270	1.90	T68-2	7	18
12	270	0.25	270	2.20	T68-2	6	18
10	160	0.27	160	1.50	T68-2	8	18

no. 14 enam wire on ½-in-diam ferrite rod, 6 inches long.
PC—Three 150-ohm, 2-W carbon resistors in parallel with 2-inch horseshoe loop of ½-inch silver-plated strap.
L1-L5—See Table 2.
M1,M2—Simpson Wide-Vue panel meter, 01253 bezel and 01165 lighting kit (See text).
S1—9-position, 2-pole switch, Radio Switch model 88, 13-kV, 30-A.
S2—Solenoid-controlled switch; see text.
S3—SPST normally closed momentary switch, Alco 16TL-11 with 6T-2 red lens.

the LOAD control, if desired. The minimum capacitance for the LOAD capacitor is 112 pF for 10 meters, which is not difficult to obtain with an air variable type. A rating of 1 kV, minimum, is recommended. However, it is a different story for the TUNE capacitor. The minimum required capacitance is 26 pF. The direct interelectrode capacitance of the 8877 tube in grounded-grid service is 10 pF; therefore, the TUNE capacitor must have a minimum value of not more than 16 pF for 10 meters. This is nearly impossible with a 300-pF air variable. In addition, the voltage requirements for the TUNE capacitor make any air variable rather large. For these reasons, a vacuum variable is recommended for the TUNE capacitor.

Meters

Good-quality meters with bezels are essential for good appearance. The Simpson Wide-Vue® meters I used were purchased at a hamfest. The bezels were ordered directly from Simpson because they seldom appear on the surplus market. Actually, almost any meter movement can be used, so don't pass up a good meter just because it reads 50 V or 100 mA on the scale. Any meter with a movement from 100 µA to 5 mA can be used. This allows use of approximately 90% of the meters available on the surplus market. I will give instructions later for calibrating any meter to read whatever current or voltage is required.

RF Band Switch

Good RF band switches are very difficult to locate. More problems are experienced with arcing band switches than with any other amplifier component. If the band switch selected has insufficient voltage insulation, it will arc to the wiper rotor on the high-impedance 10-meter position when operating on the lower-frequency bands. I obtained the band switch for my amplifier from Radio Switch Corp.[6] The model 88 switch is a 2-pole, 9-position unit with a 13-kV peak flashover/30-A contact rating. This switch will not arc! Its list price is currently $107, and it is well worth the money!

Miscellaneous Parts and Materials

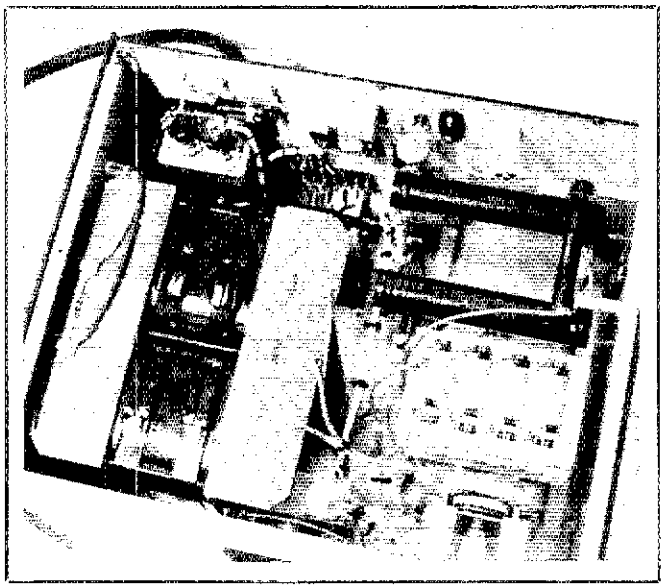
Many of the small parts (capacitors, relays and resistors) can be purchased at Radio Shack. Their parts selection is good, and continues to increase. You can usually find a store around the corner in almost any city. Pioneer Electronics is also a good source for commercial-grade components.[7] Good-quality PC-board material can be found at almost any hamfest. Don't compromise here—use G10 glass-epoxy board. As for coils? Make them. Complete "how-to" instructions are given later.

High-Voltage Power-Supply Circuit Description

The key to *continuous duty* in a high-power linear amplifier is the power supply. It must be able to deliver the required voltage and current on a continuous basis. Power supplies are usually the limiting factor in commercial linear amplifiers.

A WORD OF CAUTION IS IN ORDER. *The power supply is a very dangerous piece of equipment! Give it proper respect. One mistake can be fatal. Use proper precautions in the construction and testing of this unit, and be careful to build a safe unit.*

I recommend that the power supply be built first. The construction is not complex



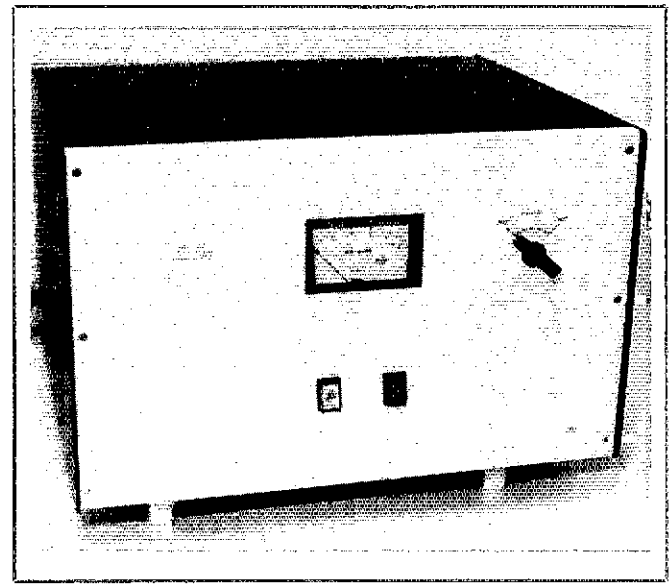


Fig 4—High-voltage power supply top interior view.

and it can serve as a training ground for amplifier building techniques, particularly for the first-time builder.

Power-Supply Design

The power supply is shown in Fig 4, and the schematic diagram is shown in Fig 5. The hypersil power transformer has a 234-V ac primary, and a 3300-V ac secondary that is tapped at 2600 V. This selection of two output voltages allows for a high- and low-power capability. An alternative to this approach is to include a Variac® or Powerstat® autotransformer on the transformer primary.

The primary circuit of the power transformer includes a step-start circuit to protect the diode bank during the initial charge of C1, the 53-μF filter capacitor, when the power supply is turned on. Two 50-ohm, 25-W resistors, one in each leg of the primary, are shorted by time-delayed relays approximately 3 to 4 seconds after application of power. The more current drawn through the resistors at start up, the more voltage drop realized and this, in turn, protects the diode bank. The delay is provided by the time constant of the 500-ohm resistor and 100-μF capacitor. The relays must be dc types. Those I used have 90-V dc coils which allows power to be supplied from one 117-V leg of the primary. If 90-V relays can't be obtained, 24-V dc relays can be substituted. A 24-V dc power source must be provided if this is done.

The rectifier unit is a full-wave bridge with eight diodes in each leg. A 470-kilohm resistor and a 0.01-μF, 1-kV capacitor are wired in parallel with each diode to equalize the voltage and protect the diodes from voltage spikes.

The power supply is controlled remotely from the RF deck. A test switch has been incorporated to allow the supply to be energized without the RF deck. A shorted Cinch-Jones plug must be inserted into a socket in the rear of the supply for test switch S1 to operate.

Two pilot lights are mounted on the front panel. One pilot light is on whenever 234 V ac is present in the supply. The other lights when the power supply is activated.

A high-voltage meter is included on the front panel. The metering is done across a 25-ohm, 5-W resistor in series with the bleeder resistor. This voltage divider keeps the total high voltage off the meter. A 50-ohm, 50-W resistor in series with the high-voltage B+ circuit protects the tube and power supply from any current surge resulting from a tube flashover or other cause. In addition, a 0.6-ohm, 1-W resistor in series with the B+ line acts as a fuse resistor. A large current surge will cause the resistor to explode—an inexpensive protection device should a problem occur.

High-Voltage Power Supply Parts Selection

Transformer

It is important to find a good power transformer that can provide the proper operating voltages for the tube. Remember that some voltage drop will occur when current is drawn from the transformer. The voltage drop depends largely on the quality of the transformer (core and wire size), and can range from 200 V to over 1 kV. The transformer should have a 234-V ac primary. Transformers with 117-V primaries are usable only if two identical units can be wired in series to provide a 234-V primary. The secondaries can by wired in series or parallel, depending on the voltage requirements. Remember that the transformers must be identical.

The required transformer secondary voltage depends on the final voltage requirement of the tube and the power-supply circuitry. If a bridge rectifier is used, the power-supply high voltage will be about 1.4 times the secondary voltage. If a voltage doubler is used, the high voltage will be about 2.8 times the secondary voltage. A voltage doubler requires two filter capacitors, or more, so if a single oil-filled filter capacitor is to be used, the design can't be a voltage doubler. The *ARRL Handbook* contains circuits for both types of power supplies.[8]

The power-handling capability of a transformer can usually be estimated by its weight. As a rule, the heavier the transformer, the greater the power capability. The transformer for a 1500-W, continuous-duty amplifier will weigh 60-80 lb. The transformer used in this power supply was obtained from Peter Dahl Co.[9] The hypersil design provides a good ratio of power capability to size and weight. I have used several Peter Dahl transformer designs in the past and found them to be of excellent quality and reasonably priced.

Filter Capacitor

Enough filter capacitance is required to obtain good voltage regulation. What is enough? I have used as little as 18 μF and as much as 100 μF in power supplies. The required capacitance can be obtained with a single oil-filled capacitor or with a series string of computer-grade electrolytics. Either way, I recommend at least 25 μF be used, with at least a 10% voltage safety factor. The filter capacitor used in this power supply is a single oil-filled unit rated at 53 μF at 5k V dc. The capacitor was obtained from Peter Dahl Co, and is physically very small for the voltage and capacitance rating.

Diode Bridge Rectifier

The full-wave, diode-bridge rectifier is made up with 1000-PIV diodes rated at 3 A. The unit is a commercial module sold by Peter Dahl Co. Each diode string is built on a separate glass-epoxy board. The module is supplied with 1-inch angle brackets on each end, but because of space restraints, the angle was removed

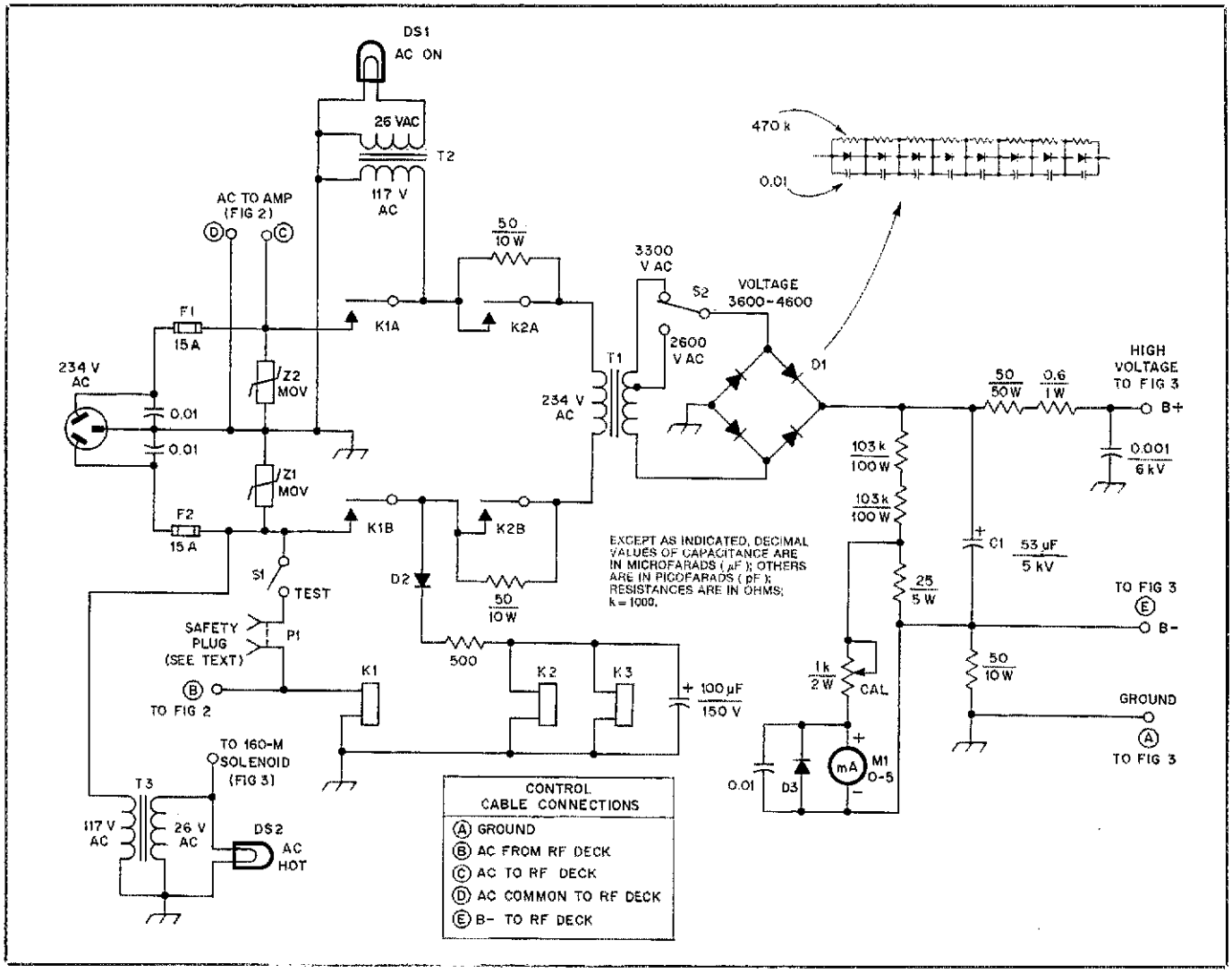


Fig 5—High-voltage power supply schematic diagram. Part numbers in parentheses are Radio Shack.

C1—Oil-filled capacitor, 53 µF, 5 kV, Peter Dahl Co.
D1—Diode bridge rectifier assembly, Peter Dahl Co, see text.
D2,D3—Diode, 1 kV, 2.5 A.
F1,F2—Fuse, 15 A.
K1—2PDT mercury plunger relay, Dayton 6X598-3.
K2,K3—SPDT relay, Potter Brumfield PRD1DYO/90VDC.
M1—High-voltage meter, 3½-inch Simpson Wide-Vue, 01253 bezel and 01165 lighting kit.
Z1,Z2—MOV transient suppressor, 117 V ac (276-568)
P1—Two-pin Cinch-Jones socket and plug (274-201 and 274-202)
P2—Eight-pin Cinch-Jones connector.
S1—SPST switch (275-690)
S2—Modified 6PST switch, Fair Radio Sales.
T1—Power transformer, 2600/3300-V ac sec, Peter Dahl Co.
T2,T3—Transformer, 26 V ac, 300 mA (273-1386)
Miscellaneous
Pilot lamp—Alco 16TZ, 6T-4 (yellow) and 6T-2 (red) lenses.
Cabinet—CTS model MCLS 10-17-14 black and white, SPP 10-14 black side panels.

and the module was mounted in a vertical position using two Nylon bolts.

Should you decide to build the rectifier assembly, use good-quality diodes, such as HEP-170s or 1N5408s. Be sure to parallel each diode with a 470-kilohm resistor and a 0.01-µF, 1-kV capacitor.

High-Voltage Switch

The transformer has two taps on the secondary to provide a high- and low-voltage capability. The front-panel VOLTAGE 3600-4600 switch is fabricated from a 6-position, heavy-duty ceramic switch (Radio Switch Corp p/n 65). The switch detent and all but the second and fifth contacts are removed. New stops are fabricated from glass-epoxy board. Full high voltage appears across this switch, and therefore, it must be well insulated. The switch is mounted on two pieces of ¾-inch Plexiglas® to provide 2-inch spacing from any chassis or panel ground. A fiber shaft protrudes from the switch through the front panel. To protect the contacts; this switch must never be actuated when the power supply is on.

Construction Details

Next month, I will describe the unique construction details for building this high-power linear amplifier and power supply. In the meantime, should you be so inclined, get out there and find the parts! Remember that you should build the power supply first, so concentrate on those components.

Notes

[1]J. L. Pittenger, "Modular Linear Amplifier for the High-Frequency Amateur Bands," *Ham Radio*, Jan 1981.
[2]J. L. Pittenger, "A 3CX800A7 Linear Amplifier," Ham Radio, Aug 1984.
[3]J. L. Pittenger, "3CX1200A7 10 to 80 Meter Amplifier," *Ham Radio*, Aug 1985.
[4]W. I. Orr, ed, *Radio Handbook* (Indianapolis: H. W. Sams, 1975), 20th edition, Sect 22-4, "A Modern 3-1000Z Linear Amplifier for 80-10 Meters."
[5]Ham Trader Yellow Sheets, PO Box 2057, Glen Ellyn, IL 60138-2057.
[6]Radio Switch Corp, Rte 79, Marlboro, NJ 07746, tel 201-462-6100.
[7]Pioneer Standard Industrial Electronics, 1900 Troy St, Dayton, OH 45404, tel 513-236-9900.
[8]M. Wilson, ed, *The 1986 ARRL Handbook* (Newington: ARRL, 1985).
[9]Peter Dahl Transformer Co, 4007 Fort Blvd, El Paso, TX 79930, tel 915-566-5365.

Electromagnetic Pulse and the Radio Amateur

Part 2: This month, we present the method and results of the first of two series of tests of EMP/transient-protection devices.†

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The inherent weakness of solid-state components to damaging transient electrical energy has stimulated the electronics industry to develop a large variety of transient-protection devices. In order to identify low-cost, commercially available devices capable of protecting Amateur Radio equipment, an extensive market search was made and a representative number of protective devices were purchased. The protection devices purchased were the most current types available for use with Amateur Radio equipment where it connects to power lines, antenna systems, communications lines and other potential transient sources. The test program was divided into two stages: First, the protection devices, then the Amateur Radio equipment.

Test Objectives

No common test procedure existed for determining the effectiveness of different types of protection devices. Therefore, we sought to develop a common test procedure to ascertain the average performance of a wide variety of devices against the fast-rising and powerful transient pulses that are generated by lightning and EMP. Three standard electromagnetic pulses were used to simulate the expected transient waveforms associated with ac power connections, short interconnecting wires and long exterior conductors that are found in the typical Amateur Radio installation.

Protection devices that allowed a voltage spike to exceed their rated clamping voltage by 100% (6 dB), or exhibited a significant delay in response time, were rejected. The 6-dB overload level was selected because it is common to design electronic circuits to withstand such an overload for short durations. Those devices that suppressed the initial voltage spike to an acceptable level, less than twice the clamping voltage, were accepted for further testing.

Table 3
Peak Voltage and Current Values vs Conductor Type

Conductor	*Peak Voltage (Volts)*	*Peak Current (Amperes)*	*Test Class*
Power Connections	600	120	A
Box interconnections	600	20	B
Exterior Conductors	4500	1000	C

Test Program

Threat Definition

Other than in the case of a direct lightning strike, EMP is generally considered a more stringent threat to electrical systems than lightning. Consequently, the test pulses approximated the characteristics of EMP, rising to full strength in approximately 10 ns and decaying exponentially in about 1 μs. The waveform that is frequently used in unclassified work was used for this test; it is expressed as:

$$E(t) = 5.25 \times 10^4 \exp(-4 \times 10^6 t) - \exp(-4.76 \times 10^8 t) \quad \text{(Eq 1)}$$

where
E is volts per meter
t is time in seconds

The transient threat to electrical hardware does not come directly from the free field, but from the interaction of the electric and magnetic fields with electrical conductors. Current peaks in excess of thousands of amperes are predicted as a response to EMP. Similarly, voltage levels may reach hundreds of kilovolts. In practice, however, the physical dimensions and characteristics of the conductors themselves tend to limit current and voltage amplitudes, although not always without physical damage to the conductors. For example, it has been proposed that the highest transient voltage transmitted through a residential power-distribution breaker box would be limited by air-discharge breakdown. Conversely, in an Amateur Radio station, the transients experienced, if limited at all, would be determined by the lengths and configurations of conductors exposed to the fields, and the dielectric strength.

The peak values shown in Table 3 were used in the protective-device qualification tests for this program. These peak values were used because they are representative of the transient pulses expected in a typical Amateur Radio system, and they could be readily reproduced in a laboratory test environment.

To test for insulation breakdown of the protective devices, the highest pulse level obtainable in the laboratory (25 kV) was used. Each protective device was subjected to ten equal pulses in order to ensure that protection was not circumvented by the first transient received. A cooling time of approximately one second was allowed between pulses.

Direct Testing

Direct device testing consisted of driving the device terminals with a differential-mode signal from a pulse generator. The test was conducted once with a source impedance appropriate to the voltages and currents listed in Table 3, and once with the tabulated voltage and a source impedance of 50 ohms. This impedance was chosen because it is encountered most commonly in house wiring and antenna circuits. The input- and output-pulse magnitudes were recorded photographically. A comparison was made of the input and output voltages with and without the device in the circuit,

†Part 1 appears in Aug 1986 *QST*. Part 3 will appear in a subsequent issue.

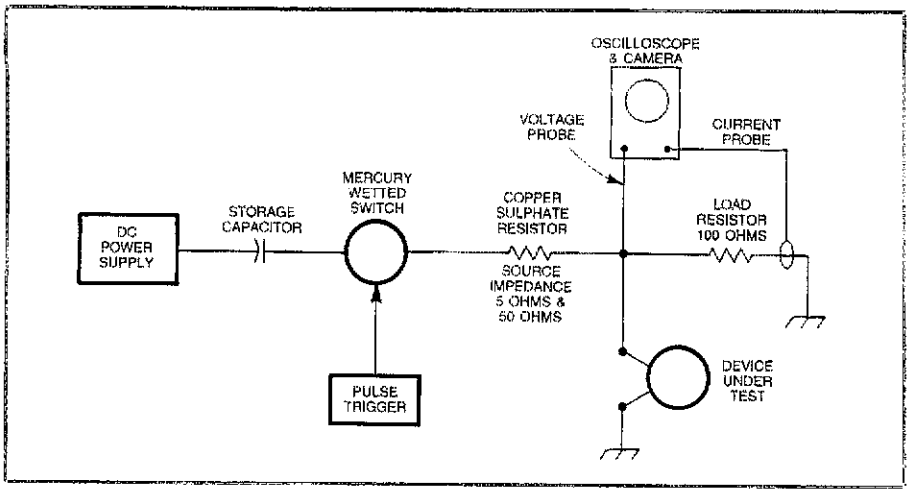

Fig 8—Low-voltage pulser; below 5 kV.

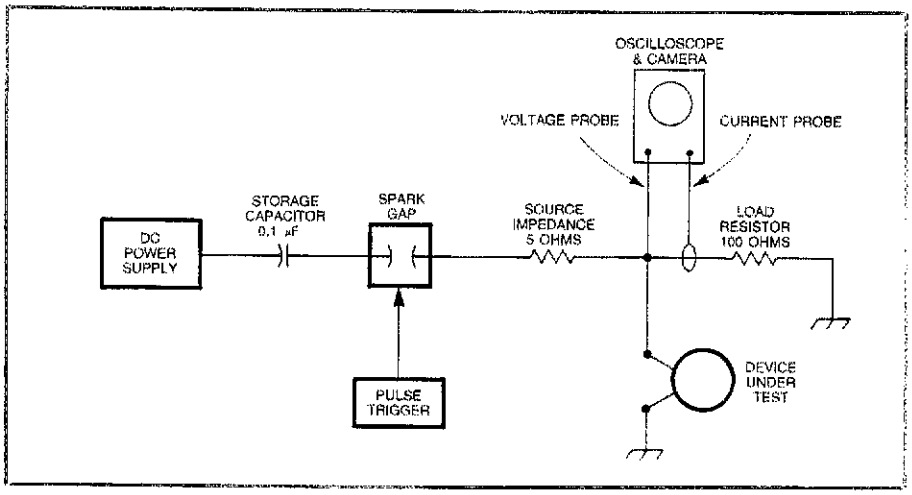

Fig 9—High-voltage pulser; above 5 kV.

and a transient-rejection ratio (in decibels) was calculated using the relationship:

$$RR\ dB = 20 \log_{10} \frac{\text{peak signal in}}{\text{peak signal out}} \qquad \text{(Eq 2)}$$

From one to 15 devices of each type were tested. When 10 identical devices of any one type had been tested with forward and reverse polarity, the data were statistically analyzed to determine if further testing was required. For statistical analysis, 10 items were considered to provide a representative sample of the device's performance, since the devices performed consistently.

Test Equipment

Two pulse generators were used. One provided pulses below 5 kV (600-V and 4.5-kV tests), the other produced pulses above 5 kV (25-kV test).

Pulses Below 5 kV

Transient pulses for this test were generated by manually firing a mercury-wetted switch to discharge a storage capacitor through a copper-sulphate source resistance of the appropriate size to generate the desired current pulse (see Fig 8). The capacitor was charged to the desired voltage level by a quick-recovery, high-voltage power supply. Transients were fired across a 100-ohm load resistor protected by the device under test.

Data were recorded by photographing a properly calibrated oscilloscope display. For repeated pulse requirements, the camera shutter was held open to record all (nominally 10) of the pulses of one polarity, and then, after removal of the device under test, to record the applied transient with the same exposure. Reverse-pulse measurements were obtained by reversing the leads of the device under test and repeating the photographic sequence.

Pulses Greater Than 5 kV

Transient pulses for this test were generated by manually firing a 2-inch spark gap to discharge a 0.1-μF storage capacitor through a 5-ohm copper-sulphate source resistance to generate the desired current pulse (see Fig 9). The capacitor was charged to the desired voltage level by a quick-recovery, high-voltage power supply. The transients were fired across a 100-ohm load resistor protected by the device under test.

Again, data were photographically recorded. Current and voltage were recorded for the initial pulses of each device. The voltage probe was attenuated by a flexible copper-sulphate resistance of suitable value. For repeated pulse requirements, the camera shutter was held open to record five of the pulses and the reference in a manner similar to that of the lower-voltage measurements described previously. The polarity of the second set of five pulses was not reversed, and the current trace was usually omitted from the second data set.

Small-Device Tests

For physically small devices, test measurements were conducted inside a metal enclosure. Penetrations of the enclosure were made by the high-voltage lead from the mercury-wetted switch, the system ground and the voltage probe. Currents were measured by a sensor on the system ground, but were not regularly recorded as part of the test data. The voltage probe was run in solid-sheath coaxial cable to the metal enclosure, and the internal probe was shielded by a metal braid to within a few millimeters of the probe tip.

Shunt-protective devices were connected between the high-voltage input terminal and system ground. The voltage probe and load resistor were also connected to the same terminals. For device combinations containing series elements, the line side of the device was connected to the input terminal, and the voltage probe and load resistor connected between the load side terminal and ground.

Large Devices

For devices with special connectors too large to fit within the test chamber, connecting adapters were made of straps and braid to provide the lowest-impedance circuit available. In many cases, however, the inductance of the connection did affect the measurement, particularly in the case of determining the reference grounds.

Ac Power Tests

To test the ability of the devices to function when connected in a 117-V ac circuit, ac was provided by an isolation transformer connected to the device through a large inductance. If the device continued to arc or pass current after the pulse, the transformer was manually disconnected (but not always before the device had melted).

Test Results

A total of 56 different devices were tested. All of the devices substantially suppressed the test pulses. However, not all of the devices suppressed the test pulse to an acceptable voltage level on every test.

Twenty-six of the 56 devices passed the low-impedance drive tests and 40 passed the high-impedance drive test. To pass the particular test, the device had to suppress the peak-voltage pulse to less than two times its published, designed clamping

Table 4
Devices with Acceptable Clamping Voltages Low-Impedance Drive Tests

Manufacturer and Device	Designed Maximum Clamping Voltage (MCV) (Volts)	Average Measured Peak Clamping Voltage at 600 V and 4.5 kV (APV) (Volts)	Acceptable Clamping Voltage (APV = <2 MCV)
Fischer			
FCC-120-P	300 (1)	200	300
FCC-250-300-UHF	300	1333	
FCC-250-300-UHF	350	1633	
FCC-450B-75-BNC	75	670	
FCC-250-150-UHF	150	1700	
FCC-250-120-UHF	120	1700	
FCC-450-120-UHF	120	800	
Joslyn			
2027-23-3B	230	600	
2027-35-B	350	1940	
1270-02	190	400	
1250-32	350	2300	
1663-08	66		
2027-09-B	90	1820	
2027-15-B	150	1620	
2022-44	250	1460	
2031-23-B	230	1560	
2031-35-B	350	1360	
General Electric			
V39ZA6	76	132	76
V82ZA12	147	230	147
V180ZA10	300	428	300
V8ZA2	20	120/690	60 (3)
V36ZA80	63	120	63 (3)
PolyPhaser Corporation			
IS-NEMP	200 (2)	380	200
IS-NEMP-1	200 (2)	380	200
IS-NEMP-2	200 (1)	600	
TII			
Model 428	280	350	280
Siemens			
S10K11	40	120/690	
S20K25	80	131/720	80
S14K50	125	220/620	125
S10K60	160	265/710	160
S14K130	340	464/1050	340
B1-C75	75 (2)	600/910	
B1-C90/20	90 (2)	600/938	
B1-C145	145 (2)	600/880	
B1-A230	230 (2)	600/960	
B1-A350	350 (2)	632/1020	
S8-C150	150 (2)	600/4500	
T61-C350	300 (2)	672/990	
Alpha Delta Communications, Inc (4)			
LT	635 (1)	4500	
R-T	635 (1)	400	635
General Semiconductor			
587B51	650	290	650
ICTE-5	7.1	112/560	60 (3)
ICTE-15	20.1	116/580	60 (3)
ICTE-8C	11.4	119/510	
LCE-6.5A	11.2	239/780	
LCE-15A	24.4	158/590	
LCE-51	91.1	188/770	
LCE-130A	209	270/830	209
PHP-120	319	—	—
GHV-12	8	155/590	80 (3)
GSV-101	0.85	115/500	60 (3)
GSV-201	1.7	120/570	60 (3)
Electronic Protection Devices, Inc			
Lemon	300 (1)	380	300
Peach	300 (1)	350	750 (3)
S. L. Waber			
LG-10	300 (1)	550	300
Archer (Radio Shack)			
61-2785	300 (1)	90	300

(1) Estimated or calculated
(2) Dc break-down voltage
(3) Acceptable above 2 MCV
(4) Alpha Delta recently released new versions of their Transi-Trap™. These units are the Model R-T and LT having an "EMP" suffix. In these units, the EMP clamping level is three times lower than previous designs.

voltage, or exhibit an acceptable response waveform.[4] The manufacturer of the protection device normally establishes the maximum clamping voltage using a much slower pulse (8 μs rise time and 20 μs decay time) than the expected electromagnetic pulse and the test pulse (10 ns rise time and a 1 μs decay time). In some cases, the dc breakdown voltage is used as the reference clamping voltage. Therefore, the measured clamping voltage of the devices was expected to be higher than the published figure. During the tests, these higher clamping voltages were found with few exceptions.

Low-Impedance Testing

The low-impedance test was conducted at two different voltage levels (600 V and 4.5 kV). The devices were tested with positive- and reverse-polarity pulses. There was no significant difference in response caused by the different polarity pulses, with the exception of certain General Semiconductor TransZorbs®.

Twenty-six devices were considered to have acceptable pulse-suppression characteristics. The most consistent performer was the metal-oxide varistor (MOV)[5]. Varistors suppressed the leading edge of the pulse wave to less than two times the designed clamping voltage. Table 4 shows those devices that have acceptable clamping performance. The accepted devices have rejection ratios that range from 0.75 dB to 16.47 dB for the 600-V test pulse, and from 13.06 dB to 21.47 dB for the 4.5-kV pulse.

Gas-discharge tubes and devices containing only gas-discharge tubes did not respond well to the 600-V pulse. The rise time (10 ns) and the low voltage level were not sufficient to cause the tube to ionize and conduct the test pulse to ground within the rise time. With 10 pulses being injected at a 1-second injection rate, the gas-tube ionization was delayed for periods of up to 4000 ns for each pulse, and in some cases, the measurements were off the observable scale. This slow response time makes the gas-discharge tube an unacceptable device to use as the sole protection unit for a low-voltage pulse with a slow rise time such as experienced with the 600-V pulse that had a rise time of only 60 V/ns.

Twenty devices were considered to have acceptable measured clamping voltages on the low-impedance test. Six other units had a satisfactory response waveform and were accepted although their clamping voltage was over two times their published or design clamping level. Not all of the devices were tested at the 600-V level. Of the ones that were, the varistors and the ac power-line protection devices were the best performers.

High-Impedance Testing

This test was conducted only at the 4.5-kV level. The devices were tested with positive- and reverse-polarity pulses. Again, no significant response differences were noted with the different polarity pulses, except with the TransZorbs. The 4.5-kV, 50-ohm test pulse is considered to be the most accurate simulation of the expected EMP energy that will be impressed on the ac power and coaxial-cable

[4]Notes appear on page 26.

Table 5

Devices With Acceptable Clamping Voltages High-Impedance Drive Test

Manufacturer and Device	Designed Maximum Clamping Voltage (MCV) (Volts)	Average Measured Peak Clamping Voltage at 4.5 kV 50 Ohms (APV) (Volts)	Acceptable Clamping Voltage (APV = <2 MCV)
Fischer			
FCC-120-P	300 (1)	420	300
FCC-250-300-UHF	300	393	300
FCC-250-300-UHF	350	260	350
FCC-450B-75-BNC	75	210	
FCC-250-150-UHF	150	220	150
FCC-250-120-UHF	120	240	120
FCC-450-120-UHF	120	120	120
Joslyn			
2027-23-3B	230	310	230
2027-35-B	350	366	350
1270-02	190	600	500 (3)
1250-32	350	940	
1663-08	66	90	66
2027-09-B	90	378	
2027-15-B	150	242	150
2022-44	250	294	250
2031-23-B	230	336	230
2031-35-B	350	291	350
General Electric			
V39ZA6	76	254	150 (3)
V82ZA12	147	254	147
V180ZA10	300	388	300
V8ZA2	20	174	100 (3)
V36ZA80	63	170	100 (3)
PolyPhaser Corporation			
IS-NEMP	200 (2)	140	200
IS-NEMP-1	200 (2)	150	200
IS-NEMP-2	200 (1)	160	200
TII			
Model 428	280	410	280
Siemens			
S10K11	40	186	100 (3)
S20K25	80	190	150 (3)
S14K50	125	234	125
S10K60	160	232	160
S14K130	340	436	340
B1-C75	75 (2)	220	
B1-C90/20	90 (2)	210	
B1-C145	145 (2)	200	145
B1-A230	230 (2)	218	230
B1-A350	350 (2)	230	350
S8-C150	150 (2)		
T61-C350	300 (2)	250	300
Alpha Delta Communications, Inc (4)			
LT	635 (1)	700	635
RT	635 (1)	720	635
General Semiconductor			
587B51	650	600	650
ICTE-5	7.1	134	
ICTE-15	20.1	146	
ICTE-8C	11.4	124	
LCE-6.5A	11.2	250	
LCE-15A	24.4	200	
LCE-51	91.1	220	
LCE-130A	209	210	209
PHP-120	319	400	319
GHV-12	8	218	
GSV-101	0.85	168	
GSV-201	1.7	174	
Electronic Protection Devices, Inc			
Lemon	300 (1)	580	300
Peach	300 (1)	1000	750 (3)
S. L. Waber			
LG-10	300 (1)	600	300
Archer (Radio Shack)			
61-2785	300 (1)	300	300

(1) Estimated or calculated
(2) Dc break-down voltage
(3) Acceptable above 2 MCV
(4) Alpha Delta recently released a new version of their Transi-Trap™. This unit has an EMP suffix. In these units, the EMP clamping level is three times lower than previous designs.

interfaces to the amateur's equipment. Therefore, the results of this test were expected to be the most significant of the program. The devices tested are listed in Table 5.

Varistors

Varistors performed adequately during the test. The General Semiconductor, General Electric and Siemens varistors performed consistently. The varistors tested had clamping voltages ranging from 0.85 V to 350 V. The average measured varistor clamping voltage ranged from a low of 168 V to a high of 436 V. Nine out of 12 varistors were found to have acceptable clamping voltages. Three varistors exceeded their designed clamping voltage, but performed consistently and could be used at a higher voltage level if desired.

Gas-Discharge Tubes

The advantage of using a gas-discharge tube is in its ability to handle large power transients for short periods.[6] One of the disadvantages of gas tubes is that once they begin to conduct, a continuous ac or dc operating voltage of the proper level will keep the tube in the conductive state after the pulse has passed. This characteristic can result in the destruction of the tube, as was experienced during another phase of this test program. Several gas tubes were destroyed when attached to an isolated ac power source and then exposed to a 25-kV pulse. The pulse started the tube's conduction and the ac power sustained the tube's ionization and conduction until the tube was destroyed.

In a special test, two gas tubes were connected in series between the pulse source and system ground. An ac voltage was impressed across the source circuit and then through a 100-ohm resistor to ground. The gas tubes did not begin to conduct until they were pulsed. When pulsed, the tubes ionized and conducted the pulse to ground, then shut off. The applied ac power did not sustain the ionization across the series-connected tubes.

Similarly, a gas tube and a varistor were connected in parallel to ground with an ac current in the circuit. When pulsed, the tube ionized and conducted the transient current to ground while sharing the current with the varistor, then shut down without being destroyed. It was concluded that gas tubes could be used for their high power handling capabilities, but only when used at the proper voltage levels or with another device to cut off the tube. This design adaptation is found in commercial ac-power protection devices and RF devices using gas tubes.

Coaxial-Line Protectors

Eleven RF protection devices from three suppliers were tested. These devices are designed to be placed in the coaxial transmission line. All of the units, with the exception of the one with the lowest clamping voltage, were accepted. This exception, the Fischer FCC-450B-75-BNC, is rated to clamp at 75 volts. It did suppress the 4.5-kV pulse to an average of 210 V and was given a rejection ratio of 26.62 dB, still very good performance.

The measured clamping voltages ranged from a low of 120 V (for a device rated at 120 V) to a high of 720 V (for a unit rated at 635 V). The coaxial-line protectors ex-

hibited a very high rejection ratio to the 4.5-kV high-impedance pulse, starting at a low of 16.15 dB for the Alpha Delta Transi-Trap R-T to a high of 30.14 dB for the Polyphaser IS-NEMP devices. The Fischer FCC-250-350-UHF clamped 90 V below its rated clamping voltage of 350 V. This was not considered to be a problem, but a lower clamping voltage potentially could interfere with the transmitted RF signal.

Power-Line Protectors

There are numerous ac power-line protection devices available, but our selection was limited to the lowest-cost devices. Ten devices from seven sources were tested. All of the units, with the exception of the Fischer FCC 120 F-P, Joslyn model 1250-32 and the General Semiconductor models 587B051 and PHP 120, could be plugged directly into an ac wall outlet.

Internally, the devices consist of a combination of gas-discharge tubes, varistors or other protective circuitry. All except one were found to be acceptable. The published clamping voltages ranged from a low of 190 V to a high of 650 V. For several devices, the designed clamping voltage was not known, so a 300-V level was assigned to them for purposes of comparison. The measured clamping voltages ranged from a low of 300 V to a high of 1 kV.

TransZorbs

Seven units from General Semiconductor were checked in an effort to find a device that would clamp at a very low voltage level. The one with the lowest-rated clamping voltage is the ICTE-5 (7.1 V); the unit with the highest-rated clamping voltage is the LCE-130A (209 V). Average measured clamping voltages ranged from a low of 124 V to a high of 250 V. Only one of the units was accepted — the LCE-130A. Rated at 209 V, it had an average clamping voltage of 210 V. All of the other TransZorbs conducted only at levels considerably above their ratings.

Test to Failure

The larger of the two pulse generators was used to generate a 25-kV pulse at 4 kA for 1 μs. This provided a total energy output of 100 J. Up to five each of the 36 devices were tested with only three of them approaching failure. The three ac power-line protection devices experienced excessive internal arcing, although they did not fail completely. All of the other devices survived the 10 pulses and suppressed the voltage transient voltage without failure.

Conclusions

Of the 56 devices tested, there are many that have acceptable transient-voltage suppression capabilities and can be used for the protection of Amateur Radio equipment. These include ready-made units for direct connection to the ac power lines and coaxial antenna lines as well as smaller devices that can be used alone (varistors) or in combinations (gas-discharge tube/varistor) to protect other points.

[Editor's Note: This series of articles is condensed from the National Communications System report (NCS TIB 85-10) *Electromagnetic Pulse/Transient Threat Testing of Protection Devices for Amateur/Military Affiliate Radio System Equipment.* A copy of the unabridged report is available from the NCS. Write (no SASE required) to Mr Dennis Bodson, Acting Assistant Manager, Office of Technology and Standards, National Communications System, Washington, DC 20305-2010, or call 202-692-2124 between the hours of 8:30 AM and 5 PM Eastern.]

Notes

[4]The published clamping voltage of a device is the average voltage level where the device will change from a nonconducting state to a conducting state.

[5]Varistors are voltage-dependent devices that behave in a nonlinear electrical manner similar to back-to-back Zener diodes. When subjected to high-voltage transients, the varistor's impedance changes over a large range from a near open circuit to a highly conductive circuit, thereby switching the transient voltage to ground or some other point. Varistors are designed for a large assortment of switching (clamping) voltages.

[6]The tubes tested are sealed gas-discharge tubes consisting of two or three electrodes properly separated by insulators and filled with a rare gas. These tubes are designed to switch rapidly at a specific voltage level from a nonconductive to a conductive state (arc mode) when subjected to a fast-rising voltage transient. When the voltage across the tube's electrodes is increased, ionization of the inert gas occurs and the tube conducts across the electrode gap. The breakdown-voltage level is determined by the design of the tube's electrode spacing and the gas pressure.

Strays

SEARCH YOUR SHACK

Help a museum get up and running. Motorola Communications and Electronics, Inc, in Anchorage, Alaska, is establishing a Museum of Early Two-Way Radio Equipment. They have already acquired a few post-World War II tube-type items, but would greatly appreciate any donations of equipment or assistance from amateurs who may have interesting or unusual examples of two-way radio gear. Let's drag out those old pack sets, turkey roasters and other ancient radios in mint condition, and help preserve our heritage from the early days of VHF and UHF FM communications. Contact curator Don Parker, 5333 Fairbanks St, Suite 1, Anchorage, AK 99502. (*tnx K4TXK/KL7*).

QST congratulates...

☐ the following radio amateurs on 60 years as ARRL members:

- Shelley Trotter, W6BAM, of Santa Ana, California
- Harry Legler, WØPB, of Hiawatha, Kansas

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After our building experience is past and the lessons are learned, we fail to realize that a whole new generation of inexperienced newcomers have entered the ranks of hamdom. Why not share your test circuits and other building projects with them? How about explaining soldering techniques or how to prepare a printed-circuit board from scratch?

You can be an "Elmer" through the pages of *QST* by preparing a technical article on your workshop techniques. Submit material to Paul K. Pagel, N1FB, Senior Assistant Technical Editor, 225 Main St, Newington, CT 06111.

Next Month in *QST*

Looking to improve your antenna system? October articles will offer a four-element 24-MHz Yagi that offers exceptional performance, and examples of *efficient* broadband 80-meter dipoles.

Next month's Affiliated Clubs in Action column is a photo essay of club activities; perhaps you'll rake in one or two ideas for your group's autumn schedule. The Public Service pages highlight computers on the go—how one group used mobile packet radio to monitor a marathon. In Training asks, What is your grade as an instructor? Honest self-examination can bring genuine self-improvement as a ham radio teacher.

Two rare countries participated in the ARRL International DX Contest. Find out which ones by reading the contest results in the October issue.

A 1935 Ham Receiver

Radio childhood for many hams meant experiencing the magic of the regenerative receiver. You *can* go home again—if you know where to get the parts.

By Harry R. Hyder,* W7IV

In 1935 I was 15 years old. I had graduated from building crystal and one-tube broadcast sets to making two- and three-tube shortwave receivers. I knew that there was such a thing as Amateur Radio, but I knew no hams. Using a door buzzer and a straight key built from parts of an old Erector toy set, I had memorized the code to the point where I could pick out an occasional word from the hams or commercial stations I heard.

The shortwave sets I built did not look like much; I had neither the money nor the skill to do better. My sets were made mostly from parts of discarded broadcast sets of the 1920s, suitably modified. I built these sets at the rate of about one a month. Whenever I acquired an interesting new part or read of a new circuit, I tore apart the older set and rebuilt it. The "chassis" was wood, and the panel was a piece of scrap metal that I had managed to straighten out and paint. I had only a few simple hand tools and no test equipment whatsoever. Getting a set working involved a lot of guesswork. But I read *QST* and *The Radio Amateur's Handbook* at my high school library, and I learned a lot. It was all fun.

In my dotage, my mind turned to those happy days. Nostalgia overcame me. Would it not be fun to build the set I would have liked to build in 1935, if only I had had the money and ability?

First, I needed a circuit. This was no problem; regenerative receiver circuits are engraved indelibly in my mind. I decided to use two stages of audio, since it is always easier to reduce gain after a set is built than to increase it. I also put in more filtering and decoupling than I would have thought necessary in 1935; I have learned something since then! The circuit I decided on is shown in Fig 1.

Since I wanted the set to be authentically "1935," I established the rule that all parts I would use had to have existed then. This was not possible in all cases. About ten years ago, I decided that never again would I build anything that was not 100% solid state, and as a result I gave away all of my large stock of tubes, sockets, high-voltage power transformers and other parts unique to vacuum-tube circuits. Fortunately, I kept parts that might be useful in building more modern gear, including variable capacitors, dials, and switches. But I saved no "30s" under-chassis small parts, including resistors and fixed capacitors—and these are hard to obtain today. Even new fixed capacitors capable of withstanding a couple of hundred volts are hard to find, but a source was uncovered.[1] I got tubes, sockets, fixed mica capacitors and one plug-in coil form from ham friends, who were all enthusiastic about my project and helped gladly. And so I accepted this compromise: In my re-creation of a 1935 receiver, modern components are used where necessary, but all parts on the front panel and above the chassis are just as they would have appeared in 1935 (see title photo and Fig 2).

I decided to wind my detector coil for the 7-mc. band, since there is activity on that band day and night. When the set was wired and ready for a test, I reviewed in my mind the technique of tuning a regenerative receiver. I had not done this since before WW II. Let's see: "Advance the regeneration control slowly until the set goes into oscillation. Hold it just above that point, then tune, re-adjusting the regeneration control as necessary."

I did not get that far on the initial trial, because the first thing that greeted me when I turned on the power was a loud hum. When I removed the detector tube from its socket, the hum went down to a low level. My immediate suspicion was heater-to-

*1638 W Inverness Dr, Tempe, AZ 85282

[1]Antique Electronics Supply, 668 W First St, Tempe, AZ 85281.

cathode leakage in that tube. I went through six tubes. Two of these tubes produced no hum, but they did nothing else, either—they were dead!

When I held my hand near the detector tube, the hum increased greatly, so I decided that I needed a tube shield. Pentode detectors in regenerative receivers of 1935 were almost always shielded. I had thought of this, but had not been able to locate a shield. So I improvised one from an old coil shield can and consoled myself with the thought that I might have done the same thing in 1935. I also shielded the detector grid lead while I was at it. This reduced the hum to a tolerable level, although it is still a little higher than I would like. (Perhaps I am more critical in 1986 than I was in 1935.) I tried grounding, floating and balancing the heater circuits with no improvement. Completely shielding the set would help, but I did not want to go that far.

After I had reduced the detector hum, no further troubles were encountered. The detector goes into and out of oscillation very smoothly. There is no trace of "fringe howl" or any of the other problems that plague regenerative receivers. Audio output is more than adequate.

In the 1930s, few hams used the same antenna for both transmitting and receiving. The receiving antenna was usually a random-length wire, coupled to the hot end of the detector grid coil through a small capacitor. I made provision for this, but I also discovered that my modern 50-ohm antenna system works well when connected to the cathode tap on the coil.

No one ever complained about the sensitivity of a regenerative detector. This set will receive a 1-microvolt signal with a good signal-to-noise ratio, as measured by my Hewlett-Packard 606A signal generator. Selectivity is another matter. How did I ever separate those signals? On a regenerative set, every part of the band sounds like a DX contest pileup! After using a modern transceiver with super-sharp crystal filters, I began to think that it was a miracle that I was able to work anyone at all in the 1930s. But I did, and, as I remember, the c.w. subbands were more crowded then than they are now. The human brain is a wonderful filter, once you learn to use it.

I am very pleased with this set. Every evening I turn it on and tune the band. It seems strange to be tuning a set without a digital readout or a calibrated dial. Finding the 7-mc. band is easy: I set the station transceiver to 7.000 MHz, put the three-tuber into oscillation and adjust the band-setting capacitor until I hear the oscillating detector with the transceiver. Regenerative sets *do* radiate!

I thank David Lowenstein, N7AF, Frank Alrich, WB7OMZ, and Liscum Diven, W7IR, for their contributions to my 1935 receiver. Now, my thoughts are turning to building a companion 1935 transmitter. The Antique Wireless Association has yearly

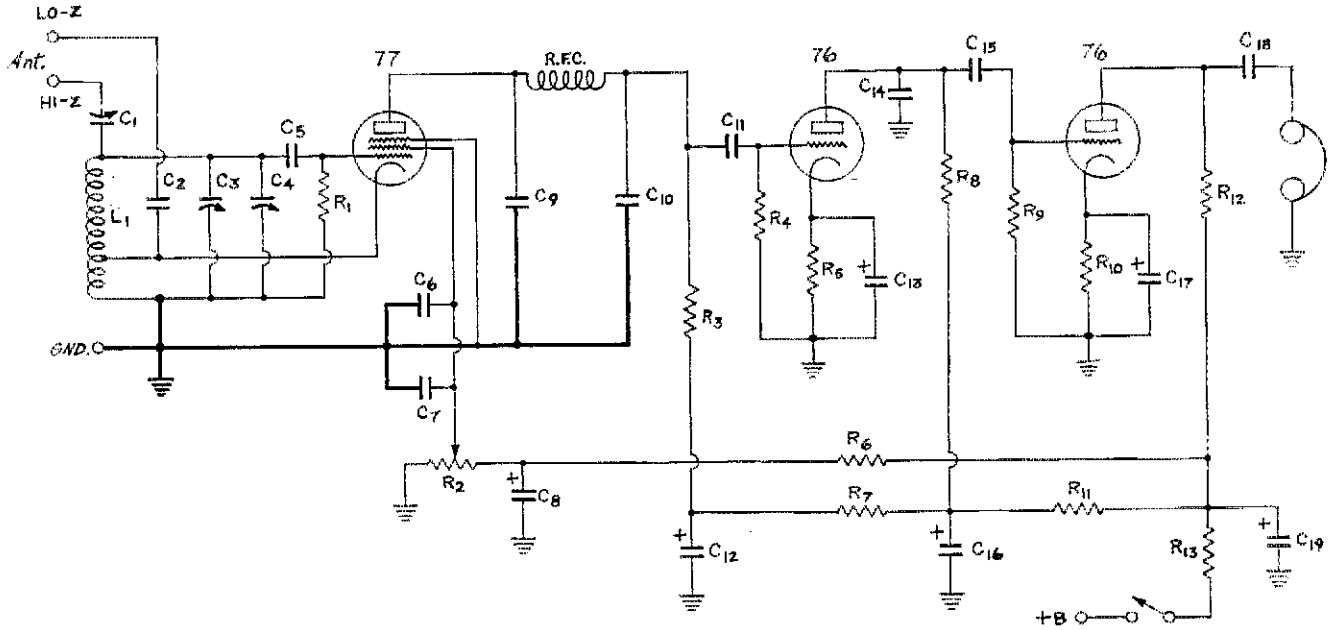


FIG. 1 — CIRCUIT DIAGRAM OF THE THREE-TUBE RECEIVER.

***The tube heaters (6.3 volts) are wired in parallel. The B supply may be anything from 100 to 250 volts d.c. The negative-B connection is made to the chassis (ground). Heavy lines indicate "ground" connections which should be made to a single common point on the chassis. Power-pack design for a.c. operation is given in* The ARRL Handbook.**

C_1—30-mmfd compression trimmer condenser (antenna coupling).
C_2, C_5, C_9, C_{10}—100-mmfd fixed mica condensers.
C_3—100-mmfd midget condenser (bandset).
C_4—10-mmfd midget condenser (bandspread).
C_6, C_{14}—.001-mfd fixed mica condensers.
C_7—1-mfd paper condenser, 200-volt rating.
C_8, C_{19}—10-mfd electrolytic condensers, 350-volt rating.
C_{11}, C_{15}—.01-mfd plastic film condensers.
C_{12}—33-mfd electrolytic condenser, 350-volt rating.
C_{13}—47-mfd electrolytic condenser, 35-volt rating.
C_{16}—22-mfd electrolytic condenser, 350-volt rating.
C_{17}—22-mfd electrolytic condenser, 50-volt rating.
C_{18}—.1-mfd paper condenser, 350-volt rating.
L_1—detector coil: 9-3/4 turns No. 20 tinned copper wire, spaced to occupy a length of 3/4 inch on a 1-1/2-inch diameter 4-prong coil form. Cathode tap 4/5 turn from ground end.
R_1—2.2-megohm, 1/2-watt resistor.
R_2—50,000-ohm wire-wound potentiometer (regeneration control).
R_3, R_8—47,000-ohm, 1/2-watt resistors.
R_4, R_9—470,000-ohm, 1/2-watt resistors.
R_5—2200-ohm, 1/2-watt resistor.
R_6—47,000-ohm, 1-watt resistor.
R_7—22,000-ohm, 1-watt resistor.
R_{10}—1500-ohm, 1/2-watt resistor.
R_{11}—10,000-ohm, 1-watt resistor.
R_{12}—22,000-ohm, 1/2-watt resistor.
R_{13}—1000-ohm, 1-watt resistor.

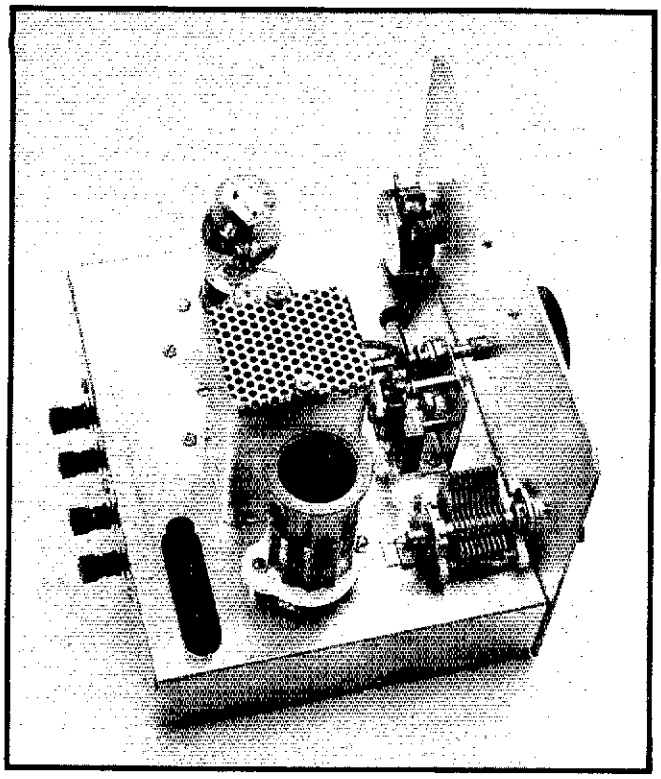


FIG. 2 — A GLANCE BEHIND THE FRONT PANEL OF THE 1935 RECEIVER SHOWS THE MODEST CONSTRUCTION THAT MADE REGEN PERFORMANCE FAMOUS

The detector is a 77, hidden from view in the improvised shield can just above the plug-in detector coil. A pair of 76's takes care of audio amplification chores. Panel controls, from top to bottom, are regeneration, bandspread tuning and bandset tuning. The detector grid coupling condenser (C_3) and grid leak (R_1) are mounted on the bandset condenser bracket. The three binding posts to the left of the detector coil are antenna terminals; connections for plate and heater power are made via the four binding posts at the rear of the set.

contests for hams using ancient equipment. What shall I use in the final amplifier? An 807? No; 807s weren't available until 1936. Maybe a 210 or a pair of 46s? I'll have to see what tubes and parts my friends have.

How Regenerative Detectors Work

Regenerative detectors get a lot done with relatively few parts—and in the lean '30s, those were the magic words responsible for the great popularity of the "regen," or "blooper," as it was sometimes called. What made it tick? The usual regenerator was a grid-leak detector with RF feedback. Fig A shows a triode grid-leak detector. When an incoming signal drives V1's grid positive with respect to cathode, current flows from cathode to grid and returns to the cathode via R1, the *grid leak*. This is rectification, here called *detection* because it results in demodulation of the incoming signal. Rectified RF charges C1. C1 is usually 50 to 250 pF or so, and the resistance of RI is between 1 and 10 megohms. Though the charge on C1 tends to "leak off" through R1, the R1C1 time constant is many times longer than the period of the applied RF signal, providing steady bias for V1. C2 and the RF choke bypass the plate for RF.

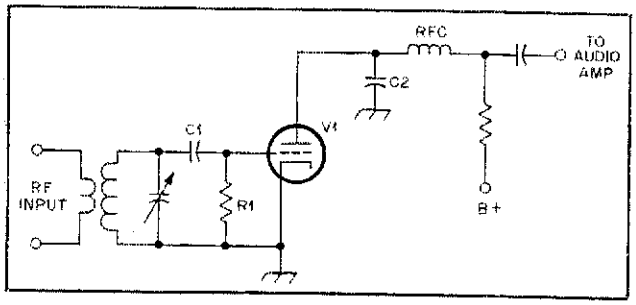


Fig A—A grid leak detector. Action of numbered components is discussed in the text.

Rectification of any AM sidebands on the incoming signal—containing, say, speech or music—causes V1's bias to fluctuate at the modulating frequency, since the R1C1 time constant is too short to smooth audio-frequency bias variations. Plate current thus varies in step with the modulation envelope, and audio may be recovered across V1's plate load. The triode grid-leak detector combines diode detection with a stage of audio amplification—an arrangement much more sensitive than a diode. A pentode grid-leak detector would afford even greater sensitivity.

As sensitive as the grid-leak detector may be, however, it can detect only relatively strong incoming signals. And if we want to receive CW or carrierless signals such as SSB, we're out of luck because we need a beat frequency oscillator (BFO) to demodulate them. All we need do to solve both problems is add RF feedback to our grid-leak circuit—and we have a regenerative detector.

Fig B shows the circuit. Now, V1's plate is kept above RF ground, and a small inductance in the plate lead—a *tickler* coil—is placed near the grid tuned circuit to provide in-phase RF feedback. This results in the amplification of the incoming signal many thousands of times before detection. V1 may even oscillate if feedback is made strong enough. When it does, we're ready for CW and SSB reception, with V1 simultaneously serving as RF amplifier, detector, audio amplifier and BFO. Detector sensitivity is maximum at the point just below oscillation—at *critical regeneration*. Feedback may be controlled by varying the reactance of the plate bypass, C2, or plate voltage.

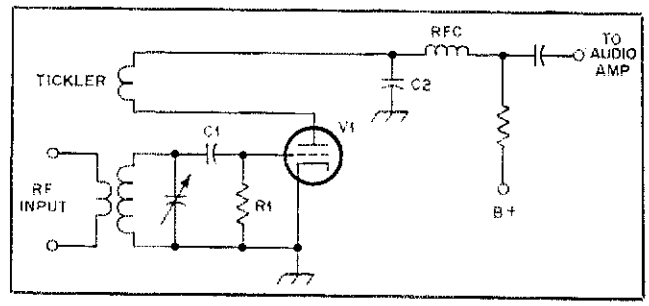


Fig B—Regenerative detector. Addition of a tickler coil provides RF feedback.

Just about any oscillator circuit could be used as a regenerative detector. W7IV's circuit is a Hartley regenerator: In his receiver, the oscillator anode (pentode screen) is held at RF ground, and positive feedback is supplied from the cathode to a tap on the grid coil—a Hartley oscillator. Feedback is controlled by varying detector screen voltage.

Regens had their drawbacks. Audio from local broadcast stations might be audible across a regen's entire tuning range because of cross modulation. A random-length wire coupled to a regenerator might "suck out" enough energy from the detector grid circuit to stop oscillation—and as the antenna swung in the wind, its varying capacitance to ground might shift detector tuning. Receiver shielding and grounding were critical if similar frequency shifts with hand movement were to be avoided. If detector RF got to the rectifier anodes in a regen's power supply, re-radiation after intermodulation with line-frequency ac might result in "tunable hum"—tunable because it varied in severity as a receiver was tuned. Worse, all the hams in a neighborhood could hear each other's receivers, since an oscillating detector coupled right into an antenna was also a QRP transmitter!

It was tough to receive weak signals in the presence of loud local amateur stations: A weakly oscillating detector might stop oscillating ("block") or be "pulled" toward or onto the frequency of a strong signal. (This was why so many regen users tended to listen to their CW at quite high pitches—less pulling that way!) Impedance coupling between detector and audio amplifier sometimes gave rise to "fringe howl," an audio oscillation caused by a negative-resistance effect in the detector plate circuit near critical regeneration. Detector tubes were often highly microphonic.

Sure, you could put a stage of RF amplification ahead of a regenerative detector and pretty much cure radiation and suck-out. But the regen still had its problems with overload, was relatively unstable, and wasn't as good for radiotelephone reception as the superheterodyne receiver. Maximum sensitivity for AM phone, just short of detector oscillation, resulted also in excessively sharp selectivity, to the detriment of recovered audio. With the detector oscillating, selectivity had to be achieved at audio—or with the ear-brain filter, as W7IV says.

Once the single-signal superheterodyne receiver made the scene—"single signal" meaning that it responded to CW signals on only one side of zero beat, something a regen couldn't do—the writing was on the wall for the blooper. Still, the sheer simplicity and economy of the regen made it *the* receiver for many hams in the '30s.—*David Newkirk, AK7M, Assistant Technical Editor,* QST

Although Extra Class ham Harry R. Hyder was first licensed in 1938 as W2LIW, one of his earliest memories is that of his father (never a ham) assembling broadcast sets on the kitchen table with the admonition that young Harry stop playing with the variable capacitor. This may have planted the seed, but it wasn't until he took a grade-school science course that Harry was formally introduced to electricity. Experiments in backyard telegraphy gave way to crystal radios and one-tube broadcast sets. Harry became aware of Amateur Radio in 1933, when the family bought a broadcast set that included coverage of the 160-meter band.

Harry has been a League member since becoming a ham in 1938. He attended City College of New York and RCA Institutes after graduating from high school, landing a position as an RCA-Radiomarine technician after a few nonradio jobs. After that, radio paved the way: A stint as a radio officer in the Merchant Marine during WW II led to engineering positions with Fairchild Camera and Instrument Corp and Bendix Radio. He became a Senior Engineer on radar and related equipment for Motorola (Arizona) in 1957. Having long since dropped W2LIW for W3NVL while with Bendix in Baltimore, Harry became K7HQN with the move to Motorola, doffing 'HQN in favor of W7IV in 1968. He retired from Motorola in 1984.

Since 1945, Harry has published in Popular Science, Radio News, QST, Ham Radio, CQ *and* Worldradio. *He operates on bands from 160 through 10 meters, and whenever he thinks of something to build that he's capable of building, he heads for the workshop. There's no doubt about what Amateur Radio means to Harry R. Hyder, who writes: "My addiction to ham radio is permanent; there is no cure."*

Strays

QST congratulates...

☐ the following radio amateurs on 50 years as ARRL members:

- Lewis Connoly, W4DVO, of Tampa, Florida
- Howard Sayers, W9NZS, of Park Ridge, Illinois
- Harry Holland, W1GUJ, of Taunton, Massachusetts
- John Salin, W3FKT, of Rehoboth Beach, Delaware
- Richard Corson, WA6LDW, of Los Altos, California
- Marion Neary, N7AA, of New Plymouth, Idaho
- Edwin Chinnock, W2FZY, of Ft Lauderdale, Florida
- Buford Smith, W4FCJ, of Conway, South Carolina
- Wendell Cushing, K4VN, of Forest Park, Georgia
- Howard Schonher, W4PZL, of Columbus, Georgia
- Cecil Chisholm, W7LGF, of Phoenix, Arizona
- George Diehl, W2IHA, Chatham, New Jersey
- Harold Pedersen, W6MRP, of Kingsburg, California
- Emil Malik, W6GVM, of Sacramento, California
- Clarence Griffith, W6IZR, of Petaluma, California
- Harry Heffrin, W6MFH, of Sacramento, California

I would like to get in touch with...

☐ hams who were stationed on Tinian during WW II, particularly members of Navy Comm Unit 12. F. Tarkington, AF3G, 2013 Glen Ross Rd, Silver Spring, MD 20910.

☐ hams who are amateur or professional botanists, or who are members of BSA or ASPT. Rob Wallace, WA2SPO, Dept Biol Sci, Rutgers University, Box 1059, Piscataway, NJ 08854.

☐ hams interested in martial arts. L. Adams, G4RKV, 7 Clare Dr, Greenhill, Herne Bay, Kent CT6 7QT, UK; or G. Mullender, G4NAO, 3 Fernie Close, Fareham, Hampshire PO14 3SQ, UK.

☐ hams of any age for pen pals. Eric Wilson, N4HGZ, 302 Church St, Wilmington, NC 28401.

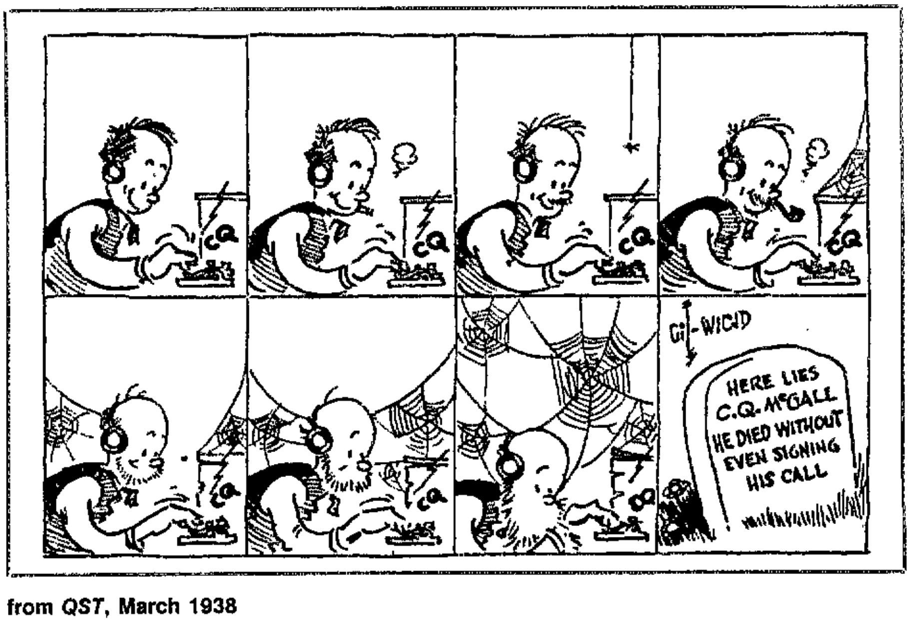
☐ anyone who has experience in troubleshooting a Heathkit HG-10 VFO. W. Cringan, VE7WC, 6311 Rodolph Rd, Victoria, BC V8Z 5V9, Canada.

☐ anyone with an instruction manual for a National NC-183 receiver. Mike Martin, KA1IOO, 695 Middlebridge Rd, Narragansett, RI 02882.

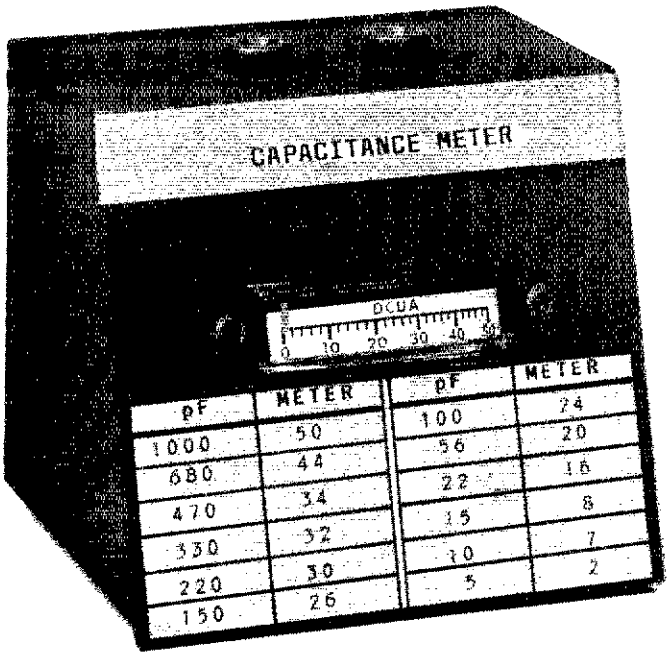
☐ anyone with a manual for the Stoddard Radio Interference and Field Intensity Meters, 20-400 and 375-100 MHz ranges. Guy Black, W4PSJ, 12317 Hanger Rd, Fairfax, VA 22033.

☐ anyone with manuals or schematics for an Intel MCS-85 System Design Kit, Keytronics 65-01563.001 keyboard and PCB-002 and 140P1803A. Jim Gentile, K1ICE, 56 Lexington St, Lawrence, MA 01841.

☐ anyone with information for a Com Center Corp voting comparator, Model CV-2020. Bron Kidwell, N3AGB, 9003 Townsend La, Clinton, MD 20735.



from *QST*, March 1938



•*Under Construction*

Measuring Small-Value Capacitors

Part 11: A commercial capacitance meter is accurate, but costly. Learn how to measure values from 5 to 1000 pF inexpensively with a simple, homemade capacitor checker.

By Doug DeMaw, W1FB
ARRL Contributing Editor
PO Box 250
Luther, MI 49656

Do you have a drawer filled with unmarked small capacitors? How about those units that are marked, but with strange color coding that seems to defy deciphering? I have been exposed to both situations many times, and this caused me to build various types of testers that would aid in sorting my capacitors for future use.

My inherent frugality is a constant stimulant toward building equipment rather than purchasing it. Most small projects for my ham workshop are homebuilt, either from my design or that of some other ham who has published his or her work in one of the amateur journals. The cliche about not "reinventing the wheel" is certainly applicable for most amateur equipment, except when added features are needed, or when improved performance is desired. This month's practical exercise is based on the earlier work of T. H. Holbert, GM3DXJ and G. R. Foggin, G3GRF, relative to their development of simple capacitance-measuring devices.[1]

Modern Methods and Design

Yesterday's technology provided commercial instruments of the analog variety for measuring capacitor values, leakage and power factor. Laboratory-grade bridges were used for measuring unknown components of L, C and R. The bridge contained a 1000-Hz audio oscillator, and when the bridge was balanced to indicate the value of a component under test, a null in the audio tone was heard in the earphones. However crude this may seem by today's standards, the scheme was viable and yielded accurate readings.

Later, a tuning-eye vacuum tube was used to indicate (when a narrow wedge appeared in the green display) that the instrument was adjusted to read the value of a capacitor or resistor. This type of instrument was more compact than the older bridge units, and it enabled us to perform a test much faster than when operating a bridge type of tester.

Those early-day instruments have been replaced by comparatively miniature digital capacitance checkers. Their ranges cover capacitance values from 1 pF to many hundreds of μF. Values of capacitance are displayed in decimal numbers, which aids us in learning the unknown values precisely.

For most amateur applications (filters excluded), the approximate capacitance value is acceptable. We need not know, for example, that a specific capacitor has a value of, say, 22.68 pF. In fact, in many of our circuits we can get by with capacitor and resistor tolerances of 20 percent without observing a difference in circuit performance. With this concession in mind, I developed the tester that is described in the workshop part of this article. I find it entirely adequate for learning the approximate values of small silver-mica, disc-ceramic and polystyrene capacitors of 1000 pF or less. The tester is more convenient to use than is a dip meter and known-value inductor. With that arrangement we place the unknown capacitor in parallel with the known inductor, find the resonance point with the dip meter, then the capacitance value. We may also apply the standard equation for frequency to determine the value of the capacitor.

The G3GRF Circuit

Fig 1 shows the circuit that G3GRF derived from the more complex circuit of GM3DXJ. It features two capacitance ranges—0 to 100, and 100 to 2000 pF (LO and HI of S1). I duplicated the circuit and found that it worked reasonably well. The problem I experienced was that the higher values of capacitance tended to bunch up, respective to the meter reading, at the high end of the M1 scale. This made it difficult to obtain sufficient resolution for determining the capacitor values to my satisfaction. One advantage of the circuit in Fig 1 is, however, the use of a 1-mA dc meter. These are more common and less expensive than μA meters: My circuit requires a 50- or 100-μA instrument.

Calibration of the G3GRF circuit calls for placing a 100- or 200-pF capacitor across points X, then adjusting R1 or R2 for a full-scale reading at M1. Smaller values of capacitance provide lower meter readings. Calibration is further carried out by using a variety of known-value capacitors to plot meter readings for future reference when measuring unknown-value capacitors.

This Month's Project

My version of the GM3DXJ circuit (Fig 2) is designed to measure values from 1 to 1000 pF. Therefore, only one range is avail-

[1]RSGB Bulletin, March 1964.

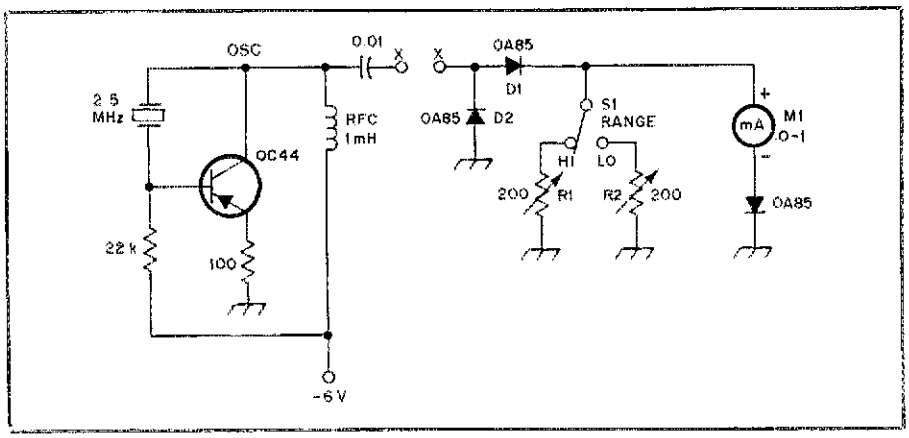


Fig 1—Original G3GRF circuit for a two-range capacitance checker as presented in the 7th edition of Amateur Radio Techniques by G3VA (RSGB publication).

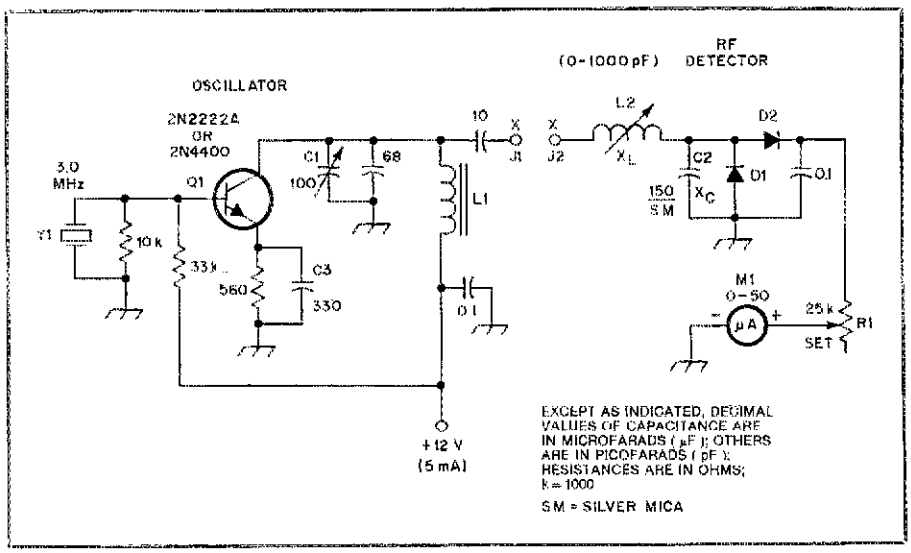


Fig 2—W1FB version of the G3GRF tester. Fixed-value capacitors are disc ceramic unless otherwise noted. Fixed-value resistors are 1/4-W carbon-composition.

C1—10-100 pF trimmer, ceramic or mica compression.
C2, C3—See text.
D1, D2—Small-signal, high-speed diode, such as 1N914.
J1, J2—Banana jacks or binding posts.
L1—Toroidal inductor (28 μH). Use 18 turns of no. 28 enam wire on an Amidon Assoc FT-37-61 ferrite core (μ = 125).
L2—Use 21 turns of no. 28 enam wire on a ¼-inch OD slug-tuned form with an HF-band core (see text). If a toroid is used, wind a 2.8-μH inductor by using 26 turns of no. 30 enam wire on an Amidon T37-2 powdered-iron core (see text).
M1—Microammeter, 50 to 100 μA dc.
R1—PC-mount control, 20 or 25 kΩ.
Y1—Fundamental crystal, computer type (see text).

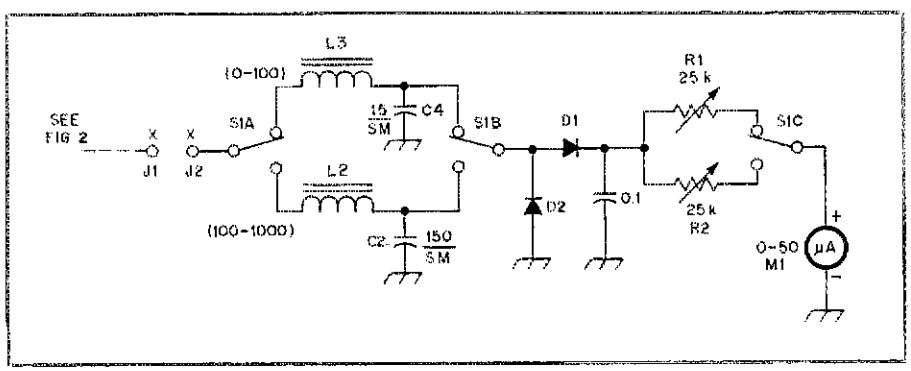


Fig 3—Circuit for a two-range switching arrangement that can be applied to the circuit of Fig 2. See text for reactance values that pertain to C4, C2, L2 and L3.

able. Also, I used a 3.0- rather than a 2.5-MHz crystal, which was the one I had available in my collection of crystals. A 2.0- to 2.5-MHz crystal can be used, if you have one on hand. Many surplus dealers sell computer crystals for as little as $1.50 (Digi-Key Corp for one), and they are available in the specified range.

Rather than using a Pierce oscillator, I chose the Q1 circuit of Fig 1, with which Wes Hayward, W7ZOI, and I have had predictable success. C3 has a reactance (X_c) of approximately 155 ohms. It is part of a feedback network. The remaining capacitance is within the transistor (base to emitter). This oscillator requires a tuned collector (C1/L1).

To minimize loading on the Q1 collector, we will use only 10 pF of capacitance from L1 to J1. Too large a value will prevent Q1 from oscillating, since it will lower the Q of the tuned circuit along with adding too much parallel C across L1. The added capacitance will not allow C1 to bring the circuit to resonance.

I added L2 for the purpose of "debunching" the meter reading at the high end of the capacitance range. It has the same reactance (X_L) as the highest value of capacitance to be tested (1000 pF in this case). The X_c of 1000 pF at 3.0 MHz is 53 ohms. Therefore, L2 must have an X of 53 ohms, which results in 2.8 μH [L(μH) = X_L / 2 C(MHz)]. Since C and L have the same reactance, L2 and the 1000-pF test capacitor form a series-resonant circuit. This permits maximum RF energy from Q1 to pass to the detector diodes, D1 and D2. L2 presents an ac resistance in the RF path when smaller values of capacitance are inserted at J1 and J2, thereby causing a lower meter reading than would otherwise result.

As an aid to the foregoing objective, I added C2 (X_c = 354 ohms). It forms a capacitive divider with the capacitor under test. This causes little effect on the 1000-pF capacitor at J1 and J2, but does siphon off more and more RF energy as the test-capacitor value becomes lower.

I made one other circuit change to aid meter linearity. R1 is in series with M1 rather than in shunt, as shown in Fig 1. Owing to the square-law response of D1 and D2, a very nonlinear meter reading results in circuits of this type. The presence of the SET control of Fig 2 helps to linearize the meter response. The greater the R in the series path to M1, the more linear the response. This situation is aided by the use of a microammeter rather than a milliammeter. That is, the more sensitive the meter, the greater the R needed at R1 to provide a full-scale meter reading during calibration.

To connect the capacitor to the terminals, use a pair of banana-jack/alligator-clip connectors. You can make these connectors by soldering the tail of the alligator clip to the hole in the banana jack. When you want to measure a capacitor,

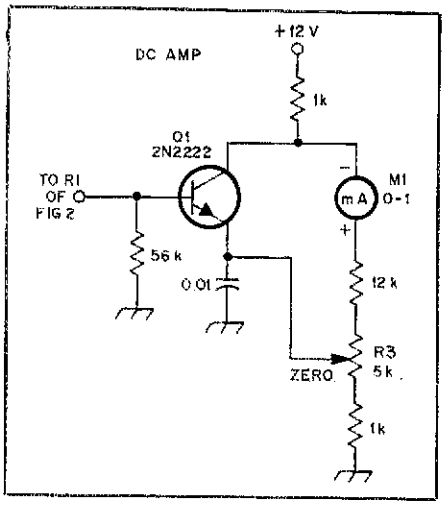


Fig 4—A 0-1 mA dc meter may be used with the circuit of Fig 2 by adding this meter amplifier.

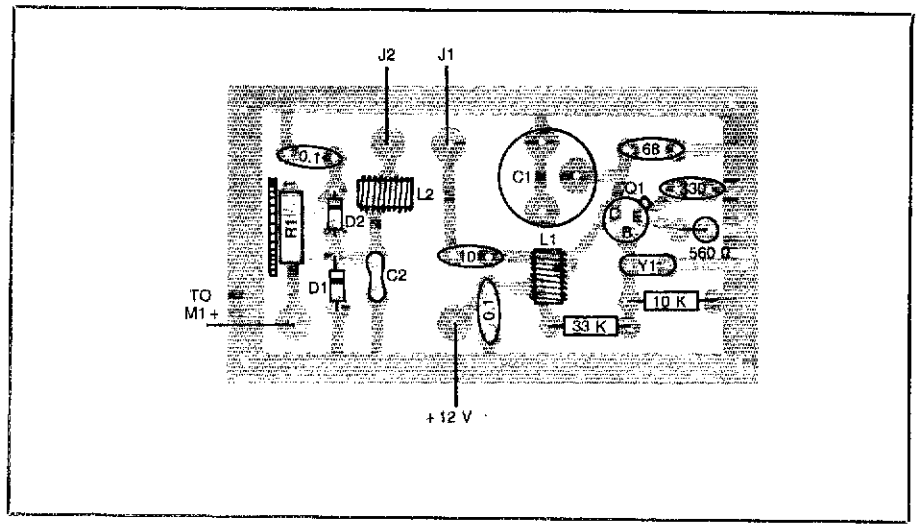


Fig 6—Parts-placement guide for the capacitance meter. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

place the leads between the jaws of the alligator clips. Avoid using long leads between the instrument and the capacitor under measurement; it only serves to introduce error.

A Two-Range Instrument

Fig 3 illustrates how you may add a switch and three components to obtain two capacitance ranges. With reference to Fig 2, we have added S1, C4, L3 and R2 in Fig 3. This arrangement permits expanding the M1 response scale for capacitor values from 1 to 100 pF. Alternatively, the high range could be set up to read 100 to 2000 pF. You may wish to consider a low range of 5 to 500 pF, and a high range of 500 to 2000 pF. The rules are yours to make.

Using a 1-mA Meter

There is no reason why you can't use that 1-mA dc meter you have been saving for a special project. A suitable meter amplifier is shown in Fig 4. Q1 "magnifies" the dc current from D1 and D2 of Fig 2, which permits the 1-mA meter to respond like a μA meter. R1 of Fig 2 is retained, and R3 of Fig 4 is used to zero the meter when no capacitor is attached to J1 and J2 of Fig 2.

Construction Notes

In keeping with my frugality, I made my instrument cabinet from pieces of double-sided PC board. Single-sided PC stock may also be used.

J1 and J2 are binding posts. They should be insulated from the panel by grinding away the copper around them (a ½-inch circle around each post). This will minimize stray capacitance to the panel, which would, if present, affect the readings for low-value capacitors. You may prefer to cut a rectangular hole (using a nibbling tool) in the panel, glue in a plastic hole cover, and then mount J1 and J2 on the plastic block.

L2 of Fig 2 may be wound on a toroid core. Adjustment for peak meter response can be carried out by compressing or spreading the turns on the toroid core. A slug-tuned coil is easier to adjust. If you use that type of inductor, be sure the core material in the slug is suitable for use at 2 to 3 MHz, consistent with a high Q. J. W. Miller Co coil forms with the red or yellow slugs (permeability of 10 and 8, respectively) are satisfactory.

An interior view of the assembled capacitance tester is shown in Fig 5. A PC-board pattern is provided in Fig 6. You may choose to avoid the PC board and use W7ZOI "ugly construction" by using the "dead-bug" approach on a piece of unetched circuit board. Perforated circuit board may also be substituted.

I must confess that my lab is equipped with a modern, sophisticated digital capacitance meter. I use it when I need to closely match the values of capacitors, or

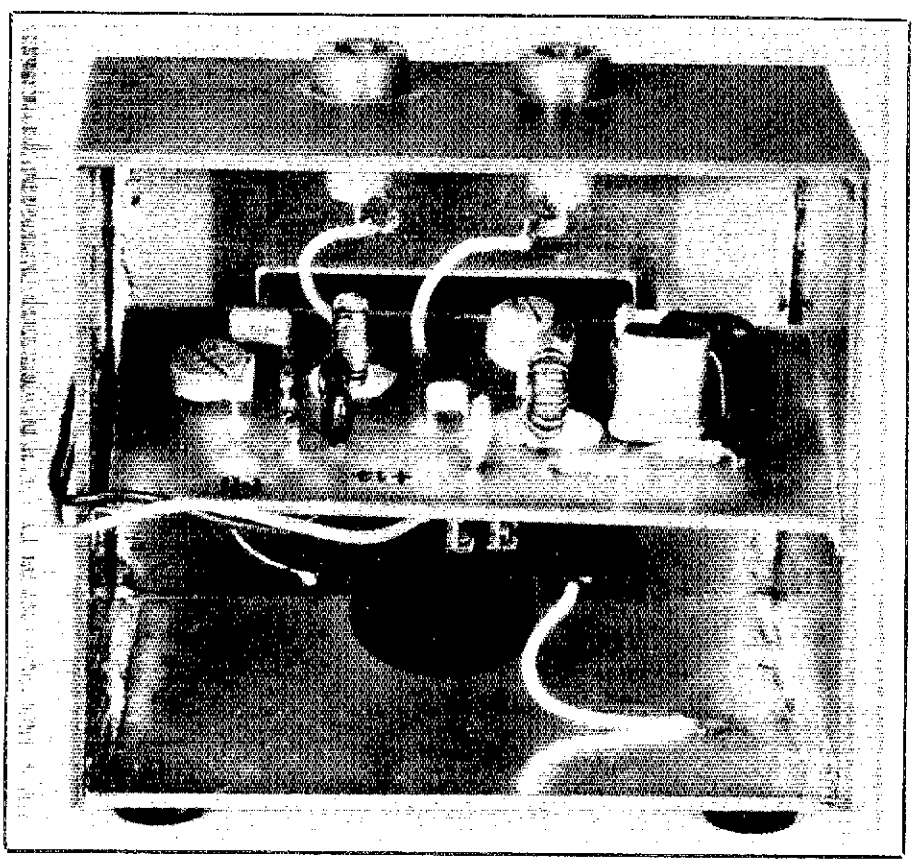
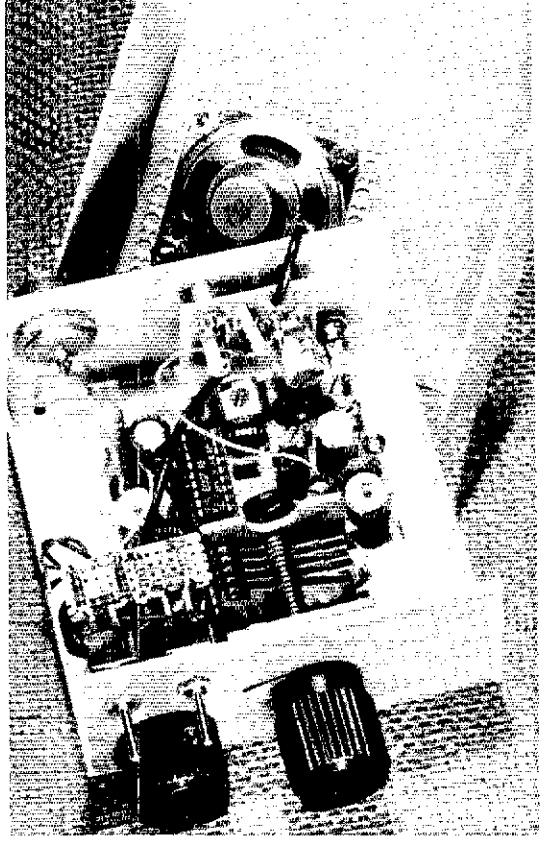


Fig 5—Interior view of the assembled tester. The case is made from sections of PC board that are soldered together.

(continued on page 39)



The SIMPLEceiver

Maximum simplicity or minimum complexity—take your choice! Here's a high-performance receiver with one transistor, one multipurpose IC and, optionally, a single IC audio stage.

By Bruce O. Williams, WA6IVC
Assistant Technical Editor, QST

It's been a long time since I tried to build the "minimum" receiver. I've gone the full gamut: from crystal sets, through conventional superhets and ultimately to direct-conversion receivers. I have not been satisfied with the performance of any of them.

Recently, I was going through my junk box—keeping most of the good stuff and throwing away too little of the other—when I came across a box of old crystals. In trying to determine their pedigree, I remembered that several years earlier, during the CB-to-10-meter craze, Bruce Muscolino, W6TOY, and I had modified a couple of 23-channel CB transceivers to operate on 10 meters. Of course, we didn't use the recognized band plan. As a result, we had two nice, but useless, black boxes that were ultimately disposed of at the local flea market.

At the completion of that project, my junk box gained several crystals in the 10.595- to 10.635-MHz range. After playing around with the numbers for a while, I realized that if I used the 10.595-MHz crystal with a 455-kHz IF, I could detect a 10.140-MHz signal (bingo—right in the 30-meter band!). If I could "rubber" the crystal enough, I'd have a VXO receiver—maybe even a transceiver. I spent the next few weeks looking at many ways to implement this concept and thereby provide a use for the hundreds of other 10-MHz crystals that must be in junk boxes all over the world.

Component-Selection Considerations

A literature search of recent designs in RF ICs led me to two possible choices for a super-simple-superhet receiver base. The Motorola MC3357 and MC3359 ICs are designed to function as low-power, narrow-band FM IF strips. A block diagram of the MC3359 is shown in Fig 1. The schematic diagram for this chip is shown in Fig 2. The device includes a 10-MHz crystal oscillator stage, a doubly balanced mixer, a six-stage 455-kHz limiting IF amplifier, a quadrature detector and audio amplifier stage, an op amp that can be used either as an active band-pass filter or an additional audio stage and a broadcast detector section that is used in the FM configuration to derive squelch/muting. The MC3357 is almost identical to the '3359, except that the IF has only five stages and the quadrature detector is a little harder to "get into." Either device, however, holds promise for a "one-chip" receiver—the ultimate in simplicity.

Fig 3 shows a block diagram of a simple, but adequate superheterodyne receiver for amateur use. It uses a VFO, a mixer, an IF, a detector with a BFO and an audio stage. These elements are almost all represented by sections in the '3357 or '3359 devices. The only thing missing is the BFO to feed the product detector and, possibly, an audio amplifier capable of driving a speaker.

I tried repeatedly to make the "broadcast detector" oscillate to provide a BFO, but succeeded only in destroying the chip. Don't bother to duplicate this effort—although these chips are not expensive, the idea seems futile. Finally, I realized that an

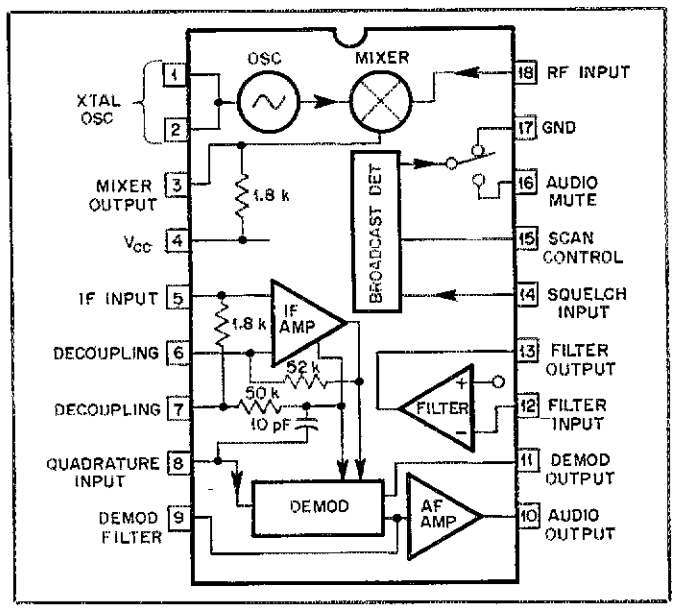


Fig 1—Block diagram of the Motorola MC3359 low-power narrow-band FM IF IC.

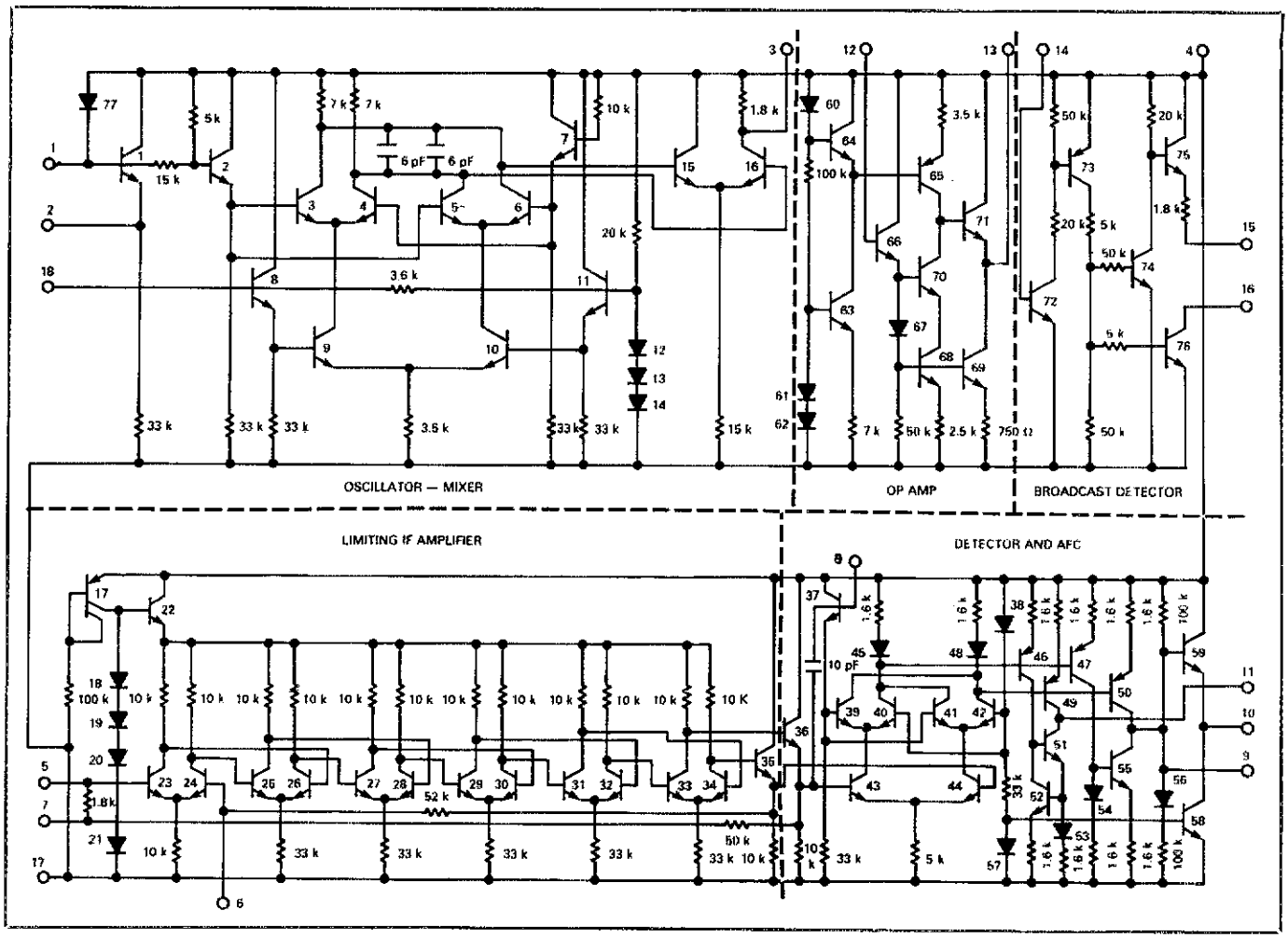


Fig 2—Schematic diagram of the MC3359 IC. (Courtesy of Motorola Linear Integrated Circuits Book.)

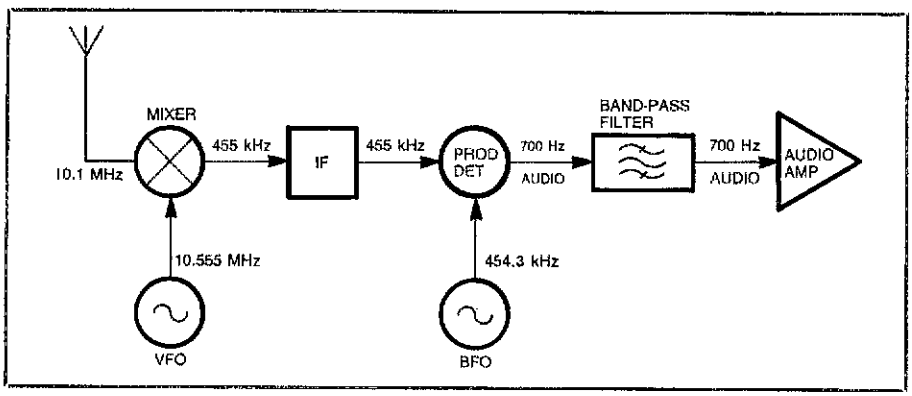


Fig 3—Block diagram of a simple amateur receiver.

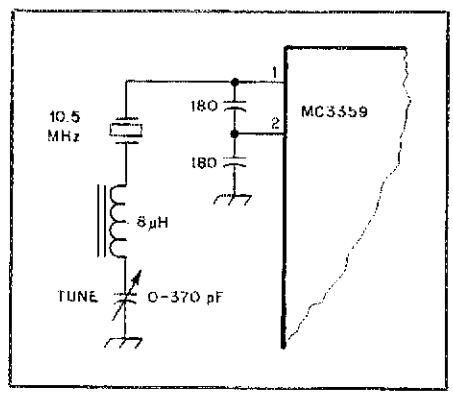


Fig 4—VXO schematic diagram.

additional transistor stage would be required for the BFO. However, if you persist and find something in the chip that will oscillate at about 455 kHz, let me know.

Accordingly, my design is based on using the MC3359 chip for VFO, mixer, IF, detector, audio amplifier and filter. In developing the design, I tried three different types of BFOs: a crystal, a ceramic piezoelectric resonator and a low-cost LC oscillator using a 455-kHz IF transformer. The BFO design ended up using an FET oscillator, with a 455-kHz IF transformer for the frequency-determining element. But more about the BFO later.

Circuit Description

I originally tried the VXO approach. A 10-MHz crystal can be tuned over a maximum range of about 10 kHz using a series inductor and tuning capacitor. A variable capacitance of 0-370 pF and an inductance of approximately 8 μH (43 turns no. 26 enam wire on a T50-6 toroid) provide this tuning range. If you decide to go this route, remember that you can only *lower* the frequency, not raise it. Also, realize that component size determines how small your package can be. If you attempt to get too much of a tuning range, the oscillator will take off on its own and become a very unstable VFO. Fig 4 shows the connections for the VXO approach. While the VXO design works, I felt it worthwhile to try to make the '3359 crystal oscillator think it was a VFO and be able to cover the entire

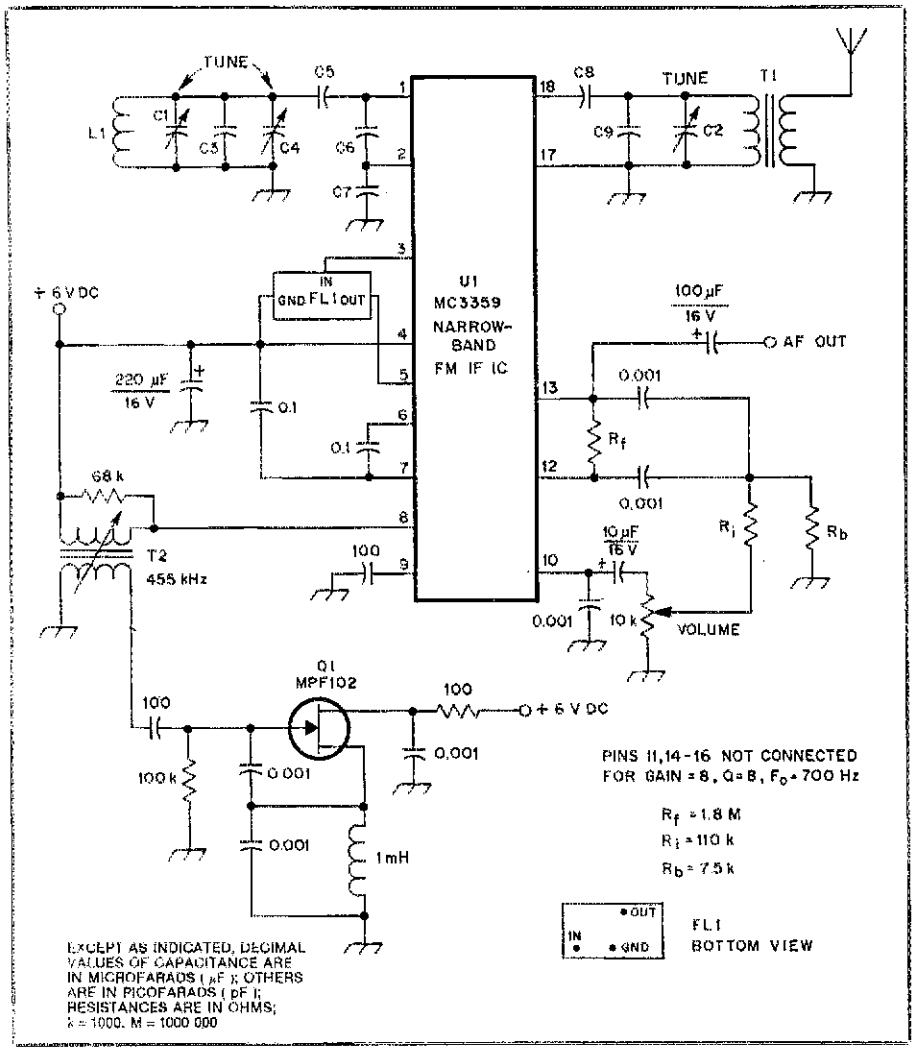


Fig 5—Schematic diagram of the SIMPLEceiver.
C1,C2—3-10 pF variable.
C3-C9—See Table 1.
FL1—Murata CFU455I or CFU455H 455-kHz ceramic filter, with an RF ground at +6V dc.
L1—See Table 1.
Q1—MPF102 N-channel JFET.
T1—See Table 1.
T2—455-kHz miniature IF transformer (black or yellow core).
U1—Motorola MC3359 or ECG860 low-power narrow-band FM IF IC.

Table 1
Circuit Elements for Both 30 and 40 Meters

30 Meters

C1, C2	C3	C4	C5	C6	C7	C8	C9	L1	T1
3-10	100	0-5	120	180	180	15	100	13t no. 26 enam on T25-6 toroid	*Pri*—16t no. 26 enam on T50-6 toroid. *Sec*—4t no. 26 enam on primary

40 Meters

C1, C2	C3	C4	C5	C6	C7	C8	C9	L1	T1
5-60	180	0-100	120	390	390	25	180	16 t no. 26 enam on T37-6	*Pri*—36t no. 26 enam on T50-6. *Sec*—4t no. 26 enam over primary

Note: All capacitor values are in picofarads.

30-meter band.

A major problem encountered when working with an IC like the '3359 for a purpose for which it was not intended, is "getting into it." This is an 18-pin DIP device and, while its construction is fine for its designed purpose, for this project more access points to the internal circuitry would have been advantageous. We are limited to just two access points in the front end (oscillator-mixer), a single mixer output, a single input and no output point in the IF and very limited access to the detector. With a little conniving, however, it is possible to make the various elements do just about what we want them to.

See Fig 5. Pins 1 and 2 are the base and emitter of a bipolar-transistor crystal oscillator that is connected to the doubly balanced mixer. There is a 33-kilohm resistor in the emitter, but by using a Colpitts configuration, the transistor functions as an LC oscillator. It seems to be a little sensitive to the amount of inductance in the tank circuit, however, and I found that with less inductance than shown, it will not always oscillate. With this much inductance, or more, it is possible to cover the 40-meter band and perhaps even 80-meters. I do not think there are any frequency-sensitive elements in the chip, and I have one version working on 40 meters. Table 1 shows the circuit elements for both 30 and 40 meters.

The RF input signal is applied through a single-tuned circuit to the other side of the doubly balanced mixer (pin 18). The 455-kHz output of the mixer, at pin 3, is routed through a 455-kHz ceramic filter to the six-stage IF at pin 5. The −6-dB bandwidth of the filter shown is 2 kHz. Although a broader unit works well, by limiting the bandwidth of the signal, the noise is also limited. This filter is fine for CW reception, but if you wish to copy SSB signals, a 3-kHz filter (the CFU455H) is better. The 455-kHz signal from the IF is routed internally to the quadrature detector. Note that the configuration of this detector is similar to that of a doubly balanced detector or mixer. If sufficient BFO energy is introduced to the quadrature detector (through pin 8 and the 10-pF capacitor), it thinks it is a product detector! To develop this energy, the Colpitts BFO uses a standard 455-kHz AM IF transformer (yellow or black core) for the frequency determining element, and the transformer secondary drives the detector through pin 8. This scheme works well when the transformer is tuned for best oscillator stability. The BFO frequency can be moved quite a bit by tuning the transformer. By careful tuning, the output frequency of the BFO can be located close to one edge of the IF passband to give almost single-signal reception. That is, it is possible to position the BFO signal so that the beat signal on one side of the passband is attenuated.

BFO Alternatives

Three types of BFOs were tried in the project. I first used a junk-box piezoelectric resonator in a modified Pierce configuration, and the oscillator performed as well as most crystals. The resonator was purchased at Radio Shack (two for 99 cents), but is no longer a stocked item. I tried using a crystal and also had very good results. Unfortunately, if you do not already have a 455-kHz crystal, you will invest more in the crystal than in the rest of

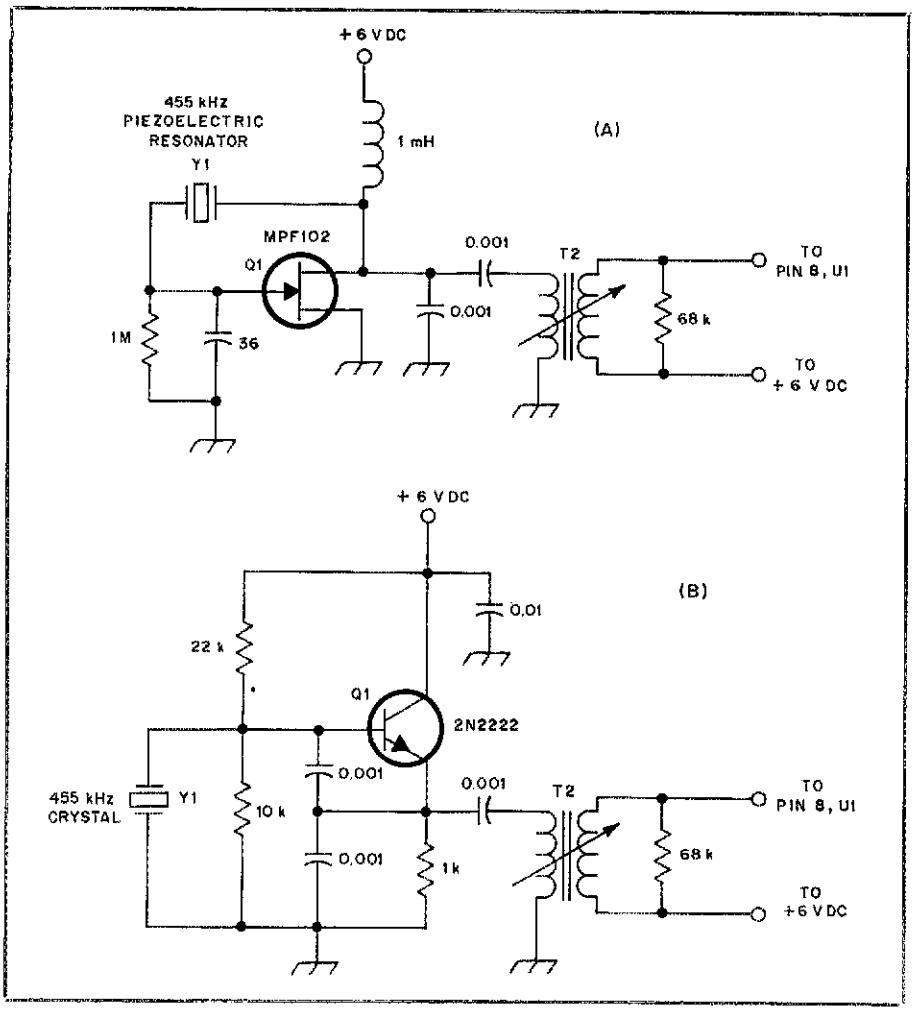


Fig 6—Two alternative BFO configurations. At A, a 455-kHz piezoelectric resonator is used as the frequency-determining element. At B, a 2N2222A bipolar transistor is used as a crystal oscillator.

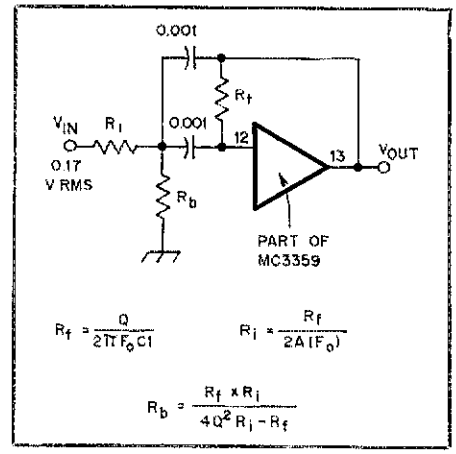


Fig 7—Schematic diagram of the op amp as a bandpass filter.

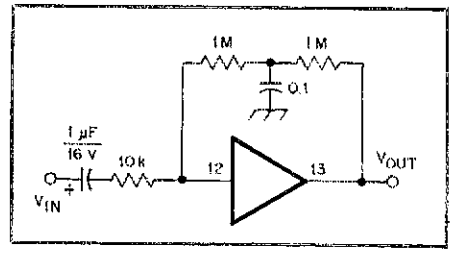


Fig 8—Schematic diagram of the op amp as an audio amplifier.

the radio. I went back to the resonator approach and uncovered a usable and available type.[1] Variations in the circuit components may be necessary to get any one resonator to oscillate. The final design shows an LC oscillator, but you can use any frequency-determining element you might have handy (Fig 6). Several versions of the receiver using the LC approach worked well. The 455-kHz IF transformer must be used in any event, so that considering the additional cost of the resonator or crystal, the LC design is attractive. With the relatively narrow bandwidth of the IF filter, the BFO should oscillate at about 454.3 kHz to detect the signal.

Audio Requirements

There is enough audio at pin 10 to drive a pair of sensitive headphones without any additional amplification. To get the maximum use out of the '3359 chip, however, I use the op amp portion as an audio-bandpass filter with some gain (Fig 7) and there is sufficient audio to drive a small speaker at a low level. The equations I use to determine the resistive elements of the filter are from the Motorola data sheet, and are shown below.

$$R_f = \frac{Q}{2\pi f_o C1} \qquad \text{(Eq 1)}$$

$$R_i = \frac{R_f}{2A\,(f_o)} \qquad \text{(Eq 2)}$$

$$R_b = \frac{R_i R_f}{4Q^2 R_i - R_f} \qquad \text{(Eq 3)}$$

where

f_o = center frequency
$A(f_o)$ gain at center frequency
Q, f_o, the value of C1 and
$A(f_o)$ are selected

You can select your own filter

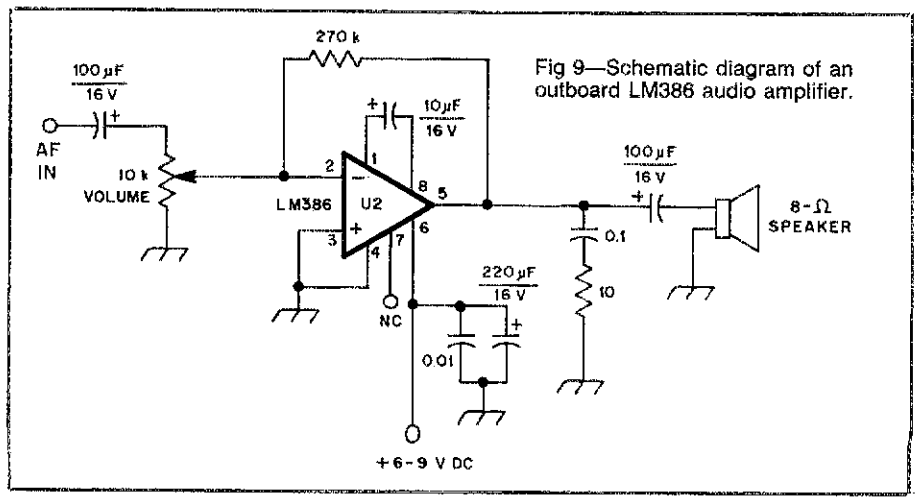


Fig 9—Schematic diagram of an outboard LM386 audio amplifier.

[1]Notes appear on page 39.

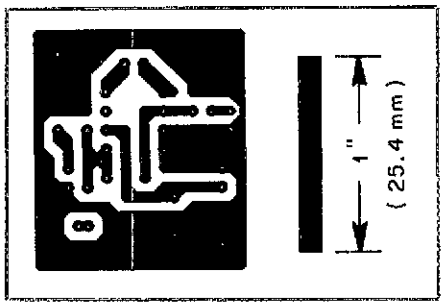


Fig 10—Circuit board etching pattern for the LM386 audio amplifier. The pattern is shown full size from the foil side of the board. Black areas represent unetched copper foil.

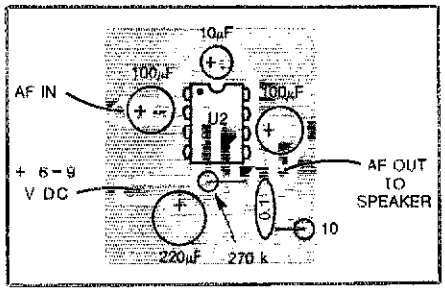


Fig 11—Parts-placement diagram for the LM386 audio amplifier.

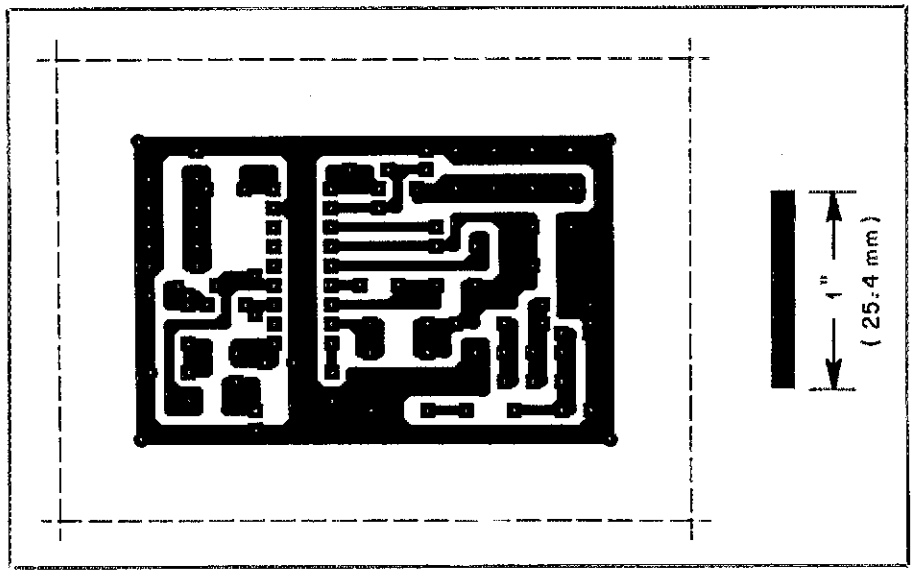


Fig 12—Full-size SIMPLEceiver PC-board template, shown from the foil side of the board. Black areas represent unetched copper foil.

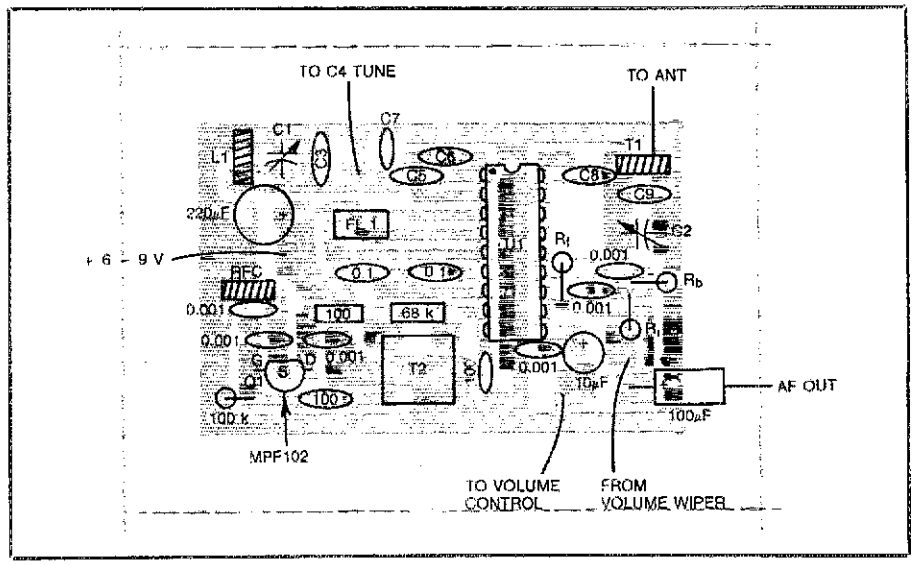


Fig 13—Parts-placement diagram for the SIMPLEceiver.

characteristics using these equations. I was not satisfied with the performance of the op amp as a filter, but it does help. I used a gain of 8 and a Q of 8 at 700 Hz. Experiment with the resistance values until you are satisfied with the result. If you use an outboard filter, the op amp can provide additional audio gain into the filter (see Fig 8). I found that an outboard LM386 AF amplifier, as shown in Fig 9, works well. An etching pattern for this amplifier is shown in Fig 10. Fig 11 is the parts-placement diagram.

Construction

I built the breadboard model using a type of PC board that I discovered in England. Trade-named Veroboard, it is PC-board material with etched copper strips on one side. The strips are tinned and predrilled in a 0.10-inch pattern so that DIPs, as well as discrete components, may be stuffed and soldered into the board. When you wish to discontinue the circuit on a given strip, it can be cut with a hobby knife or a special spot-face cutter. This breadboarding method is much faster and neater than any other method I have ever used and is not expensive. It is ideal for one-of-a-kind projects and experimentation.[4]

A PC-board template for the SIMPLEceiver is shown in Fig 12. Fig 13 shows the parts-placement diagram.[3] The dimensions allow mounting the entire receiver in a small case. Local oscillator tuning can be accomplished either with a voltage-variable capacitor or by means of a small variable tuning capacitor in series with a small fixed capacitor. The actual tuning capacitor range is small; a change of approximately 0-5 pF permits coverage of the entire 30-meter band. Using a 100-pF tuning capacitor on the 40-meter band allows coverage of approximately 7.0-7.4 MHz.

Whether you use the PC board or the stripboard approach, it is important to attack construction in the proper sequence. Start with the BFO. Once you have it working to your satisfaction, build the local oscillator. When you think the oscillator is working in the general frequency range you want, continue with the balance of the circuitry: the IF filter, the decoupling capacitors, the input RF circuit and the start of the audio section. Do not build the audio filter/amplifier until you are sure that you are developing an AF signal at pin 10. A pair of sensitive headphones is sufficient to determine if the oscillators and IF strip are operational. Use a frequency counter or general-coverage receiver to rough tune your oscillators prior to actual alignment. You will need a stable signal source for alignment. A simple crystal oscillator operating within the band of your choice will provide enough signal for alignment. *The ARRL Handbook* contains circuits for several crystal oscillators that work well. Align the receiver with an old Novice crystal, if you have nothing better. The only adjustments needed are the local oscillator, the BFO and tuning of the input tank circuit.

Performance

The prototype units were constructed on stripboard and showed surprisingly good

performance. In the ARRL Lab, we measured a minimum discernible signal (MDS or noise floor) of approximately −122 dBm, equivalent to a sensitivity of about 0.18 μV. It was very sensitive. The dynamic range measured approximately 60 dB, and the third-order input intercept was about −66.5 dBm. Three variations of the design showed similar performance. Although this does not approach the performance of most modern receivers, it is as good as most of the older tube-type receivers and is very respectable for a small, fun-type receiver. It allows good reception of CW signals on the 30- and 40-meter band with a modest antenna. Adding some attenuation in the input effectively increases the dynamic range and improves the third-order input intercept. Here, again, *The ARRL Handbook* has several designs that will be effective.

The size of the unit makes it perfect for portable work or traveling. With a maximum current drain of about 11 mA, the battery should last a long time. I found that the entire receiver can get noisy when using a 9-V battery, but that it really loves 4.5 to 6 V. If you use a 9-V battery, a dropping resistor of about 820 ohms should provide about 4.5 V to the receiver. A pack of three or four AA dry cells is about right, otherwise.

Conclusion

Using available parts from a reasonably stocked junk box, total cost of this receiver should be relatively low. The choice of cabinet, type of tuning capacitor and method of controlling BFO frequency will have a big effect on the cost, however. Don't be afraid to experiment with my design—there are probably an infinite number of ways to improve it.

After spending several weeks working on this "simplest" receiver, I received a data sheet from an English manufacturer that describes a complete AM receiver in a three-pin TO-92 case and another configuration offering the complete receiver with an audio stage in an 8-pin DIP. Ahhh . . . progress!

Notes

[1]Several companies make these resonators. I obtained some from Murata-Erie, part no. CFB455E. They work well in the circuit shown in Fig 6A.

[2]A product similar to Veroboard, and called "printed stripboard," is marketed by Dick Smith Electronics, Inc. See address below.

[3]A complete kit of all parts (No. K6355) including fiberglass printed-circuit board, case and vernier dial is available for $29.95 plus $3 shipping from Dick Smith Electronics, Inc, PO Box 8021, Redwood City, CA 94063, 800-332-5373 (orders). In California call 415-368-1066 (orders) or 415-368-8844 (inquiries). California residents must add 6.5% sales tax. Orders outside the US must include US funds and add 20% of merchandise total for shipping.

Small Value Capacitors

(continued from page 33)

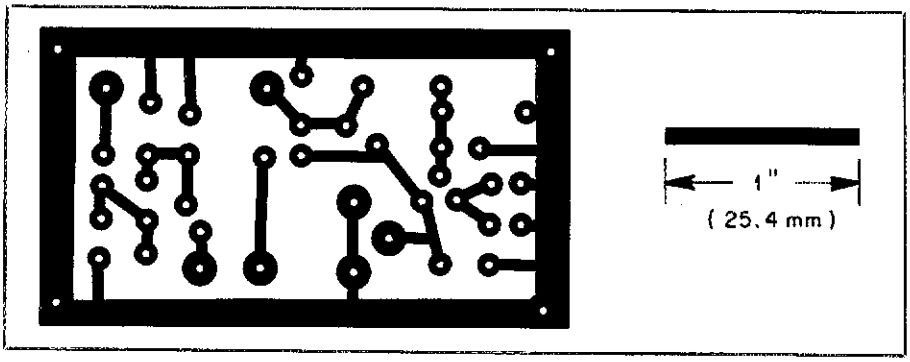


Fig. 7—Circuit-board etching pattern for the capacitance meter. The pattern is shown full size from the foil side of the board. Black areas represent unetched copper foil.

when I need precise values for critical circuits such as bandpass filters. However, for routine work I favor the homemade unit, since I am inherently "hung up" on analog readouts for any device I use—including a wrist watch! No doubt it is a purely psychological malady, but I like to see what's above and below the reading I am observing, even though there is nothing there!

If you have no means for making capacitance measurements, I am sure that this month's project will become a useful addition to your workshop.

I wish to commend the august gentlemen from the UK, GM3DXJ and G3GRF, for their work in developing the circuits that inspired this article.

Strays

I would like to get in touch with . . .

☐ anyone interested in participating in a propagation study during auroral openings by monitoring the 10-m beacon on 28.253 MHz. John Mahagan, WB4JHS, 3001-C Pisgah Pl, Greensboro, NC 27408.

☐ anyone with a schematic/manual for a Subraco MT-15X transmitter. Sidney Rubin, KA2NUS, 245 W 74th St, New York, NY 10023.

☐ anyone with a schematic for a KRK 102-B, strips and timers for a Zenith 504, and a supply of RCA Nuvistor tuners and their call strips. Gene Mich, 612½ N Adams, Fredericksburg, TX 75624.

☐ anyone with a manual/schematic for a Waterman Pocketscope, Model S14B. Rudolph Guttentag, KA2YWA, 29-10 137th St, No. 4B, Flushing, NY 11354.

☐ anyone with schematics/manuals for a Sylvania 3-inch oscilloscope, Model 108, and a DeVry 5-inch oscilloscope, Model 34. Ed Roller, WA2VPW, 40 Highland Ave, Gillette, NJ 07933.

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- "Community Access Systems," by James Eagleson, WB6JNN
- "The Xerox 820-I Compendium, Part 3," by AMRAD
- "A High-Resolution Potentiometer," by Albert Weller, WD8KBW

Other features include: the monolithic microwave integrated circuit, information about trademarks and new product announcements.

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL members is $6 for 12 issues; for nonmembers, $12. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

An Automatic Rotator Controller

As promised, here's the first project that uses the ARRL Microcontroller board. This addition allows you to control two rotators simultaneously!

By Jon Bloom, KE3Z
ARRL Laboratory Supervisor

The modern ham shack is becoming a hands-off environment. The era of the synthesized, computer-controlled radio, the automatic antenna matching network and the CW keyboard are making our operating hours easier and more pleasant. One of the few remaining hold-outs among the manual operations of bygone days is the antenna rotator. Although automatic rotator-control systems do exist, most of us are still using the two-finger technique: Hold the brake and direction switch down on the control box until the antenna is pointing in the right direction, then release the direction switch, then the brake. Not a particularly difficult job, but an annoying one when you would rather be tweaking the receiver controls to get that weak one centered just so in the passband. It's even more annoying when you are trying to track that low-orbiting satellite in both azimuth and elevation, meanwhile tuning the rig to correct for Doppler shift! Enter: the Automatic Rotator Controller.

The system described here is a two-channel, fully automatic controller. By two-channel, I mean that it will control two separate rotators. The rotators are wholly independent of one another, although they may be physically attached, as in a satellite azimuth/elevation system. The rotators themselves will typically be commercially acquired. This design assumes that the rotators have 28-V ac motors and include a linear feedback potentiometer. This is typical of most of the rotators used in amateur antenna systems. Commands are given to the controller to position the antennas from either a front-panel keypad or from a serial RS-232-C device such as a personal computer.

An Intelligent Machine

A machine such as this has to be intelligent; it must be capable of making decisions. In this case, the decisions are relatively simple: Where is the rotator pointing? Where should it be pointing? How should it be moved, if at all? The need to control the rotator's braking system also necessitates decision making: Is the rotator moving? Is the rotator stopped? (The term "brake" is actually something of a misnomer when applied to these rotators. The mechanism might better be called a "hold" or "latch." In fact, using the brake to stop the rotator motion is a good way to damage the rotator or antenna.) Although a controller that makes such decisions could be implemented using many different schemes, the use of a microcomputer is by far the easiest. In this case, I have used the ARRL microcontroller board as a building block.[1]

Fig 1 is a block diagram of the automatic rotator controller. The rotator interface board is connected to the expansion bus of the microcontroller and to the rotators. The rotators are controlled through a number of solid-state relays (SSR) that switch the 28 V ac to the motors and brakes. The state (on or off) of each SSR is determined by the state of a bit of the control register, which is set whenever the microcontroller board writes to the control register as directed by the software. Rotator position is detected by examining the voltage developed across the position-sense potentiometer within the controller. The value of this voltage is determined by comparing it to the voltage from a digital-to-analog (D/A) converter that is set by the software. By varying the D/A output voltage under software control, an analog-to-digital (A/D) conversion is performed and the software can "see" where the rotator is pointing.

The display/entry board in Fig 1 is optional. If you want to be able to enter the desired position without using a serial device, you will need the keypad. In any case, the display is useful regardless of the control system used. The display consists of two three-digit LED read-outs that show the rotator position in degrees.

The serial port is also optional. If you plan to use a personal computer to send positioning commands to the rotator, you will need the serial port. Otherwise, you can simply omit it.

Rotator Interface Board

Fig 2 is the schematic of the rotator interface board. P1 connects to the expansion bus of the microcontroller board and is the path by which the software communicates with the interface. U1 decodes the microprocessor control signals. When the microcontroller is addressing the rotator interface, the XPORT signal will be asserted (low). This signal allows U1 to enable the D/A converter, U3; enable the status register, U2; or strobe the control register, U12. Which of these actions occurs is based on the state of the A1 and A2 address lines and the RD and WR signals from the microcontroller. When the control register is strobed, the six least-significant bits of the data bus are latched into U12. The states of these bits appear at the outputs of the open-collector inverters of U15. For example, a high (1) on data line D0 will appear as a low (0) at the output of U15C. This low will allow current to flow through the LED inside U8, an optoisolator. The light-activated SCR in U8 will turn on, allowing current to flow through the diode bridge at U18 and the gate of Q3. Thus 28 V ac will be applied to the brake of rotator 2. A high at the output of U15C will keep the LED in U8 off and none of these currents will flow. The other control-register bits control the application of 28 V to the other rotator connections in a like manner.

U13 and its associated resistors, R29 and R30, form a constant-current generator. This current is applied through the position-sense potentiometer in the rotator, from the wiper to one end of the potentiometer. This causes a voltage to develop at the POS2 terminal that is proportional to the resistance. Since the resistance is proportional to the rotator position, the voltage can be converted to the position easily by the software. To read the voltage, the software will set the D/A converter, U3, to produce an output voltage that is compared to the POS2 voltage by U4B. The output of U4B will be high if the D/A converter voltage is greater than the POS2 voltage. By setting different D/A output voltages, the POS2 voltage can be measured very accurately. The D/A converter is a 10-bit device. That means it can produce 1024 discrete output voltages. The minimum output voltage is

[1] J. Bloom, "The ARRL Microcontroller Board," *QST*, Jul 1986, pp 14-19.

0, with the maximum being set by the 1.25 volts developed across U5, a reference diode. U4C amplifies the D/A output so that the voltage will have a range of 0 to 8 volts.

Some rotators have limit switches that remove the operating voltage from the motor windings when the end of travel has been reached. For such rotators, the opening of these switches is detected by monitoring the voltage at each end of the starting capacitor, C7 or C9. This voltage is rectified and filtered to produce a dc voltage, LIM1 or LIM2. These signals are then sent to the microcontroller as part of the status register. For rotators that do not have this arrangement, the W1 and W2, or W3 and W4 jumpers should be installed to keep these status signals in order.

Display/Entry Board

The schematic of the display/entry board is shown in Fig 3. This board connects to the microcontroller's parallel interface. The keypad is a matrix of switches; when a key is pressed, two of the signal lines are connected together. The software sets the bits of the PIO on lines PA4 through PA7 and reads the lines on PBØ through PB4. When a key is pressed, the signal on one of the PA lines will appear on one of the PB lines. The software can then determine which key is pressed.

The display is multiplexed. The software first places the four bits of data representing the digit to be displayed by U9 on the PAØ through PA3. This data is converted to the seven-segment-display signals by U1 and applied to all of the LED displays. The software selects U9 as the active display by asserting PB7 low, which clears the decade counter, U2. The counter's outputs are applied to U3, which brings the Y0 output of U3 and the output of U10A low, applying +12 V to the anode of U9 through Q7. After approximately 1.5 milliseconds, the PAØ through PA3 data is changed to the data for U8 to display and PB5 is asserted. This causes the counter to increment, and the Y1 output of U3 to go low, selecting U8. This action is repeated for all of the digits.

Some of the capabilities of the controller are optional. For example, if you have no plans to use the serial port, simply remove the WD8250 (U5) from its socket on the microcontroller board. The software will detect the absence of this device and will not attempt to do serial I/O. Similarly, the display/entry board can be eliminated if you want to use *only* the serial port. For this option, remove the Z80® PIO (U6) from its socket. Finally, you can use the controller as a single-channel (one-rotator device) by just eliminating the components on the rotator interface board between U15 and the rotator connections of the unused channel. In this case, the software won't know that the rotator isn't there, but if you never issue any commands for the unused rotator, it won't matter. If you choose to eliminate a rotator, eliminate the channel 2 rotator because the controller defaults to rotator 1 as the active one on power up.

Connecting the Rotator

Fig 4 shows a typical connection to two rotators. Either channel may be used for either rotator, although typically an elevation rotator will be on channel 2. If you plan to connect the controller to a different rotator from the ones shown, plan carefully. Make *sure* the motor or brake outputs from the controller are not connected across the position-sense potentiometer, as this could easily burn out the potentiometer.

The motor-start capacitors, C7 and C9 of Fig 2, must be connected to the rotators. In the Hy-Gain rotators, this capacitor is connected to two unique terminals of the rotator. In many rotators, the capacitor is simply connected between the CW and CCW motor windings.

The values of R29, R30, R33 and R34 were selected based on a 500-ohm position-sense potentiometer. If you are using a rotator with a different value potentiometer, select resistors that will allow you to adjust the sum of R29 and R30 or R33 and R34 to $0.15R_{PS}$, where R_{PS} is the value of the position-sense potentiometer.

Although 28 V is the design voltage, the components specified can be used at other voltages. Note that one side of the rotator supply voltage is connected to system ground at COM1 and COM2, so for safety, an isolation transformer *must* be used if line voltage is applied to the rotator circuit. The circuit shown will not drive dc motors directly. If you must operate dc motors, relays can be used at the outputs of the Rotator Interface board to switch the dc.

The weak point of many rotators is the position-sense potentiometer. This

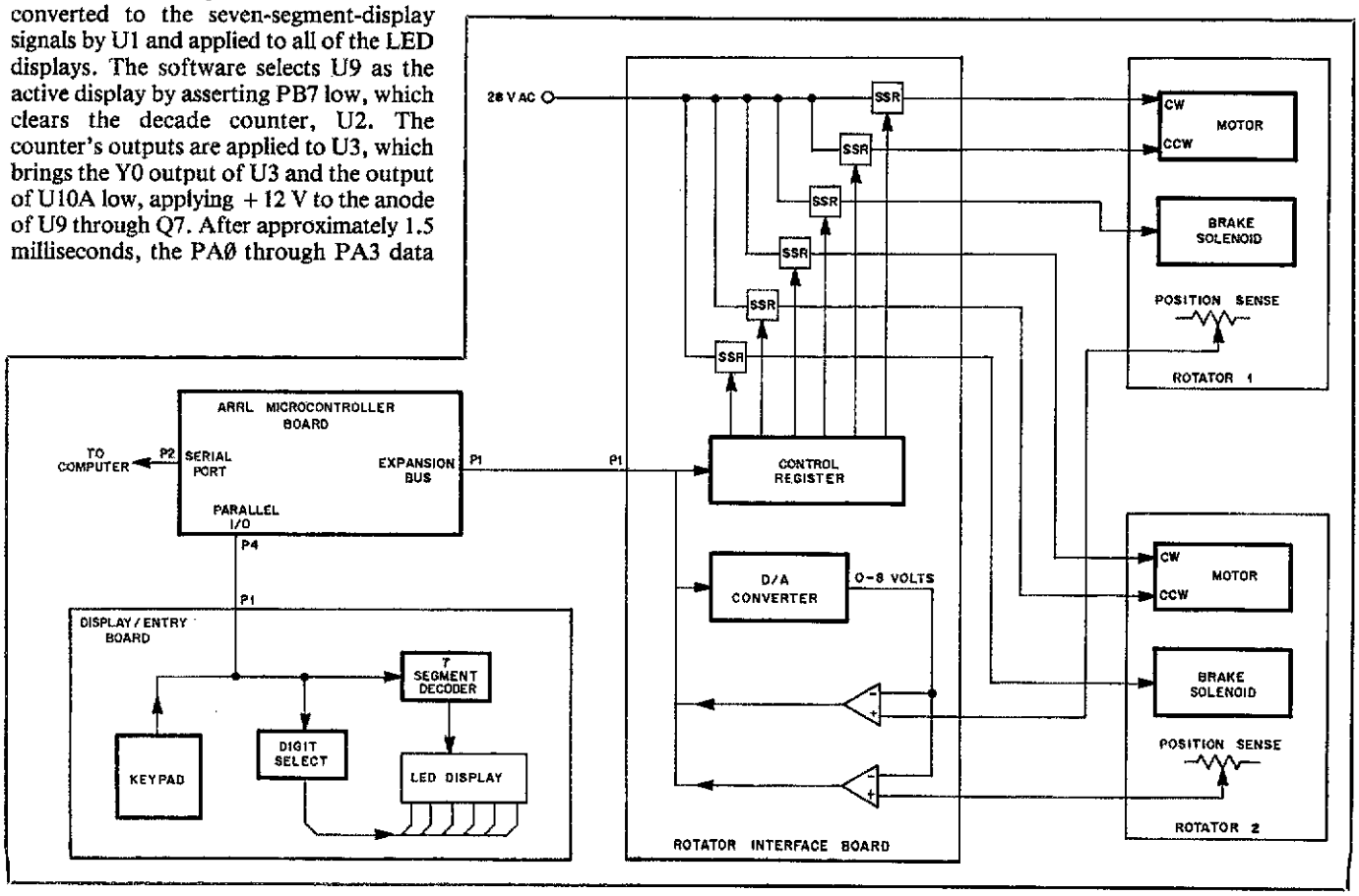


Fig 1—Block diagram of the Automatic Rotator Controller.

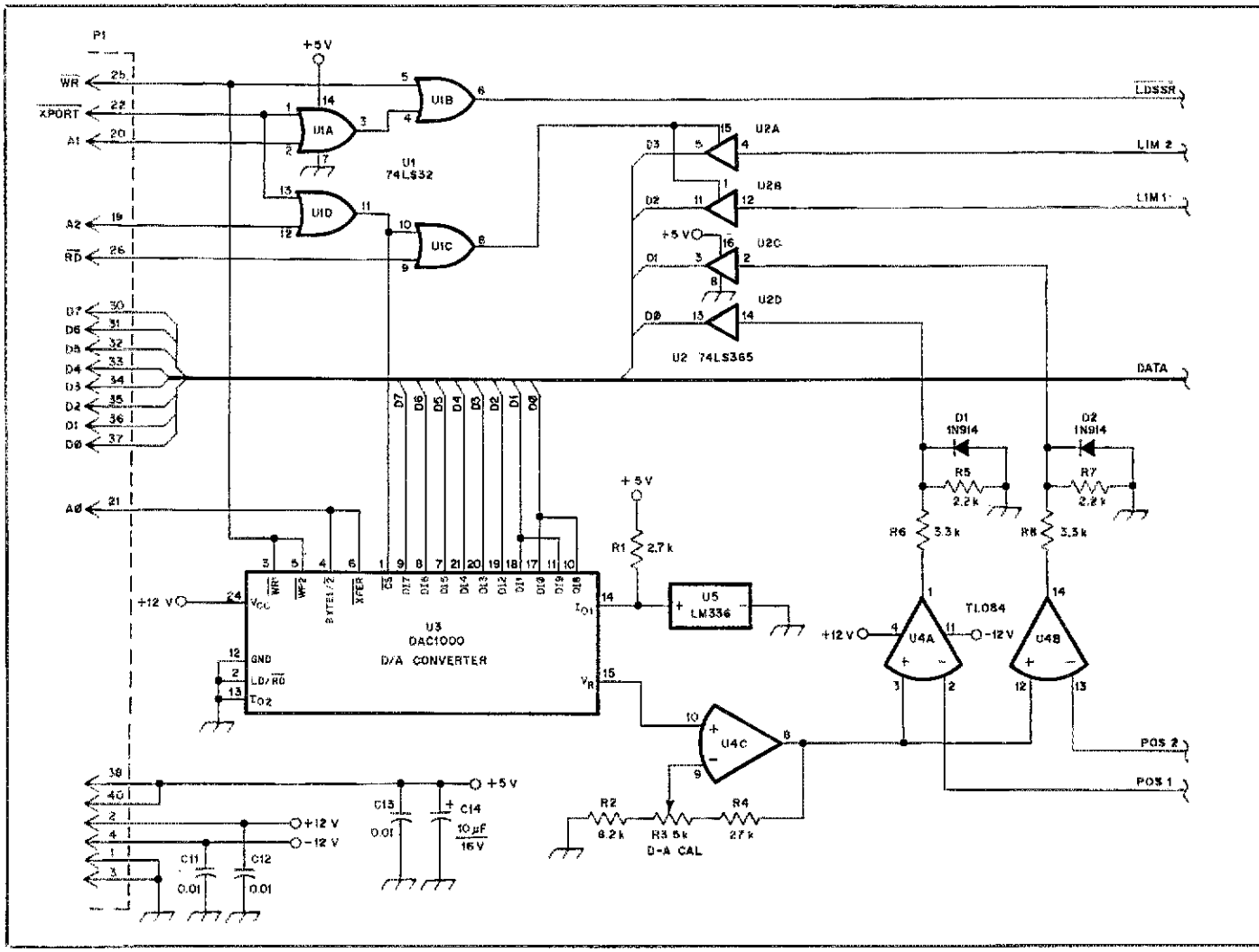


Fig 2—Schematic diagram of the rotator interface board.

P1—40-pin, dual-row male jumper header (0.1- X 0.1-inch centers).
Q1-Q6, incl—SC141B 200-V, 6-A triac.
U1—74LS32 quad NAND gate.
U2—74LS365.
U3—DAC1000 10-bit D/A converter.
U4—TL084 quad op amp.
U5—LM336 voltage reference.
U6-U11, incl—4N39 SCR optoisolator.
U12—74LS174 hex D flip-flop.
U13, U14—LM317L adjustable, positive-voltage regulator.
U15—7406 hex open-collector inverter.
U16-U21, incl—200-PIV, 1-A diode bridge.

potentiometer was designed to operate with a meter on a control box; the reliability and accuracy of these potentiometers are not all one might desire. A useful modification would be to replace the existing position-sense mechanism with one that uses a sealed, multiturn potentiometer.

The Software

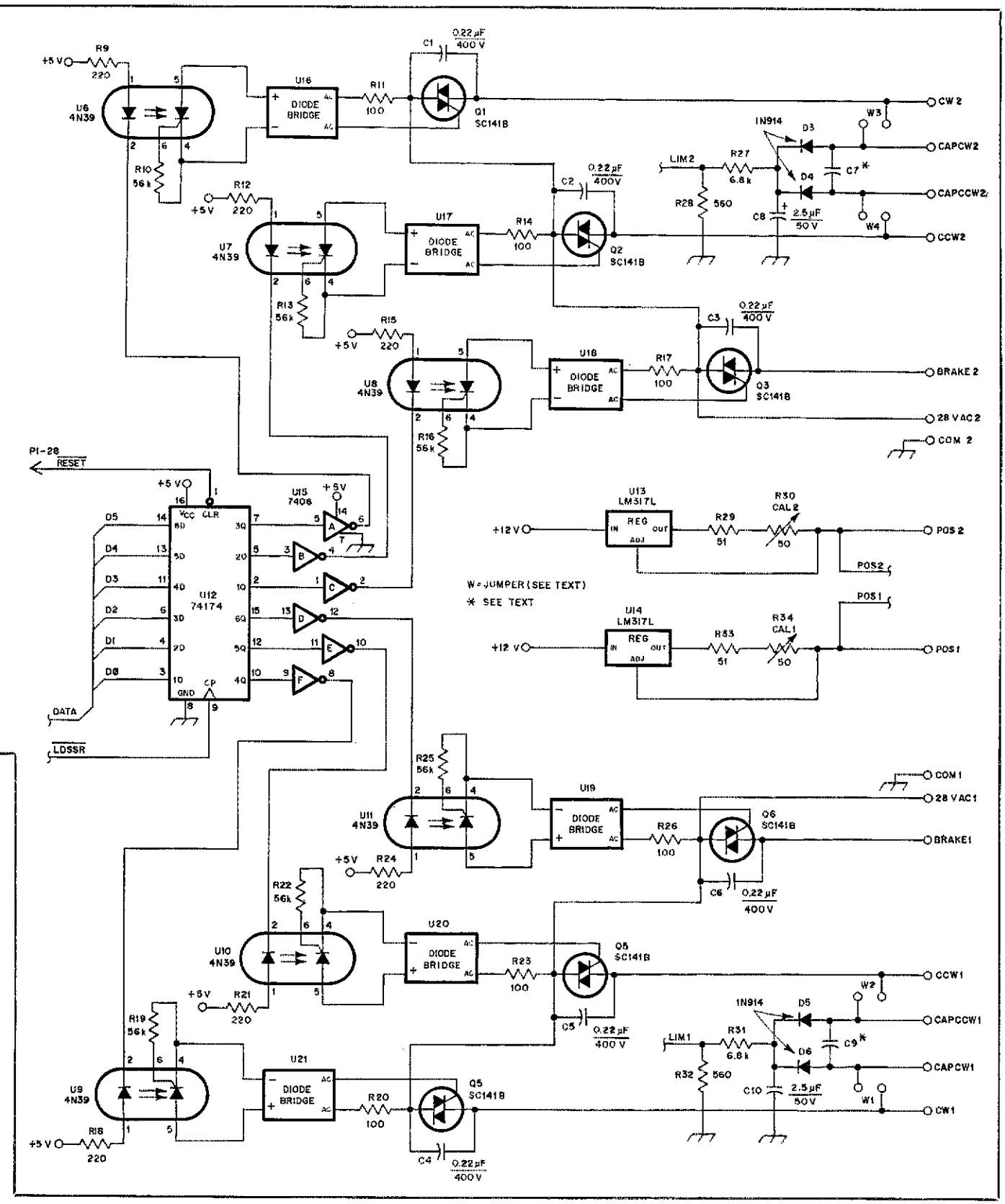
From the preceding discussion, you can see that the software for the automatic antenna controller is very busy! We won't go into the details of how the software works, but we will discuss it from an operator's point of view.

Before the controller can position the rotator, certain adjustments must be made to the system. The adjustments align the system for a particular rotator and antenna installation. These adjustments correct for component tolerances on the rotator interface board and in the rotator. Some of these adjustments are performed using the controller itself as an alignment aid. In the process, you can specify the centering, or stopping, point for the rotator. This means that although the range of positions may be 0 through 360 degrees, the limit of travel of a rotator need not be at 0 or 360; it may be anywhere within the range. At the same time, rotators that have greater or less than 360-degree travel can be accommodated.

The calibration routine is entered by the software automatically the first time you turn on the controller. The software detects the initial turn on from looking at the contents of RAM. Since the RAM contents are maintained by the onboard batteries, only the initial turn on (or loss of battery power) will cause the calibration routine to occur. If calibration needs to be performed at a later time, it can be forced by holding down the SHIFT key on the keypad while the controller is turned on.

Each step of the calibration routine is signaled by a unique calibration-mode display. The initial display in calibration mode is C-0, which indicates that the first calibration step should be performed. If the display board is not present, the serial port will be used for calibration. In this case, the controller will wait until a carriage return (CR) is received via the serial port. This carriage return is used to sense the serial transmission rate. The characters C-0 are then sent out the serial port, followed by a CR.

When the C-0 is displayed, you should adjust the D-A converter gain (R3 of the rotator interface board) for a voltmeter reading of 8 volts at pin 8 of U4C. The decimal point LED of the leftmost digit of the display for rotator 1 may flicker when you do this. Once R3 is properly adjusted, press the SHIFT key to go to the next calibration step. If calibration is being performed via the serial port, send a CR in place of pressing the SHIFT key.



The display for rotator 1 should now show C-1 (or C-1 and CR will be sent out the serial port). Press and hold the H key. The rotator should turn in a clockwise direction. If it fails to turn, or turns the wrong way, check the connections between the rotator interface board and the rotator. (Of course, if the rotator is already at the clockwise limit, it won't turn at all.) Hold the H key down until the rotator reaches its clockwise limit of travel. Now adjust R34 until the decimal point LED of the left-most digit is just at the point where it changes between the on and off states. (If the serial port is in use, the character 1, followed by a CR is sent when the decimal point would turn on, and a 0 followed by a CR is sent when the decimal point would turn off.) Once this has been accomplished, press the SHIFT key to go to the next calibration step.

The display now reads C-2. Enter the three-digit rotator position (the bearing to which the antenna is pointing) and then

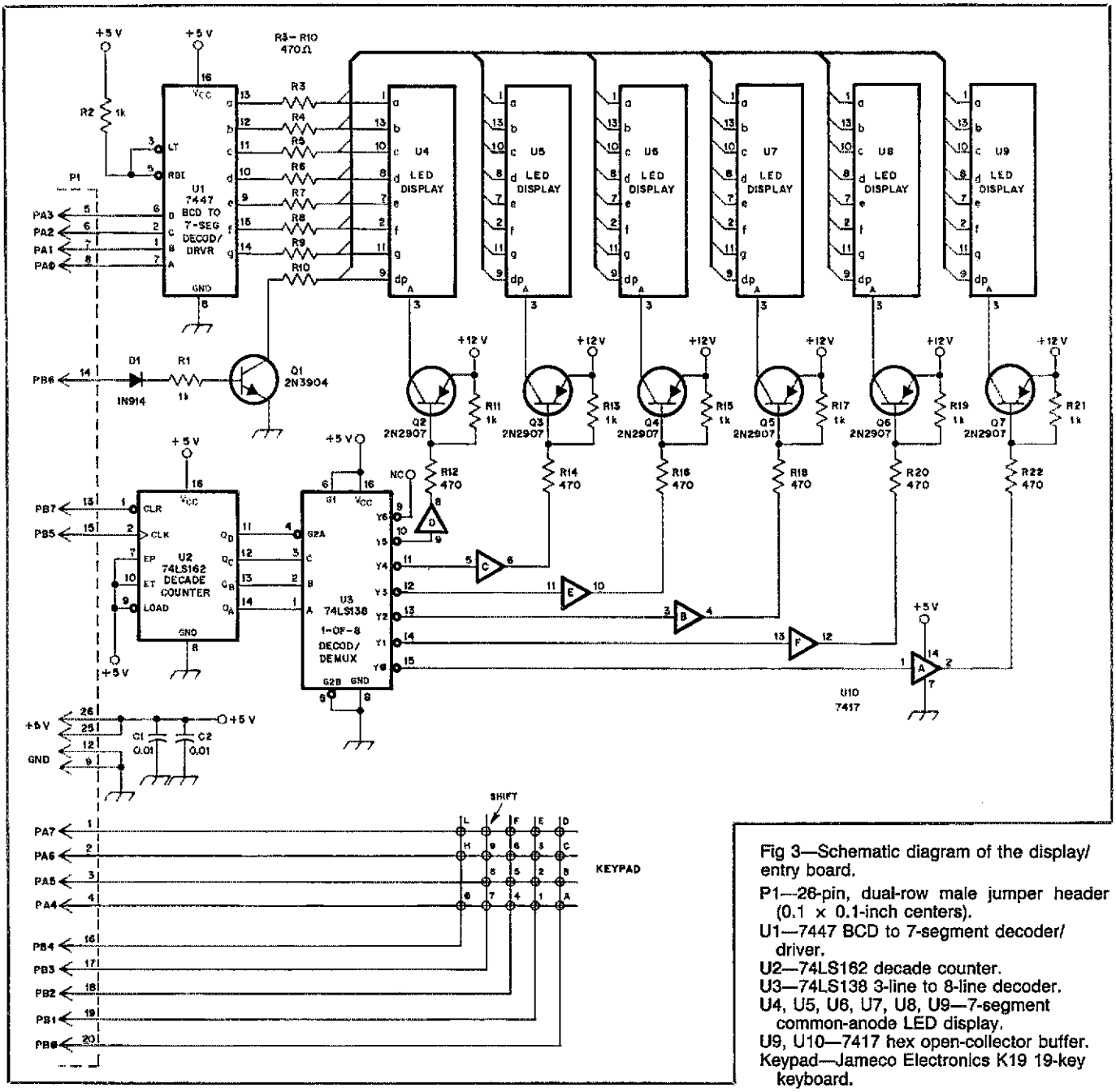


Fig 3—Schematic diagram of the display/entry board.

P1—26-pin, dual-row male jumper header (0.1 × 0.1-inch centers).
U1—7447 BCD to 7-segment decoder/driver.
U2—74LS162 decade counter.
U3—74LS138 3-line to 8-line decoder.
U4, U5, U6, U7, U8, U9—7-segment common-anode LED display.
U9, U10—7417 hex open-collector buffer.
Keypad—Jameco Electronics K19 19-key keyboard.

press the SHIFT key. If you make a mistake in the entry, you can enter the value again. If you are using the serial port, send the three digits followed by a CR.

With the display now reading C-3, use the L key to turn the rotator to its counterclockwise limit. Enter the rotator as you did for step C-2 and press SHIFT.

The display now reads C-4. Enter the three-digit error limit. This value determines what difference between the desired rotator position, and the measured rotator position will cause the controller to move the rotator. The value used depends on the particular rotator installation. Too small a value will cause the controller to search continuously back and forth across the desired position, never fully stopping, and possibly overheating the rotator. Too large a value will allow an error larger than necessary, which may not be a problem on a fairly wide-beamwidth antenna.

Rotator 1 is now completely calibrated. Steps C-5 through C-8 calibrate rotator 2 in the same manner, except that R30 is adjusted in step C-5. (Do not readjust R3.) Often, rotator 2 will be an elevation rotator. In this case, read "up direction" for "clockwise direction" and "down direction" for "counterclockwise direction." Of course, the up limit in this case will generally be around 180 degrees. Note that the rotator 1 display is still used during calibration of rotator 2.

When the display reads C-9, press the 0 key if a memory read or write is only for the currently selected controller, or the 1 key if both rotators are affected. Pressing SHIFT ends the calibration routine.

Finally, there may be times when you only need to do a partial calibration. For example, when adding a second rotator to an existing single-rotator system. To skip any step of the calibration, simply press the SHIFT key. If the SHIFT key is entered without entry of a value in steps C-2, C-3, C-4, C-6, C-7 or C-8, the existing value won't change. On initial power up, the values are set to 360, 0, 4, 360, 0 and 4, respectively, for the steps mentioned above.

Front-Panel Control

Controller operation is simple. From the

Table 1

Front-Panel Positioning Commands

P	Send the current rotator positions in the format: AAA BBB where AAA is the position of rotator 1 and BBB is the position of rotator 2.
PA XXX PB XXX	Enter the desired position for rotator 1 or 2.
Rx	Set reporting mode where x is F for full, C for change or N for none. F means that rotator position data, in the same format as returned by the P command, will be sent continuously. C means that position data will be sent whenever it changes, and N means it will not be sent automatically.

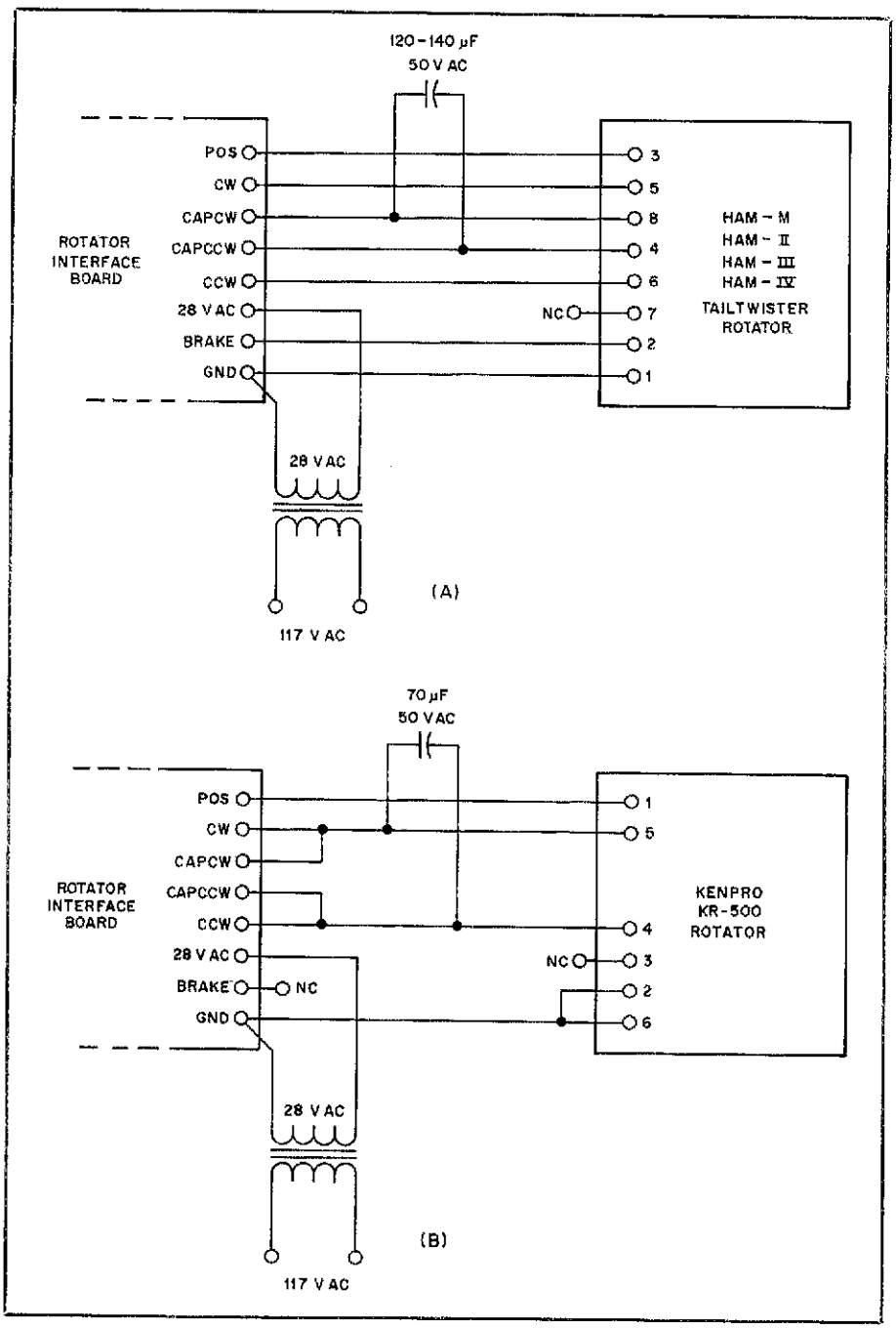


Fig 4—Typical rotator connections. At (A), the connection for the popular Hy-Gain rotators. (B) shows a rotator that has no brake or limit switches. The connections between CW and CAPCW and between CCW and CAPCCW could be made on the circuit board instead (see text).

front-panel keyboard, you can command either rotator to go to a specific position or manually move a rotator. Normally, the display indicates the present measured position of the rotators. Pressing the A or B key will select rotator 1 or 2, respectively, as the rotator that will be commanded by subsequent keypad entries. In addition, pressing one of these keys will cause the current *desired* position for the selected rotator to be displayed for approximately one second, after which the display will revert to the measured position. If the rotator was stopped and is further from the desired position than the value set in calibration step C-4 (or C-8 for rotator 2), the rotator will be moved.

You can move the rotator manually by pressing and holding the H key for clockwise movement or the L key for counterclockwise movement. Once the key is released, rotator movement will cease until a new position is entered or the rotator select key (A or B) is pressed. The controller handles brake control in manual mode as well as during automatic positioning.

The desired position for the active rotator is entered using the numeric keys. Three digits must be entered, and the controller will not accept an entry outside the range defined as the limits during calibration. If an error is made, pressing the rotator select key will restore the current desired position.

There are 10 position memories for each rotator in the controller. Pressing the D key followed by a digit key (0-9) stores the current desired position of the rotator into the memory selected by the digit key. If the value specified in calibration step C-9 was 1, both rotator positions are stored, otherwise only the current rotator position is stored. The F key, followed by a digit, reads a memory into the desired rotator position. Again, both rotators are affected if the C-9 value is 1.

The desired position of the selected rotator can be set to the rotator's measured position by pressing the C key.

Serial-Port Control

The commands given through the serial port mimic the front-panel commands functionally. Each command consists of a sequence of characters followed by a CR. To provide compatibility with BASIC interpreters, a received line feed (LF) will be ignored. Responses from the controller are also sequences of characters followed by CR. The positioning commands are listed in Table 1.

In addition, the serial port provides a facility not available from the front panel: timed positioning. This lets you load a set of positions and times into the controller's memory. Times are given in the 24-hour clock format and are written as six digits in hours, minutes and seconds. For example, 1:30 PM and 15 seconds would be entered as 133015. When a time is reached

Table 2
Timed Positioning Commands

T	Send current time in the format HHMMSS.
TC HHMMSS	Set current time.
TA HHMMSS XXX TB HHMMSS XXX	Command rotator to position XXX at the specified time.
TD HHMMSS XXX XXX	Command both rotators. The first position given is for rotator 1.
TR	Send the next time point in the format NNN HHMMSS R XXX XXX, where NNN is the number of timed-position points that can be added before memory is full, HHMMSS is the time at which the commands will be given to the rotators, R is A, B or D as set by the command that entered the time point, and XXX is the rotator position that will be commanded. Only NNN will appear if there are no time points in memory. If only one rotator is to be commanded, XXX will appear only once.

If you plan to use the timed-positioning capability to store a large number of points, you should use a 6264 8-kbyte RAM on the microcontroller board. To make the responses from the controller as easy to use as possible, you can set the end-of-response characters:

C	Send only CR at end of responses.
CL	Send CR followed by LF at end of responses.

that is in the list, the rotator(s) will be commanded to go to the specified positions. The times are entered earliest to latest. That means that if at 004500, an entry with the time 235959 is followed by an entry with the time 013000, the first rotator command will occur at the end of the current day, and the next command will occur at 1:30 of the following day. The timed positioning commands are listed in Table 2.

Conclusion

Circuit board templates are available from the ARRL for $2 (to cover preparation and handling). Address your request to the Technical Department Secretary and ask for Rotator Controller Circuit Board Templates, QS/09/86. Circuit boards and parts kits are available from A & A Engineering, 7970 Orchid Dr, Buena Park, CA 90620, tel 714-521-4160.

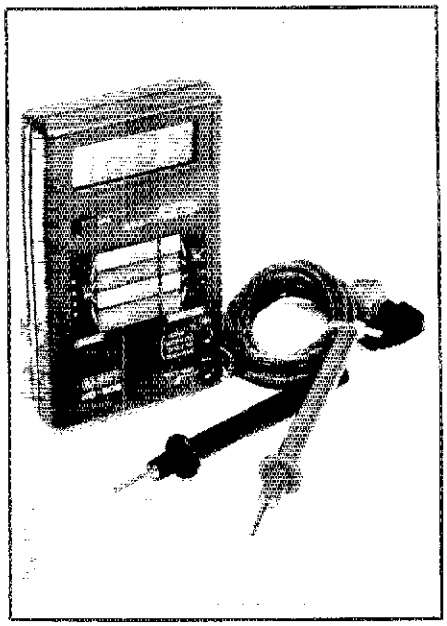
Although the automatic antenna controller was designed with satellite work in mind, it has applications in many ham shacks, from the "little pistols" to the "big guns." (Keeps the operating table from getting cluttered up with all those control boxes, you see. I should be so lucky!)

New Products

RAMSEY ELECTRONICS D-4100 COMPACT DIGITAL MULTITESTER

☐ The Ramsey D-4100 digital multimeter has a high-contrast, easy-to-read 3½-digit LCD display (maximum indication 1999 or − 1999). It is capable of 2000 hours continuous use with a standard 9-V rectangular battery. It covers four functions—ohms, dc volts, ac volts and dc current—and includes up to four ranges in each function. There is overrange indication on each range, and full autopolarity operation. Effective overload and transient protection is provided on all ranges. Designed for portable use, its dimensions are 2.64 × 4.41 × 1 inches, and it weighs only 7 oz.

The Model D-4100 is supplied complete with test leads and battery. It is available from Ramsey Electronics, Inc, 2575 Baird Rd, Penfield, NY 14626, tel 716-586-3950. Price: $22.95.—*Bruce O. Williams, WA6IVC*



Specifications

Function	*Range*	*Resolution*	*Accuracy*	*Overload Circuit Protection*
DC volts	2 V 20 V 200 V 1000 V	1 mV 10 mV 100 mV 1 V	±0.8% of reading ±1 LSD	DC ±500V AC 350 Vrms DC ±1000 V AC 750 V
DC current	2 mA 20 mA 200 mA	1 μA 10 μA 100 μA	±1.2% of reading ±2 LSD	0.5 A fuse
AC voltage	200 V 500 V	100 mV 1 V	±1.2% of reading ±4 LSD AC 750 Vrms	DC ±500V AC 350 Vrms DC ±750 V
Resistance	2 kΩ 20 kΩ 200 kΩ 2 MΩ	1 Ω 10 Ω 100 Ω 1 kΩ	±1% of reading ±2 LSD	DC 250 V AC 250 Vrms

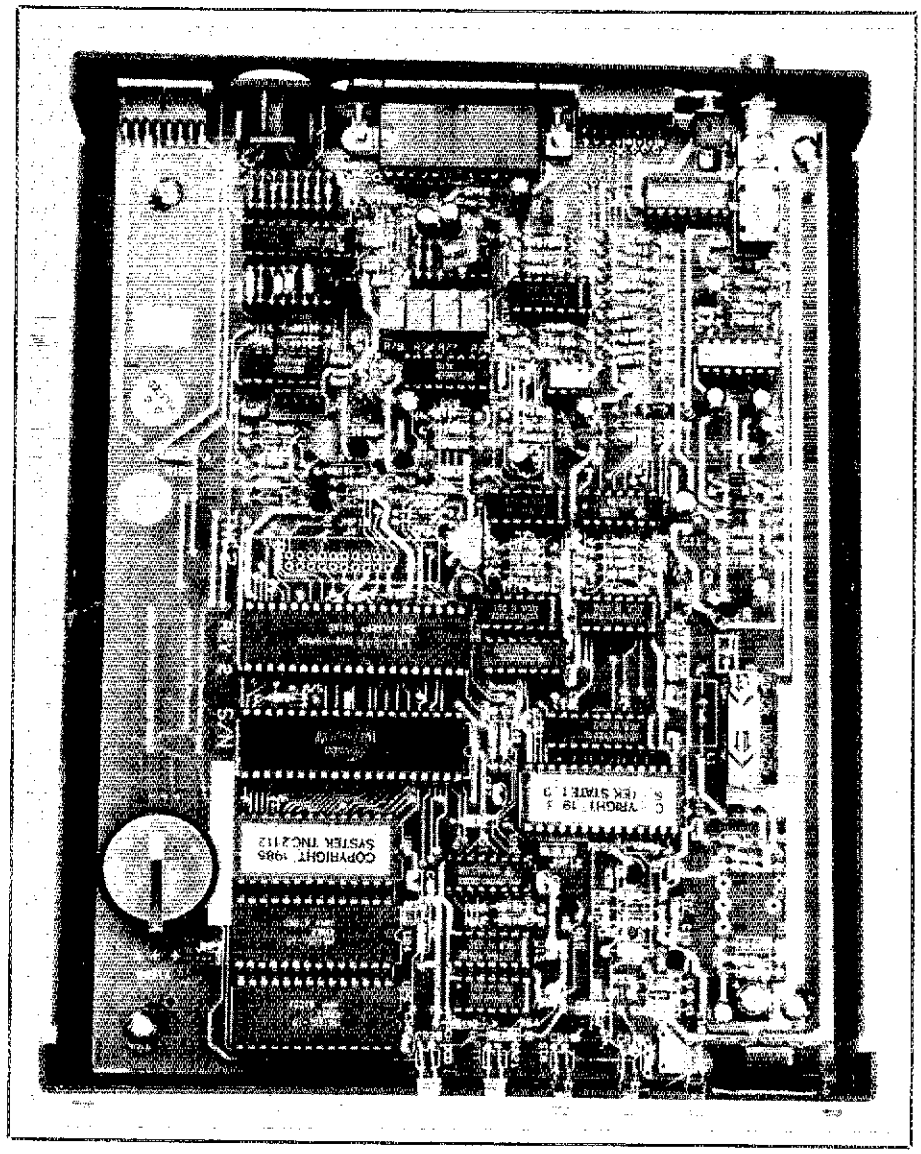
Product Review

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

MFJ Enterprises MFJ-1270 Terminal Node Controller

The Tucson Amateur Packet Radio Corporation (TAPR) has been responsible for two major developments in packet-radio hardware, the TNC1 and the TNC2 terminal node controllers. Thousands of TAPR TNC1 kits were built by amateurs, and the design was duplicated by AEA as the AEA PKT-1 and by Heath as the HD-4040. In late 1985, TAPR announced the TNC2, and long-distance trunk lines in Arizona were actually closed down from overload the day the TNC2 went on sale. When TAPR sold out the TNC2 kits, they licensed manufacturers to build TNC2 "clones." MFJ is one of the companies now marketing the TNC2 design.

MFJ makes it perfectly clear that their MFJ-1270 TNC is a TAPR clone. The PC board has the words "portions of this board were copied directly from TAPR artwork" printed on it, and the instruction manual states "portions of this manual were copied directly from TAPR documentation." This review focuses on the specifics of the MFJ TNC. For additional information on packet radio operation, see "What's All This Racket About Packet?" in Jul 1985 *QST* and "A Closer Look at Packet Radio" in Aug 1985 *QST*.



Physical Description

The first thing you notice about the MFJ-1270 is its size. The TNC is small compared to a TNC1 or AEA PKT-1. With dimensions of approximately 7 × 9½ × 1¾ inches, the '1270 will fit almost anywhere. The cabinet is black, with a simple brushed-aluminum front panel. The front-panel display includes a PWR on indicator, a CON indicator that shows that the TNC is connected to another station, a DCD (data carrier detect) indicator, a PTT indicator that shows that the transmitter is keyed and a STA (status) indicator that shows that a packet has been sent but not yet acknowledged by the receiving station. The rear panel provides a DB-25S socket for the RS-232-C connection, a 5-pin DIN socket for the radio connections, the power switch, the TTL-level serial port and the power input socket. Power is supplied by a 12-V dc wall transformer furnished with the unit.

Setting Up the TNC

The first setup step is to interface the TNC to your computer or terminal. This procedure is clearly covered in the MFJ manual. The baud rate at which the TNC communicates with your computer is set by a DIP switch on the rear panel. The MFJ-1270 will "speak" to the terminal at 300, 1200, 2400, 4800 or 9600 bauds. I used it with a Xerox 820 computer, a Commodore® VIC 20 and a Commodore C64®. The Xerox has a standard RS-232-C serial port, and I used a standard 9-line RS-232-C cable to connect it to the '1270. Since the TNC also has a TTL-level output, it may be connected directly to a VIC 20 or C64. MFJ sells a cable for this purpose, along with a simple terminal program for either computer, or you can make your own cable if you already have a terminal program. Finding a mating plug for the connector on the back of the TNC may be a bit difficult, however.

Terminal Software

Almost any terminal software will work with the TNC. If your terminal software works with a modem, it will probably work with the '1270. The MFJ terminal software supplied with the Commodore cable is a bit disappointing—the data-word format (stop bits, data bits and parity) must be set by selecting choices from a menu each time the software is run. Because the program is written in BASIC, however, it is a simple matter to rewrite the program to start with the parameters already set to whatever you choose as default values. In addition, MFJ's terminal software will not allow you to transmit a file stored on disk, or capture received text from the TNC to a disk file. This latter feature is handy if you want to monitor a frequency, and being able to send a file from disk can be useful for composing messages off line for later transmission to a bulletin board. The software rate is fixed at 300 bauds, but the C64 and VIC 20 will operate at 1200 bauds with other software. Although the MFJ software is adequate for casual operating and for checking out the TNC, most packet operators will probably want to use another terminal program.

Connecting the TNC to a Radio

Following the Introduction and Computer Interfacing chapters, Chapter 3 of the manual details the procedure for connecting the TNC

to a radio. Transmit audio, receive audio and push-to-talk (PTT) are brought out to a 5-pin DIN connector on the rear panel. MFJ supplies a cable with a matching DIN plug on one end. You must solder connectors for your radio to the other end of the cable. Detailed information for accomplishing this is given in the manual, as well as instructions for building an interface so you can use your radio for voice communications without disconnecting the TNC.

The '1270 will work "right out of the box" with most radios; I used it with an ICOM IC-2AT with no problems. When I connected the TNC to my Drake TR-22, the radio sounded like it was sending packets, but the local bulletin-board station was not receiving them. The cause was excessive deviation. I had the same problem when I connected the Drake to a TNC1—the deviation was found to be close to 12 kHz! Adjusting the deviation to a lower level and reducing the audio output from the TNC1 cured that problem, but with the MFJ TNC the audio level was again overdriving the Drake. Most newer radios have sufficient AGC or limiting circuitry, so this will not be a problem. But if you use an older radio and have trouble on packet, the excessive deviation may be the cause.

And Putting It On the Air

The manual gives clear operating instructions, with two chapters that provide the procedure for setting up the TNC when first powered up, and cover some of the computer- and radio-interfacing problems. Anyone who has used a TNC1 (or an AEA PKT-1 or Heath HD-4040) will find most of the commands familiar; however, a few new commands have been added. One interesting command is the "monitor heard" function. The TNC stores the calls of all stations it hears on the frequency, and when you type "MH," it lists the calls. By typing "MHCLEAR," the list is erased from memory. The TNC has an internal clock; when the clock is set, it will time- and date-stamp all incoming packets as well as the calls in the MH list. You also have the option of having a "header line" on each packet; for example

KB1MW>KE3Z, W1AW-5*, W1AW-4:
Hello Jon.
KB1MW>KE3Z, W1AW-5, W1AW-4*:
Hello Jon.

indicates a packet sent from KB1MW through W1AW-4 and W1AW-5 to KE3Z. In the first line, the asterisk by W1AW-5 indicates that the TNC is displaying the packet as it was "digipeated" by W1AW-5. The asterisk in the second line of the display indicates that the TNC also heard and displayed the packet when it was digipeated by W1AW-4. By watching the asterisks you can observe the progress of a packet through the network.

Another useful command is "BUDLIST". This command works in conjunction with call signs that you enter into a list called "LCALLS". With BUDLIST "on", the TNC will ignore frames from stations that are not in the LCALLS list. With BUDLIST "off", frames are ignored from stations that *are* in the LCALLS list.

All commands are well documented and indexed in the manual. The STA (status) on the front panel is a welcome addition; it is particularly useful on a busy channel or in a weak connection to know that your last packet has not yet been acknowledged.

A departure from the TNC1 design is the use of a battery backup for RAM, rather than nonvolatile RAM (NOVRAM) for storing the operating parameters. With the TNC1, you set the operating parameters and then issue the command "PERM" to store the parameters in NOVRAM. Changes that are made and not PERMed are "forgotten" when the power is turned off. With the '1270, once a parameter is changed, the TNC remembers the change, even after a power down. Default settings are stored in EPROM and issuing the "RESET" command sets all the parameters back to their default values.

The radio data rate is selected by a DIP switch on the rear panel; rates of 300, 1200 and 9600 bauds are available. I did not test the '1270 on HF, but the manual gives instructions for recalibrating the modem and optimizing the input filter for HF operation. This is not an easy modification. As an alternative, the internal modem can be completely bypassed to allow use of an external modem for HF operation.

Hardware

While the operation of the '1270 is similar to operation of a TNC1, the hardware complement is quite different. The TNC1 uses a Motorola 6809 processor, a high-level data link controller (HDLC) chip for processing packets and a UART for serial communication to a computer or terminal. In the '1270 design, a Zilog Z80® A processor is used, with a Z80 SIO for both packet processing and serial-port communications. While the TNC1 has a parallel port, the '1270 does not. The modems in both TNCs use the same chips: an MF-10 switched-capacitor filter, XR-2206 AFSK modulator and XR-2211 demodulator. The MFJ-1270 comes with 32 kbytes of ROM programmed with TNC software and 16 kbytes of RAM, with the option of increasing RAM to 32 kbytes.

Conclusion

The MFJ-1270 TNC2 performed flawlessly during the whole time I had it on the air. It was used in normal operations at KB1MW and in packet bulletin-board service at W1AW-4, where it ran 24 hours a day for two weeks with no problems. It appears to be a close clone of the TAPR TNC2, with the valuable addition of the TTL-level connection for use with Commodore computers. It is available at dealers or from MFJ Enterprises, Inc, Box 494 Mississippi State, MS 39762, tel 800-647-1800. Price class: MFJ-1270, $130; Commodore starter packs, MFJ-1282 (disk) or MFJ-1283 (tape), $20 ea.—*Bruce S. Hale, KB1MW*

KLM 220-22LBX 220-MHz YAGI

KLM's latest 22-element, 220-MHz antenna is the longest ever, and it features the latest in mechanical and electrical design techniques. It is based on design and development work done by Gunter Hoch, DL6WU, whose high-performance Yagis have captured the attention of serious VHF/UHF operators here and in Europe. His high-gain, low-side-lobe designs are a favorite among EME operators.

Hardware

As shipped, the antenna elements are bundled together securely, and the hardware is packaged in separate bags. It didn't take me long to determine that nothing was missing. KLM provides first-class hardware with this antenna. All nuts, bolts and lockwashers are stainless steel.

All parasitic elements are made of 3/16-in aluminum rod. The elements mount through the boom and are insulated from it by plastic shoulder washers. Plated steel pushnuts secure the elements in place.

Multiple driven elements have become synonymous with KLM, and the 220-22LBX is no exception. The purpose of this approach is to provide a low SWR across the band. The two driven elements, made of 3/8-in aluminum tubing, mount on top of the boom and are insulated from it by molded plastic blocks. The driven elements are connected together by aluminum straps. The feed-point impedance is 200 ohms, so KLM includes a 4:1 balun made of RG-303 coaxial cable. This cable features silver-plated conductors and Teflon® dielectric, so it weathers well. The coaxial feed line connects to solder lugs, so it is particularly important to do a good weatherproofing job to keep moisture out.

The 30-foot boom is tapered to reduce weight and wind loading. Indeed, the completed antenna weighs in at just over 10 pounds. The center of the boom is made of a 5-foot length of 1½-inch-OD aluminum tubing. Each end of the center section is swaged to accept a 5-foot length of 1¼-inch-OD tubing, and these, in turn, are swaged to accept 5-foot sections of 1-in tubing. A 5-foot length of 7/8-in tubing at the front of the antenna completes the boom.

A 1/8-in-thick aluminum plate comprises

(continued on page 57)

Table 1
KLM 220-22LBX 220-MHz Yagi Antenna

Manufacturer's Claimed Specifications	*ARRL Evaluation*
Frequency of operation: 220-225 MHz.	As specified.
Longest element: 26 in.	As specified.
Boom Length: 29 ft, 9 in.	As specified.
Weight: 10 lb.	As specified.
Turning radius: 196 in.	As specified.
Wind load: 2.0 sq ft.	Not measured.
SWR: 1.5:1 or better.	1.6:1 (See text.)

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

ADD TWO ELEMENTS ON 40M TO THE CUSHCRAFT A3 OR A4 TRIBAND ANTENNA

☐ Last year, I hit upon the idea of converting my Cushcraft A3 triband antenna into a two-element beam for use on the 40-meter band, while retaining its capabilities as a triband Yagi. Extender kits offered by Cushcraft and other antenna manufacturers enable one to use a tribander as a shortened dipole on 40 meters. But, why not move the 40-meter dipole from the center of the boom to one end and add a second extender kit to make a two-element array?

The 14-ft boom of the A3 is sufficiently long to make a 0.1-λ two-element Yagi antenna for 7 MHz. Furthermore, I would not need any additional elements if I used the triband reflector element as a 40-meter driven element and the triband director as the 40-meter director.

I considered two possible courses for arriving at my goal. First, I might use a gamma match for 40 meters, with a 10-meter trap in it so as not to affect 10-meter operation. This would allow an electrically continuous driven element for 40 meters. I finally elected, however, to open the center of the reflector element to drive it for 40-meter operation, and then use a relay to short the center for triband operation. Fig 1 shows the modified antenna.

Since the A3 boom is a bit small to support the additional weight of an extender kit on each end, I purchased an A4 boom (18 feet long and 2 inches in diameter) for the modified antenna. The new boom was shortened to 14 feet to maintain the original antenna dimensions. A small DPDT relay (24-V ac coil) with a plastic dustcover shorts the center of the 40-meter driven element for triband operation. The relay is mounted at the reflector end of the boom with an "L" bracket and a hose clamp. An RF choke (L1) of 50-Ω coax feeds the 40-meter element through the normally open relay contacts. In other words, a second coaxial line feeds the reflector element (opened at the boom and insulated with another Cushcraft element insulator) via the relay. When the relay is not energized, its normally closed contacts short out the center insulator and return the element to its original configuration as a parasitic reflector for the tribander. The 40-meter coax is grounded for triband operation.

On the director end, there is no need to split the element or place a relay. The element is tuned as a director for all four bands. The 40-meter director (with extender elements in place) is tuned to 7585 kHz, about 5 percent higher than the driven element (7225 kHz).

Upon checking the feed-point impedance of the 40-meter driven element (with the relay energized), I found it to be close to the 50-Ω feed-line impedance. This occurs probably because of losses in the traps that add to the radiation resistance. In fact, I was able to work from about 7175 to 7275 kHz with the SWR less than 1.5:1. I was able to work the whole band with a Transmatch.

Triband performance was not lowered in any way, and yet I am able to enjoy some directivity (up to 10 dB front to back with a very deep null off the sides and 3 to 4 dB of forward gain) without adding any more elements, much wind loading or weight to my triband antenna. By the way, other manufacturers' extender kits should work equally well. My results have been exceptionally good, with many contacts into Australia and Europe on 7-MHz SSB yielding outstanding reports. The antenna also performed very well into all parts of the USA. I feel that this antenna modification is a great way to get four-band directivity with a minimum of expense, weight and wind load.—*Stephen C. Taber, W4ITD, Lighthouse Point, Florida*

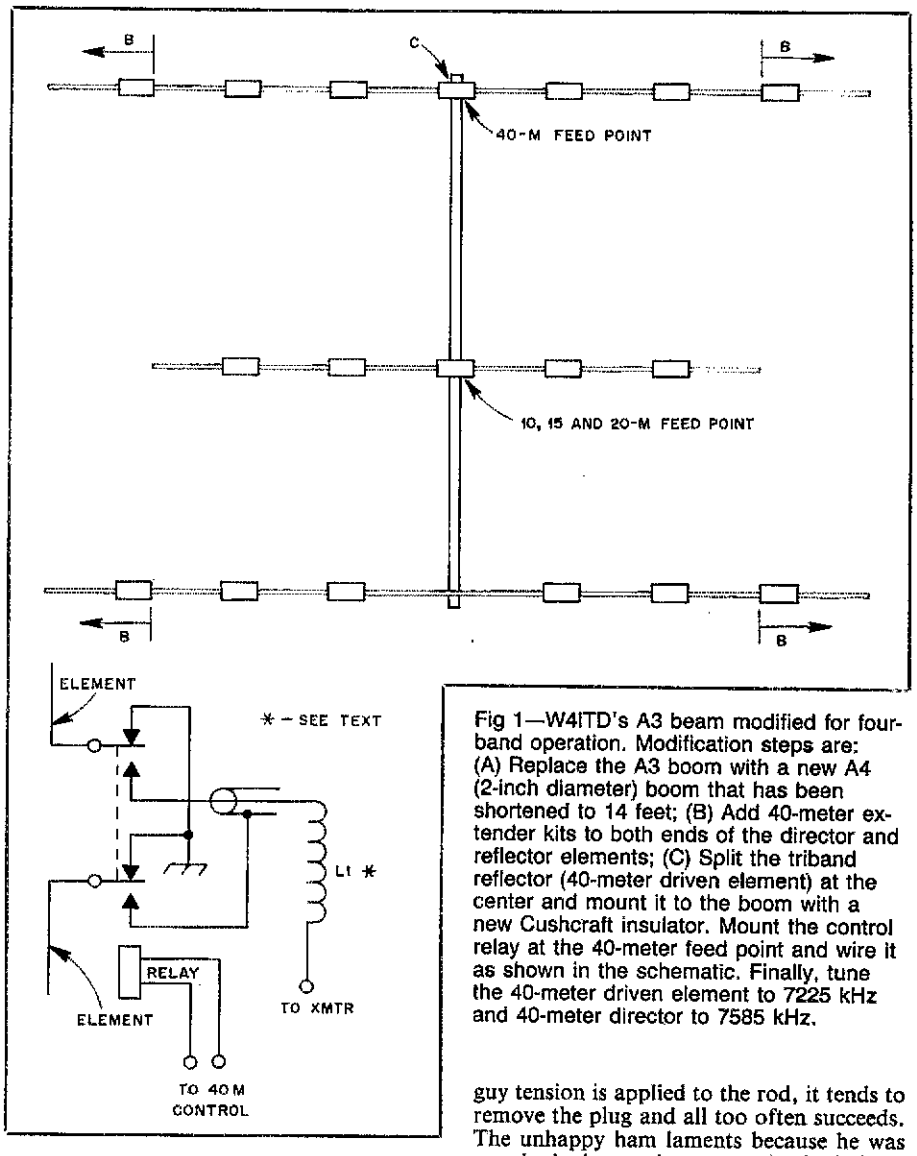


Fig 1—W4ITD's A3 beam modified for four-band operation. Modification steps are: (A) Replace the A3 boom with a new A4 (2-inch diameter) boom that has been shortened to 14 feet; (B) Add 40-meter extender kits to both ends of the director and reflector elements; (C) Split the triband reflector (40-meter driven element) at the center and mount it to the boom with a new Cushcraft insulator. Mount the control relay at the 40-meter feed point and wire it as shown in the schematic. Finally, tune the 40-meter driven element to 7225 kHz and 40-meter director to 7585 kHz.

SOME ADVICE ABOUT TOWER ANCHORS

☐ More ham towers fail because of improperly installed anchors than for all other reasons combined. The most common "sin" involves a complete misunderstanding of the concrete anchor.

Most hams use a posthole digger to sink a round hole for the tower anchor rod. They then fill the hole with concrete. Thus, the concrete takes the form of the hole—a cylindrical plug aligned with the axis of the guy. When guy tension is applied to the rod, it tends to remove the plug and all too often succeeds. The unhappy ham laments because he was sure he had enough concrete in the hole.

The holding quality of a tower anchor is more dependent on the shape and position of the concrete than most of us realize. Here are a few hints for safer anchors:

- The anchor hole should be dug in a rectangular shape and oriented perpendicular to the plane of the guy wires (see Fig 2). A backhoe with a small (12 inch) bucket makes an ideal hole.
- The end of the guy rod should rest on the floor of the hole and touch the rear wall.
- The anchor-rod eye should rest on the top lip of the hole, in line with the guy wire and exit the hole at about 45°. In order to assure the rod-eye position during the pour, drive a small wooden stake in the earth near the eye and securely wire the eye to the stake. The rod should not be bent.
- The tower manufacturer should specify the amount of concrete for each anchor. Be sure the rod remains in position during the pour and that the foot of the rod is covered with concrete.
- In most ham installations, it is neither necessary nor wise to completely fill the hole with concrete. A 1- or 2-foot block around

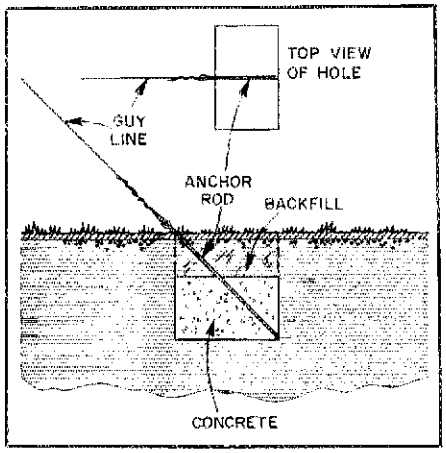


Fig 2—A cross section of the anchor hole shown in the plane of the guy line.

the rod foot is usually specified.

• After the pour, backfill the hole and allow the concrete to cure before applying tension to the rod.

After understanding this method, you can easily imagine how strong the anchor is. Any forces tending to pull the anchor from the ground must drag a small wall of concrete through undisturbed soil. When the rod is not bent or covered with concrete near the top of the hole, it is free to flex and not likely to fracture.

The only anchor worse than a round concrete anchor is an earth anchor—and the only thing worse than an earth anchor is no anchor at all.—*James H. Hayes, W4XS, Thompson Station, Tennessee*

A MESSAGE-WAITING INDICATOR FOR TNCs

☐ Here is a simple, easy-to-build circuit that can be used to give the operator of an unattended packet station a visual indication that there may be one or more messages waiting in the TNC buffer. Since many TNCs appear as a modem to the terminal, users of auto-answer modems may also find this circuit useful.

Circuit Operation

When a communications connection (a contact) is made, the TNC puts a positive voltage on the Data Carrier Detect (DCD) line (usually pin 8 of the RS-232-C port)—DCD reflects the connect status. If your TNC uses a different line to indicate connect status, that signal should be used instead of DCD. The connect signal returns to a negative voltage when the originating station disconnects. Fig 3 shows a circuit that latches the occurrence of the positive transition of DCD and indicates that one or more messages may be present in the TNC memory. DS-1 lights when the circuit is latched, thus eliminating the need to turn on the personal computer or terminal just to check the TNC buffer for messages. The operator may clear the indication by pressing S1.

U1 is a 4013B, CMOS, dual D flip-flop. It was chosen for its low supply-current requirement and its wide range of acceptable supply voltages (3-18 V). It is powered by the positive test voltage on pin 9 of the standard RS-232-C port. Because of the low 4013B current requirement (less than 16 μA, worst case), this line may be used for power even if the

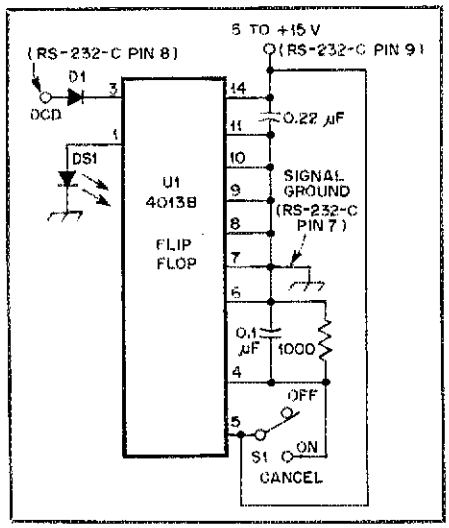


Fig 3—A schematic of WA2KWR's message-waiting indicator.
D1—1N914, or any common diode.
DS1—Radio Shack RS276-041 or any common LED.
S1—Normally open, momentary-contact push-button switch.
U1—4013B Dual D flip flop.

available current is limited by a resistor. If the positive test voltage is not present on a particular TNC, an alternate power supply, with a supply voltage equal to the voltage of the negative terminal is connected to RS-232-C pin 7 (Signal Ground). D1 protects the U1 clock input from the negative voltage swing of the RS-232-C DCD signal. Almost any common silicon rectifier with a peak inverse voltage greater than 25 V may be used for D1 (1N914, 1N4004, 1N4148, and so on).

Construction and Installation

The message-waiting circuit can be constructed on any small prototyping board suitable for integrated-circuit projects. All of the components are available at Radio Shack®. The circuit should be connected in parallel with the RS-232-C connection between the TNC and the personal computer or terminal. This can be accomplished either with a "Y" cable, or by constructing a box with two RS-232-C connectors. The box is used to house the circuit and to provide a means of connecting to the signals required by the message-waiting circuit. Other connections must be made in the box to pass the signals used by the TNC and the personal computer or terminal.

Variations

Some TNCs may give a TTL, rather than RS-232-C, connect-status indication. For this arrangement, some small changes in the construction and installation of the latch circuit can be made. First, omit D1 and add a 10-kΩ pull-up resistor between pin 3 of U1 and the +5-V supply. Connect the signal ground connection shown in Fig 3 to the TNC logic ground. Connect pin 3 of U1, the flip-flop clock input, and the 10-kΩ pull-up resistor to the TTL signal which reflects the TNC connect status. It does not matter whether this signal is active high or active low. This circuit works in either case because the flip-flop is edge triggered. With a supply voltage of +5 V, the 4013B will not source as much current as it will for a +12-V supply; if the LED is too dim, try a 2.2-kΩ pull-up resistor between the +5-V logic supply (U1 pin 14) and the 1Q output (U1 pin 1). Because of the variation in the specifications of the 4013B from manufacturer to manufacturer and the different types of LEDs available, however, this pull-up may or may not be needed. The prototyping board, switch and LED may be mounted either directly in the TNC or in a separate box, whichever is more convenient.—*Francis M. Columbus, WA2KWR, Staten Island, New York*

A PARALLEL RESISTANCE NOMOGRAPH

☐ Every ham knows the formula to calculate the resistance of two resistors wired in parallel. The chart in Fig 4 is an easier way to arrive at the answer. Also, the chart allows you to determine what parallel combinations of resistors will produce a desired value.

To determine the combined value of two resistors in parallel, plot the value of one resistor on line R1, the second on line R2, and read the resistance of the parallel combination where a line connecting the two joints crosses line R_T. Possible parallel combinations to yield a desired resistance can be found by plotting the desired resistance on line R_T and using that point to pivot a straight edge. As the straight edge is rotated, each pair of R1 and R2 intercepts is an appropriate parallel combination.

You can make the chart easily with a ruler and protractor. The scale for the three lines is unimportant; just be sure that all three lines have the same scale. There is no need to save the chart between uses; you can easily construct a new one when you need it.—*James V. Smith, KD4YD, Ellenton, Florida*

[Jim's nomograph first appeared in the Manatee ARC bulletin—Ed.]

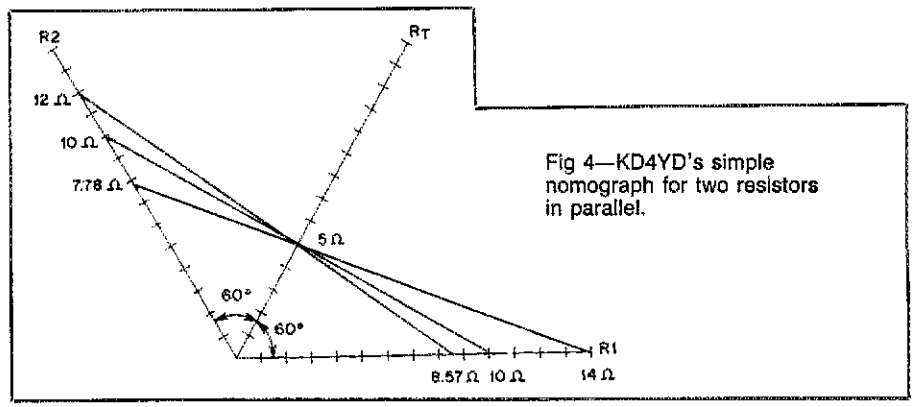


Fig 4—KD4YD's simple nomograph for two resistors in parallel.

Technical Correspondence

Conducted By Paul K. Pagel, N1FB
Senior Assistant Technical Editor

METEOR SCATTER

☐ It is good to see that interest in meteor scatter is alive and well. This is evidenced by the Jan 1986 *QST* article outlining and introducing meteor scatter for those who may not yet have tried it.[1] In maintaining simplicity for the benefit of newcomers, however, the author may have inadvertently misled them somewhat.

Clarke gives the optimum *dates* for showers, but he suggests the optimum *time* is near dawn. This is generally the best time for sporadic meteors, but is not necessarily the case for shower meteors. As shower meteors have a fairly well-defined *radiant* or direction from which they are arriving, they can hit only one side of the Earth at any given time. That is, the other half of the Earth is getting *no* meteors from this particular shower. As an example, the Delta Aquarid shower of late July hits only the side of the earth where the local time is 2200 to 0600; ie, the radiant rises at 2200 and sets at 0600. Anyone running skeds later than 0600 could get no meteors from this shower; the radiant is already below the horizon.

In addition to the foregoing go/no-go considerations, there is another significant aspect that should be mentioned. Although the procedure may seem a bit complicated, the hard work has already been done, so it should be put to good use.

The geometry of shower trails as seen from a fixed point on the earth (your QTH) changes during the day as the radiant moves across the sky. Knowledge of the geometry of the resulting trails can be used to determine the optimum time for working a given path direction. This is because (for oblique scatter below about 300 MHz) scattering is much more efficient if the trail orientation to the desired path is such as to give specular reflection.

This relationship between trail orientation and path orientation was used to derive tables of the optimum times vs path and shower as far back as the '50s. Detailed articles appeared in the April 1957 and May 1974 issues of QST.[2,3]—*Walt Bain, W4LTU, Rte 2, Lovettsville, VA 22080*

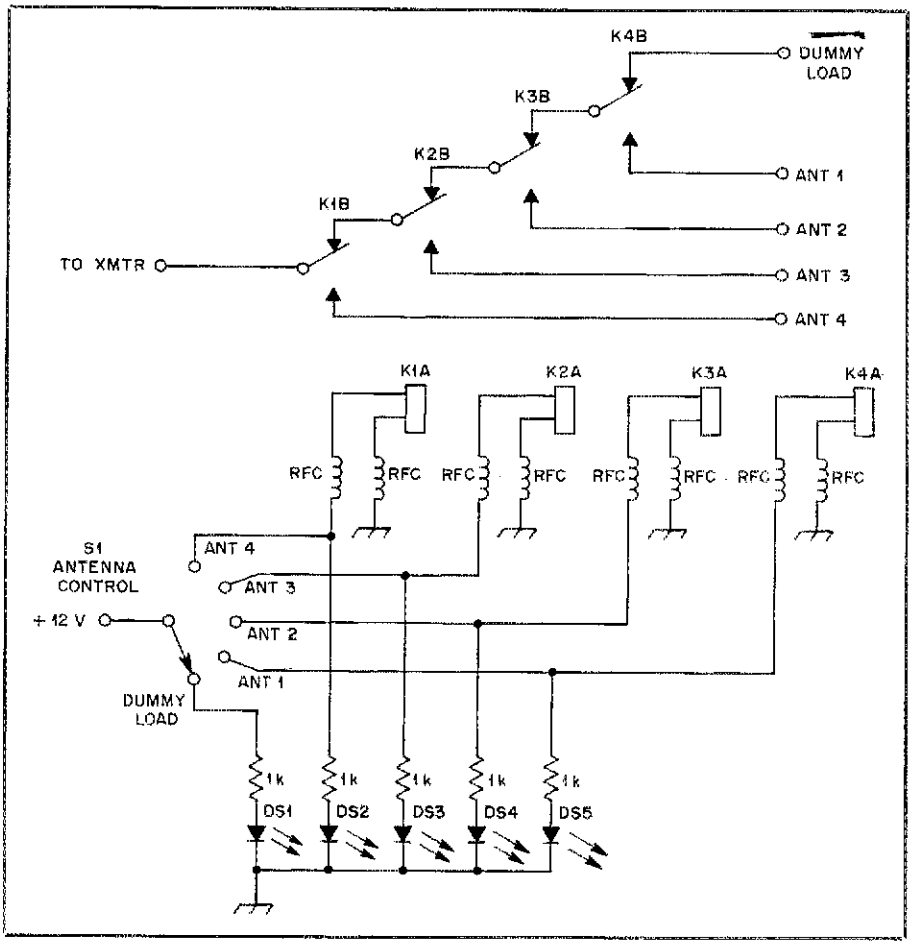


Fig 1—KU7G's modification of W1FB's HF-antenna switching scheme. S1 can be any rotary switch (12-V, contacts to handle the relay-coil current plus 12 mA). DS1-DS5, inclusive, are red LEDs (Radio Shack 276-041 or equivalent). Part numbers and sources for relays (SPDT, 12-V dc, 10-A contacts) and RF chokes (100 μH) appear in the original article.

S1—rotary switch
RFC—100-μH RF chokes
DS1-DS5—Red LEDs (RS 276-041 or equivalent)
K1-K5—12-V dc relays, SPDT, with 10-A or greater contacts, ORA Electronics TW-3415

AN IMPROVED REMOTE ANTENNA SWITCHER

☐ Doug DeMaw's article, "A Remote Antenna Switcher for HF" (*QST*, Jun 1986, p 24) is interesting and informative. The circuit in Fig 1 of the original article requires energization of both relays to select antenna no. 3. Similarly, the circuit of Fig 2 requires energizing all of the three relays shown in order to select antenna no. 4. In both cases, the indicators for each of the antennas will light simultaneously, and the power supply must be able to deliver enough current to enable all the relays at once. I would like to suggest a modification to Doug's switching scheme that will eliminate these conditions by simply reversing the connections of the normally open and normally closed relay contacts (see Fig 1). A single switch can then select each antenna and light only the LED for that antenna. As an added benefit, a single rotary switch can be used to control the modified system.

I also suggest that the last antenna position in any such system be connected to a dummy load. That way, the transmitter is automatically disconnected from all antennas when power is removed from the control unit and yet has a proper load should you transmit without selecting an antenna. Also, an open or short condition in the feed line to the switcher will show as extremely high SWR when transmitting to the remote dummy load.—*Bob Schetgen, KU7G, ARRL Laboratory Engineer*

[1]C. Greene, "Meteor-Scatter Communications," *QST*, Jan 1986, p 14.
[2]W. Bain, "V.H.F. Meteor Scatter Propagation," *QST*, Apr 1957, p 20.
[3]W. Bain, "VHF Propagation by Meteor-Trail Ionization," *QST*, May 1974, p 41.

AN HF PACKET/AMTOR/RTTY TUNING SYSTEM

☐ It becomes readily apparent that precisely tuning in an HF packet-radio signal with an SSB receiver is difficult to do without some sort of tuning indicator. Unless the signal is correctly tuned, copy is difficult. Often, two stations are off frequency from one another, thus adding to the confusion. If you've operated RTTY and used an oscilloscope and the crossed-ellipse display, its help is sorely missed.

As a result, we decided to construct a unit that would provide a crossed-ellipse oscilloscope pattern for packet-radio reception. Just as with the use of high- and low-tone pairs for RTTY, there are at least two sets of tone pairs in common use on packet. The Kantronics unit uses tone frequencies of 2025 and 2225 Hz, while the various TAPR

units use 1600- and 1800-Hz tones. We decided it would be beneficial to have a unit that could be tuned to different frequencies and different shifts, so that it could be used for tuning CW, Baudot RTTY, AMTOR and packet signals.

An earlier *QST* article described a unit that seemed to fit our needs; we made some modifications to the design. After several months of on-the-air testing, we are delighted with its performance. It has become an indispensable instrument for monitoring packet radio, AMTOR and Baudot RTTY. We've also found it useful on CW and for checking other tone frequencies. When used on 300-baud packet, it allows tuning to within a few Hertz, detecting drift, showing selective fading and variable signal strength and other useful information not apparent with other tuning systems.

Since everyone does not have an oscilloscope, we've added an LED-bar tuning indicator. There's also a switching arrangement that allows selection of one of two preset tone pairs. A single PC board contains the entire circuit, including the power supply.

Our interest in designing this tuning system is to encourage HF packet users to obtain a more comprehensive tuning method that will allow them to move away with confidence from congested packet channels. [An article describing this tuning system is in the works. Look for it in an upcoming issue of *QST*. —Ed.]—*Marcel De Vaux, W6ZDX, PO Box 1405, Carmel, CA 93921 and Paul Cooper, N6EY, PO Box 324, Carmel Valley, CA 93924*

LOOP FILTERS

☐ In "Small, High-Efficiency Loop Antennas," Jun 1986 *QST*, p 33, an important feature of this high-Q antenna was not brought out: It acts as a narrow band-pass filter on reception. I built up a model "Army loop" antenna several years ago for test purposes and enjoyed a reduction in QRM. For transmission, especially if TVI is a problem, the high-Q loop provides excellent harmonic suppression.

I used the Army-loop matching network with a fixed coupling capacitor as the antenna was designed for single-band operation only. A factor that may have made the Army loop a poor amateur band performer was the lack of a balun. When I tried it that way, I had as much RF on the outer shield of the coaxial cable as I had on the inner conductor. Use of a balun confined the antenna effect to the loop.—*Wayne W. Cooper, AG4R, 9302 NW 2nd Place, Miami Shores, FL 33150*

SOLID-STATE MUSCLE

☐ Matt Erickson's comments regarding mixers ("Mixers with Muscle," Technical Correspondence, Apr 1986 *QST*, p 41) are quite interesting. I could not find any mixer specifications for the 7360 tube to compare with a more modern mixer, and the SS-1R receiving tests did not lend themselves to a comparison with the Product Review testing of modern receiver characteristics. Those tests show that most state-of-the-art receivers are either noise limited, have a negative intercept or both.

After obtaining a Cubic Astro 102BXA transceiver several years ago that neither met the manufacturer's advertised specifications or my idea of what a receiver's performance should be, I did a little work on the receiver's first mixer.[4] After reviewing all of the published mixer data that I could find and testing the most promising models with a spectrum analyzer, I settled on the Plessey SL6400C. It has a high positive intercept, uses low LO drive and has enough gain so that an RF stage ahead of it is not required.[5]

Electromagnetic pulse (EMP) was not considered. But the mixer's performance without a front-end attenuator, and its continued good performance after the addition of a low-noise RF stage should qualify this mixer as one having muscle.[6]

There are a lot of things to consider besides the first mixer in the design of a receiver. One can compare amateur and commercial equipment. If you cannot see the difference, just look at the price tag!—*Wayne W. Cooper, AG4R, 9302 NW 2nd Pl, Miami Shores, FL 33150*

TV BOOSTER AMPLIFIER QRM

☐ [The following letter, edited for appearance in this column, was sent to Mr John Reed, FCC, Office of Science and Technology. Mr Reed's reply is included.—Ed]

Early this year, I tracked down an intermittent source of interference that had been appearing on the input frequency of my amateur two-meter repeater. The same type of interference had been observed on local 154-MHz public-service frequencies. This source of RFI was found to be a TV booster amplifier in use at a private residence. Twin-lead (300-ohm) was used to connect the amplifier to the antenna and as a down-lead to the power supply module located inside the house. Although the installation was not professional in nature, it was done according to the basic instructions supplied by the amplifier's manufacturer. Almost three months later, another source of intermittent interference was found that was similar to the first case in all respects.

In both of these cases, the offending booster amplifier was an Archer (Radio Shack) model 15-1124 mast-mount TV-FM signal amplifier. This amplifier has a switch to permit use of 300-ohm twin-lead or 75-ohm coaxial cable transmission lines. Apparently, when twin-lead is used as the down-lead, the amplifier is liable to oscillate at one or more unknown frequencies. Any environmental change such as rain, cable movement and so forth, can change the frequency of oscillation.

The owners of the amplifiers were cooperative when contacted about the problem. I completely rebuilt their systems using coaxial cable for the down-lead at no cost to them. As a result, the RFI was eliminated and TV reception was improved. Also, their neighbors who had been experiencing TVI were no longer being bothered.

Although the power level of the oscillating amplifiers is low, they can cause interference to hilltop sites that are in line-of-sight positions to the amplifiers. Ground tracking in these instances is difficult.

To quote OST Bulletin No. 63 regarding Part 15 of the Rules and Regulations, "The FCC is responsible for establishing regulations governing the electromagnetic interference potential of equipment which *utilizes* RF energy." It would appear to me that this type of product should be regulated under Part 15, and perhaps Archer should be mandated to correct deficiencies in their model 15-1124 amplifier as well as ensuring against similar problems in future models. —*Keith D. Hoyt, K6GXO, 35545 Cheseboro Rd, Palmdale, CA 93550*

Mr Reed replies:

Part 15 of our Rules has no specific emission limits applicable to mast-mounted TV-FM signal amplifiers. However, the use of such devices is subject to the noninterference requirement of Section 15.3 of our regulations. Therefore, while there are no technical standards on the emissions from these devices, if harmful interference is caused, the operator of the device must eliminate that interference. The elimination of interference may be accomplished by changes to the device or installation, such as the use of coaxial cable, or by discontinuing the operation of the device.

There are no FCC regulations that require an equipment authorization prior to marketing this type of equipment. The regulations are directed to the operation of the equipment. Thus, it is usually helpful in obtaining the cooperation of the equipment operator in resolving these problems, as you appear to have successfully done in the earlier two occurrences. Should you not be able to obtain cooperation from the operator of an interfering device, you should contact a Commission field office for assistance. —*John A. Reed, Technical Standards Branch, FCC, Washington, DC 20554*

Feedback

☐ An inconsistency has been discovered in "Introducing the Series-Parallel Network" by Warren Bruene, W5OLY (Jun 1986 *QST*, p 21). In the last sentence of the Component Relationships section, p 21, the term "$-X4/X3$" should be "$-X4/X2$." This will then correspond with Eq 8 on p 22. Our thanks to Ed Bullard, W5KWF, for pointing out the error.

☐ Author Michael Owen has discovered two errors in "VHF Meteor Scatter—An Astronomical Perspective," Jun 1986 *QST*, pp 14-20. In the Appendix, Eq 1 should read

$$JD = 367 * Y - \frac{7 * (Y + [(M+9)/12])}{4} + \frac{275 * M}{9} + D + 1721013.5 + UT/24$$

Eq 5 should read

$$EL = L + [1.915 * \sin(g)] + [0.020 * \sin(2 * g)]$$

The article's lead photograph of a Perseid meteor was taken by Emil Pocock, W3EP, during the Perseids shower on Aug 12, 1985.

[4]D. DeMaw, "Cubic Astro 102BXA Transceiver," Product Review, *QST*, Dec 1981, p 48, and Feedback, *QST* Feb 1982, p 52.

[5]W. Cooper, Hints & Kinks, Oct 1983 *QST*, p 41.

[6]W. Cooper, Hints & Kinks, Aug 1984 *QST*, p 46.

Packet Radio in Emergency Communications

More and more hams are finding out there's a public-service side to packet radio.

By Patty Winter, N6BIS
PO Box 537
Menlo Park, CA 94026

Packet radio is the wave of the future, the high-technology solution for emergency and public-service communications, right?

Wrong.

Packet radio is a tremendously effective communications technology, but it isn't "the wave of the future"—it's here now, providing valuable assistance in public-service events, drills and emergencies.

Packet-radio activity is increasing so fast and furiously that even an on-line data base could scarcely keep track of it. Some 18,000 packet systems have been sold.

What's in a packet-radio system? You can see Harold Price's primer in July and August 1985 *QST* for a thorough explanation, but basically it consists of (1) a terminal node controller (TNC), the brains of the system; (2) a radio; and (3) a terminal or full-fledged computer with communications software. The terminal will have a monitor screen or a printer, or both.

The benefits of packet radio have been widely publicized (see sidebar, p 57), but to find out what packet is really doing, let's look at highlights of packet activities in two of the nation's most populous states, along with suggestions on how best to use this technology in public-service and emergency events.

Proving Packet in Texas

The scenario: Nearly 200 "war casualties" arrive at three Dallas airports, then are transferred to over a dozen local hospitals. Each "victim" has a tag containing his or her name, military branch, rank, type of injury and other information that must be sent to hospitals quickly and accurately.

Sound like a job for packet radio? That's exactly what David Cheek, WA5MWD, and other Dallas-area hams decided last spring when they were asked to help with a test of the Civilian/Military Contingency Hospital System (CMCHS), a program to distribute casualties from a conventional European war to civilian hospitals in the U.S.

Six packet stations were set up for the drill: at three airports, the Dallas Emergency Operations Center and two participating hospitals. All except one of these also had voice operators on duty, and there were voice stations at some of the other hospitals. In all, information on nearly 200 "victims" was handled.

Participating amateurs were from the Garland ARC, the Dallas ARC, the South West Dallas ARC, Tarrant County RACES and the Ft Worth Kilocycle Klub. All the packet stations used Tucson Amateur Packet Radio Corp (TAPR) TNCs; computers included Apple, Heathkit, Epson and Texas Instruments.

David Cheek reports that there was some tendency among the voice ops to assume that everything was getting handled on packet. For instance, he was a few hundred feet away from the emergency room at Parkland Memorial Hospital and didn't find out that one bus had arrived until 20 minutes later.

This portable packet station was developed by Rick Joslin, WB5VUL, for the Palo Alto Area Chapter of the American Red Cross. Everything except the antenna and power cords fits into one camera case. The TAPR board is in the case lid, behind the metal shield. *(KT6W photo)*

Because of this, he stresses the importance of establishing clear guidelines on what traffic will be handled on which modes. He also strongly recommends having a packet net-control station "to monitor the frequency, make decisions and offer help—but not to handle much traffic. This station wouldn't necessarily direct the net, but simply keep order."

The test also turned up a fact about large text files: They cause problems. Says David, "I've noticed sometimes that a path that seems fine during a casual packet conversation may not hold for a 6-kilobyte file transfer. It's not unusual to see a large transfer end up with a 'Retry Disconnect' message."

This is exactly what happened to Bill Warner, KB5F, who was the packet op at Dallas Naval Air Station during the CMCHS test. When he attempted to send information regarding 79 "casualties" to the Dallas EOC, the packet link disconnected during the transfer, and he had to resend about 50 of the entries. To reduce the chances of this happening, David suggests limiting files to perhaps 50 lines in length, unless you have a completely reliable path.

The superiority of packet radio in noisy environments was demonstrated clearly during the CMCHS test. The hams assigned to Dallas NAS were stationed in an emergency-communications van right near a runway, and they estimated that half of the incoming messages would have been

lost (or at least needed a repeat) had they been sent on voice rather than packet.

In fact, a voice announcement that an airplane had arrived at Carswell Air Force Base and was offloading "victims" *was* missed at Parkland Memorial Hospital because someone was vacuuming the radio room. Luckily, the same information was sent on packet simultaneously, so Parkland was informed of the incoming personnel.

Since the information sent over packet radio is only as good as the information entered into the computer, David and his colleagues have placed heavy emphasis on making sure that the original data entry is accurate. For one thing, they've developed "fill-in-the-blank" forms programs so that people not trained in radiogram procedures can create a message quickly and accurately.

For instance, during a recent triathlon, Dallas-area hams set up a packet station to take routine traffic for the spectators as a demonstration of Amateur Radio. Using a radiogram program written by Phil Berchtold, N5EZM, all the operators had to type in were the destination address and the message; the place of origin, date, precedence, and so forth were included automatically.

What's more, the program converted punctuation marks to their NTS equivalents ("query," "X-ray," etc), counted the words and inserted the word count into the preamble. "A forms-filling application actually allows an operator to make more keystrokes per hour, because the repetitive parts of the message are entered only once," David notes.

David Cheek believes that many people don't understand how valuable packet radio is simply because they haven't had much exposure to it. "Packet isn't something for the future; it's here *now*. Lots of people say 'that'll be fine in five years' simply because there's no one within earshot of them doing it, so they don't realize how effective it already is.

"It's incorrect to look at packet as the mode of the future. With the availability of products and the large numbers of enthusiastic people using it, the only limiting factor is our learning to use it," says David.

Peddling Information

It's called the Primavera, a lilting Italian word meaning "springtime." But when you're trying to track 2000 bicyclists through three counties, the enchantment of California's spring beauty can give way to lots of headaches.

The Primavera bicycle tour is centered in the Diablo Valley east of San Francisco. There are actually four tours available to the cyclists, ranging from 50 to 200 kilometers in length. The longer routes wind through several canyons, over a range of hills, and 2000 feet up Mt Diablo—playing havoc with line-of-sight transmissions as well as leg muscles.

For the past five years, Kit Blanke, WA6PWW, has organized radio amateurs to staff the Primavera checkpoints and rider pickup vans ("sag wagons"). The ultimate goal is to know where every rider is at all times—or at least which checkpoints they're between. That way, missing riders can be found quickly.

With 2000 people each checking in two to four times, the hams have to deal with some 6000 pieces of information during the day. This year, 30 hams staffed 16 stations for the Primavera. Five of the sites had packet capability, including one halfway up Mt Diablo that acted as the digipeater for the others.

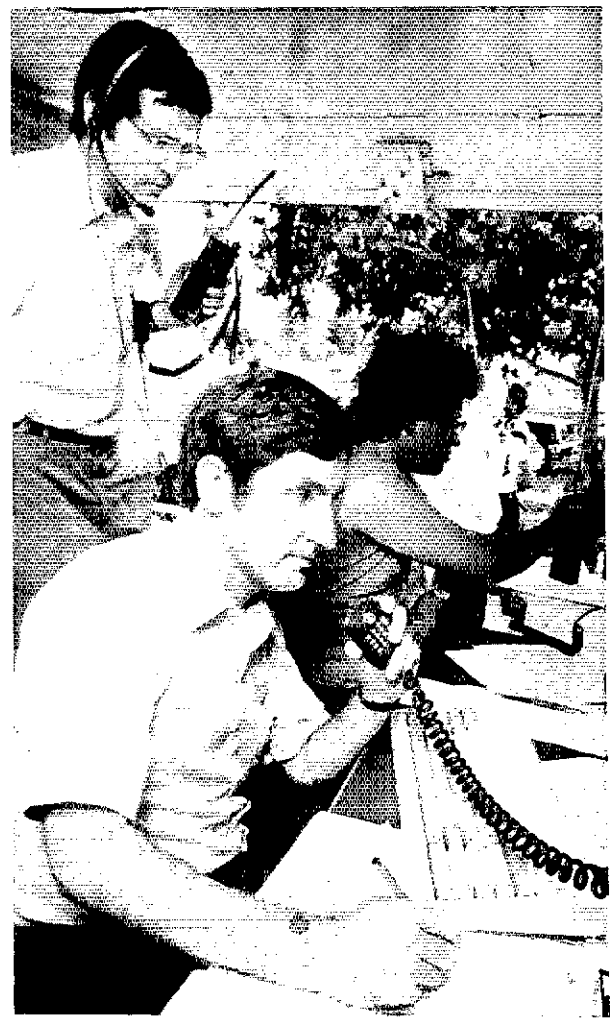
Both packet and voice net controls were located at the home of Frank Kibbish, WB6MRQ, a few miles from the start/finish line. Kit and Frank believe strongly in locating the net control well away from the distractions of the main event centers, and have done so ever since they began supporting the Primavera.

Since all the packet sites also had voice operations going on, the two nets were kept well apart from each other on the frequency spectrum. All packet activity was conducted on 220 MHz, with the voice net on 2 meters. (Some voice coordinating was also done on 450 MHz.)

Frank acted as packet net control again this year, with Mike Weaver, KA6YFB, handling the voice side. With both of them in the same room, it was easy to coordinate information between the two nets. Packeteers could also reach Frank on the phone with questions.

WB6MRQ's setup includes a microcomputer and printer as well as the packet system. The computer acts as the terminal for the packet system and can also store the incoming information on disk and print it out.

In the past, the Primavera packeteers have had to resort to elaborate strategies to overcome the fact that packet protocols didn't allow for error-checking during multiple-station connects. This year, however, Frank implemented the WA8DED firmware in his system and was able to stay connected with all the other packet stations during the entire event.



More than 200 Bay Area amateurs provided continuous emergency communications for over a week during the Lexington, California fire. During the emergency, amateurs used packet radio to maintain quick, reliable contacts between fire camps and the California Department of Forestry Headquarters. Shown (l-r) are KG6TL, N6HDN and KB6FVA. *(photo courtesy IBM)*

The sophisticated system constantly polled the network, looking for traffic from the other stations. If it found incoming data in the format used to report rider locations (checkpoint number/time/rider numbers), it sent the information directly to the computer's memory. If it saw something in a format it didn't recognize, it displayed it on the computer's screen. Typically, the latter would be a message from one of the other packeteers. As Frank Kibbish reports, the end result was a traffic-handler's dream, "We actually had two-way conversations going while the system was processing routine data."

Fortunately, only one rider wandered off the route this year, and he was found easily. Another rider was seriously injured in a spill; an amateur in one of the sag wagons was there in minutes and provided constant two-way communication with race officials until a helicopter arrived to take the victim to a hospital.

What's in the works for 1987? Very possibly packet "hand-helds." To relieve the data glut that occurs when all 2000

riders register at the start and finish of the tour, Frank is thinking of assigning extra amateurs to cover that area with packet stations consisting of Radio Shack Model 100 lap computers, belt-clip battery packs and UHF hand-held radios. Dick Tracy, eat your heart out.

Fire in the Mountains

The California Department of Forestry had been primed for packet. Barry Thaysen, WB6UGG, Chris Tubis, G8HJD, and other San Jose-area hams had given forestry personnel several demonstrations of packet's capabilities. So when the inevitable happened last summer, CDF officials were quick to ask for packet—and it came through for them.

The first "opportunity" came on the last day of June, when a brush fire broke out in the San Antone area behind Mt Hamilton (home of Lick Observatory). The first hams on the scene were Kit Blanke, WA6PWW, and Jim Dethlefson, KA6YRK, and they had Jim's packet system with them.

During the next 16 hours, the two handled traffic between the fire base and CDF district headquarters in Morgan Hill, south of San Jose. Most of the communications took advantage of packet's strength in handling large amounts of logistical information (food, equipment), but a less heralded benefit took on crucial importance for a while.

At one point, the fire encroached on a local resident's crop of, well, illicit herbs. Sensing imminent and unwanted attention by the authorities, the farmer began shooting at the fire crew. Aside from the initial call for assistance (which was made on a CDF frequency), traffic regarding the incident was handled on packet, offering far greater security from people with scanners.

Hard on the heels of the San Antone fire, CDF faced two conflagrations farther south in California, near Ojai and San Luis Obispo. Santa Barbara hams headed for Ojai with packet equipment, and Jim Dethlefson was dispatched to the other fire.

In SLO, Jim was asked to provide communications with the CDF regional office in Monterey, some 100 miles away. Unfortunately, the incident command center was surrounded by hills, and he was unable to get direct access into California's WESTNET packet link system. A path was finally found through W6IXU in Arroyo Grande, although it suffered from unreliability on long transmissions. Since 'IXU is the mailbox system for WESTNET, Jim took to dumping traffic into the mailbox, then making a quick linkup with CDF Monterey to let them know there were messages waiting.

While CDF crews were battling the flames near San Luis Obispo, another fire broke out in the hills between San Jose and Santa Cruz. By the time Jim Dethlefson got back to the Bay Area, other hams were already packeting from four locations.

The preceding Sunday, two local hams with 2-meter voice equipment had established amateur communications at the incident command center. A few hours later, Frank Kibbish, WB6MRQ, arrived with his packet gear, and immediately linked up with the CDF facilities in Morgan Hill and Monterey. The next day, another packet system was set up at the fire staging area in Los Gatos.

Kit Blanke, who was among the early amateur participants, recalls one incident that demonstrated how quickly CDF has adopted packet as its own. "The first night of the fire," he relates, "one of the officials came into the radio room and asked if we could use packet to order breakfasts from CDF headquarters for the crews scattered around the fire line. After he left, one of the other hams said to me, 'They're *asking* for packet? Did they have it available last fire season, or have they already gotten used to it just since last week?' I told her they catch on fast."

Jim Dethlefson notes that the civil officials especially appreciated packet's ability to provide them instantly with traffic in writing. "There's no confusion," he points out. "You just rip it off the printer and hand it to them." Frank Kibbish adds, "You don't have to worry about someone misinterpreting the message —it's right there in black and white."

Packet continued to perform for CDF for the duration of the Lexington fire, which burned thousands of acres and destroyed numerous homes. When use of the main local digipeater was lost (the fire took out the power lines leading to it, and its batteries eventually ran down), packet operations were moved to a voice repeater.

With a few minor changes to the packet board commands (such as delaying packet transmission until the repeater came up), this worked very well. There was some initial confusion among the repeater regulars, but once the situation and the strange noises were explained to them, they readily made way for the emergency operations.

One problem unique to forest fires surfaced during the California events: the effect of excessively heated air on VHF and UHF propagation, even over a short distance. Frank Kibbish recalls, "Even before the digipeater went down, we had trouble getting into it because of the thermals. We were looking at it right across the top of the fire, and even though we were only a few miles away and had straight line of sight, it was difficult maintaining the link."

Amateur operations at the Lexington fire continued for a week, involving some 200 Bay Area hams. Packet specialists like Jim Dethlefson (who is on CDF's designated "first in" ham team) are ready to do it all again on a moment's notice.

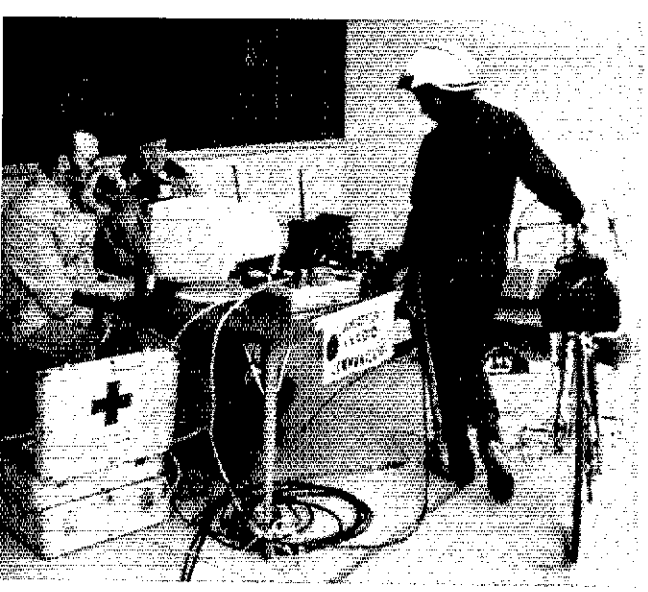
Practicing for the Big One

April 18, 1985. Seventy-nine years after an earthquake and fire devastate San Francisco, a magnitude 8.2 quake "hit" Southern California. At the California Office of Emergency Services in Los Alamitos (between Los Angeles and San Diego), packet-radio equipment is used to send messages to OES headquarters in Sacramento, 400 miles away.

The packet traffic for the earthquake drill went over WESTNET, an amateur packet network that has been in operation since early 1985. By the time of the drill, WESTNET connected San Diego with San Francisco along the California coast, with a couple of spurs going into the state's central valley. Soon, there will be two parallel paths through the state.

Harold Price, NK6K, was at Los Alamitos on April 18. "We learned several things during the exercise," he says. "First, it *is* possible to move a large amount of traffic that distance through a lot of digipeaters. Second, it wasn't possible to do it in the way we had originally intended."

Most of the problems resulted from California's length and terrain. WESTNET paths range up to 90, 120 and even 200 miles (for an alternate route that bypasses a couple of other repeaters). The longer path requires over-water ducts, which



Mike Weaver, KA6YFB, and Brent Jenkins, N6HQD, operate packet and voice at Primavera bicycle race checkpoint. *(N6BIS photo)*

sometimes fail. And sure enough, Harold reports, "two days before this exercise, a weather pattern went through that destroyed the duct, which didn't return for several days.

"Also," he says, "three digipeaters failed the day before the exercise—the largest network failure experienced before or since. Fortunately, the systems were repaired within hours. And we also had portable systems ready to go. One system was driven to a mountaintop to supply backup for the lost duct."

Packet communications were established with Sacramento soon after the exercise began, but were lost shortly thereafter due to a problem with a digipeater on the extreme north end. When this happened, the people in Los Alamitos sent CQs to the San Francisco area for assistance. Walt Miller, AJ6T, in San Jose (about 100 miles and a mountain range from Sacramento), answered and became the new link. The packet messages requested, among other things, a presidential disaster declaration, 1500 collapsible stretchers, several hazardous-materials teams, 500 tents and two 250-kW generators.

In his critique of the exercise, Harold Price stresses the advantages of using two computers at each site: one standalone for data entry, and one connected to the packet system. Otherwise, data entry comes to a halt when the packet link is being established, or when long files are being sent. The systems should be compatible, so the information can be stored on disk on the entry system, and then the disk taken to the other computer for transmission. Alternatively, you could use one computer for data entry while the other is connected to the packet board and transmitting, then switch functions so that the first system transmits its stored data while the other collects more.

Harold also suggests having a relay station partway up the line to temporarily store and then retransmit files. "The probability of dropping a packet increases with the number of digipeaters, until the probability of a packet making it all the way to the end [of a long link] and the acknowledgment getting all the way back becomes small," he points out.

For example, if you're sending a packet through six digipeaters, and at repeater number five it crashes into another packet, your system (when it realizes the failure) has to start all over again. But next time, it could get involved in another collision, or be the victim of a poor path. "When you lose a packet, you don't lose data," Harold notes, since your system will retransmit it until it's successfully received, "but you do lose time."

The other advantage of having a stopover point is that you can get the traffic out of the disaster location and let someone in a calmer area deal with routing it. This reduces the backlog on the packet system at the disaster site, since the operator there is not spending a lot of time waiting for acknowledgments on packets sent over a long link. If possible, the long-distance packeting should be conducted on a different frequency from that around the disaster area.

So how does Harold Price feel about the exercise? "The operation was a raging success. The goal was to learn how to do it better, not to get X number of messages to Sacramento. Had we just wanted to get the traffic to Santa Barbara [about 200 miles from Los Angeles] instead of Sacramento, we could have. In a real emergency, that might have been the goal. Also, we were pleased with the reaction packet got among the officials. The OES people definitely feel that packet is the way to go, as evidenced by the fact that they've bought four of them."

Taking It from Here

The exercises described in this article represent only a small fraction of the events in which packet radio has been used. At the Fourth ARRL Amateur Radio Computer Networking Conference, Steve Hall, WB6FSK, announced that Navy MARS is acquiring frequency assignments for packet, and currently has about 30 packet operators around the country ready to go. Other MARS groups are also showing interest in packet.

At the same meeting, Joel Kandel, KI4T, discussed plans for a packet-radio network that will support the National Hurricane

Packet Guidelines

Here are some guidelines, culled from the events you've just read about, for using packet radio in an emergency or public-service situation.

- Find out in advance (whenever possible) what paths you'll need and what digipeaters are needed to support them. Keep the links to as few hops as possible. Have portable repeaters available for placement on mountaintops. Test your paths with long files beforehand, since long files tend to crash more than do short ones.
- Make up a thorough packet setup checklist, including the necessary TNC command settings (MTO, MFROM, etc). For a planned event, have everyone up and running at least one hour before start time. Also, do a dry run one to two weeks beforehand, making it as realistic as possible.
- Have a packet net-control station as well as one for voice. If they're near each other, they'll be able to coordinate the nets more effectively.

The packet NCS should establish the format, content and size of packet messages, as well as how stations should set their monitor commands. If everyone can't hear everyone else, NCS should quickly establish and announce a routing list showing what digipeater paths everyone should use.

- Make sure the voice and packet NCSs agree beforehand (or as quickly as possible) which mode will handle what traffic. Packet is good for large amounts of data; anything you need hard copy on; messages with lots of hard-to-spell data; anything you want to keep a little more private. Voice is better for tactical, uncomplicated, summary traffic.
- Use a packet system that has storage capability for data entry—preferably on disk, not just in the computer's volatile memory. In an emergency, power sources may be unreliable, and if the data isn't on disk, it will disappear when the power goes. If possible, have two computers, using one at a time for data entry, and the other for actual packet transmission.
- Have backup software on hand as well as hardware (both computer hardware and radio hardware).
- Make sure you have a printer on at least one packet station in the network to provide a written transcript of all traffic. Consider using multiform (carbon) paper in the printer.
- Do everything you can to speed data entry. Have extra computers. Create fill-in-the-blank forms that eliminate the need to type repetitive information. Instruct all originating stations to use a standard format for their messages so the receiving station can quickly collate the information.
- Limit the size of files (maybe 50 lines) to reduce the chance of being disconnected on retries. On the other hand, don't make each line of text into a new packet; packet is most efficient if it's allowed to put the text into its full 128-character allotment each time, when you send short (60- or 80-character) packets, you're wasting a lot of "overhead" with the header and trailer.
- Set up a bulletin-board system in your area, and link it to more distant ones. This way, if intended recipients aren't on line when you need them, you can store their messages in the bulletin board for later pickup.
- Standardize connectors (such as power cords) and other interfaces to allow flexibility and emergency replacements. For instance, by having a cord with a standard connector coming from the radio, and a set of other cables with the complementary connector, the one radio can be plugged quickly into an ac power supply, inverter, automobile cigarette lighter, etc. The same goes for connecting packet systems to different radios.

The Benefits of Packet Radio

In a nutshell, here's why everyone's raving about packet radio's potential in emergency communications.

Speed. Typical packet transmission speeds on the 2-meter band are upwards of 1200 words per minute.

Accuracy. As long as your system is in the connected mode, it simply will not accept a packet that has acquired errors in transmission. If you get it, you get it perfectly.

Easy to learn use. Once a radio amateur has established the packet link, anyone who can type can send messages, freeing hams for tactical work. And since many packet systems include full-fledged computers, software can be written to make traffic entry even easier (for instance, by automatically inserting repetitive information such as date and place of origin).

Suitable in noisy environments. Emergency-operations centers, hospitals and the like are not always known for having calm, quiet environments. Noise doesn't interfere with your reception of packet traffic.

Provides written transcript of all traffic. Unless you're using a system without a printer, packet automatically puts your traffic in the form that emergency personnel need it: on paper.

Reduces tedious writing and typing. Once information is entered into a computer at the originating station, it may never have to be typed or written down again. This makes packet especially useful for long lists of people, supplies, etc.

Efficient frequency utilization. Unlike a phone or CW net, many packet stations can transmit and receive on one channel at the same time with minimal interference. Also, by including storage capability in the system (such as a microcomputer), massive amounts of data can be entered off line, then quickly sent to another station without wasting valuable air time.

Automatic digipeating. Any packet station can become a repeater station, a link in a crucial post-disaster network. You don't need to rely on obtaining and placing bulky repeater systems.

Portable. An entire packet system can fit easily into one or two small cases, ready to go immediately where needed.

Bulletin-board capability. Messages can be sent to computers with automatic storage capability for later pickup; you don't have to rely on the recipient being around when you call.

Independent from the radio it's used on. A packet system can be hooked up to radios from many services: amateur, police, fire, forestry, etc.

Center in Florida. And Dallas-area hams received an enthusiastic response from city and federal officials when they used packet radio during a tornado drill.

What can your Amateur Radio group do to get in on the action? Obviously, as a first step, learn all you can about packet. The ARRL publishes *Gateway*, a newsletter devoted entirely to packet radio. Talk to people in your area who are already using packet. They may even have access to a packet "bulletin board," a computer system where people can leave messages and information about packet radio.

Then, jump in yourself! Get your own packet system together. Help create networks to link packet users throughout your state, or a larger area. (Remember: Since every packet station can become a repeater, you can get a net started without ever leaving home, although mountaintop sites are certainly preferable.) And to make sure that frequencies are set aside for packet radio in your area, get involved in frequency coordination.

Packet is real and ready to go, but it needs *you* to turn its potential into a superior emergency-communications tool.

Product Review

(continued from page 48)

the boom-to-mast bracket. Plated-steel U bolts and saddles secure the plate to both boom and mast. The mast U bolts, as provided, will fit masts up to 2-1/8-inch OD. A truss made of nonconductive Phillystran® guy cable supports the boom. The truss attaches to the mast approximately one foot above the boom and is necessary to prevent boom sag. Turnbuckles allow proper tensioning of the boom-support cables.

Assembly

It took me about four hours to assemble the 220-22LBX antenna. The job was made easier by the fine machine work done at the factory. All holes were deburred and everything lined up well. The instruction manual is clear and well illustrated. Boom assembly is straightforward. The boom is quite long, and you'll need plenty of space to lay it out on a flat surface before tightening the screws.

The parasitic elements have a continuous taper. The reflector is the longest element, and the elements get progressively shorter. The insulators fit snugly, so the elements feel secure even without the pushnuts that lock them in place. In fact, the fit is snug enough that you don't need to use the pushnuts if you want to be able to take the antenna apart for portable operation.

Installation and On-the-Air Performance

The 220-22LBX may be installed for either vertical or horizontal polarization. I chose horizontal polarization because my main interest is SSB and CW at the low end of the band. Installing the 220-22LBX was easy. Although the antenna is long, the short elements make it easy to guide around tower guy wires. The boom is quite flexible without the truss, so take care not to place excessive stress on it. I installed the antenna with some other VHF and UHF antennas atop a 100-foot tower. It is fed with 120 feet of ¾-in Hardline.

Because of equipment limitations, I was only able to measure the SWR at two frequencies in the band: at the low end (around 220.1 MHz) and at 223.5 MHz. At both frequencies, the SWR is about 1.6:1. In a recent article in the newsletter *Cheese Bits*, published by the Mt Airy VHF RC, Jim Hold, N3AHI, states that apparently the baluns on some KLM LBX-series antennas are cut too short, so they resonate high in frequency. In some cases, the match can be improved by replacing the balun. I did not try this because it didn't seem worth the trouble to remove the antenna from the tower. If you buy one of these antennas, it's a good idea to check the SWR *before* installing the antenna in its final location.

On-the-air results are very satisfying. I installed the antenna just in time for the ARRL Spring Sprints. During the 220-MHz Sprint, I was able to work more than 50 stations in 17 different grid squares. The pattern is exceptionally sharp, so I was able to hear weaker stations by positioning the antenna to null out several loud local stations.

This modern antenna is certainly worth considering if you want to work DX on 220 MHz. Manufacturer: KLM Electronics, Inc, PO Box 816, Morgan Hill, CA 95037. Price class: $120.—*Mark Wilson, AA2Z*

The Club Challenge for the '80s: How to Raise Some Dough

How often has your club planned a project, only to have it squelched because of insufficient funds? Here's a proven effortless method to increase your club's treasury while helping to ensure Amateur Radio will be around through the 21st Century.

By Leo D. Kluger, WB2TRN
Club Program Manager, ARRL

What good is a club with no money in the bank? Not too much, unfortunately— volunteer efforts go a long way to providing service to the community, but sooner or later, a Field Day antenna has to be erected, a newsletter has to be printed and mailed, or a hamfest announcement has to be distributed. As the saying goes, "You gotta have cash."

Raising funds is never easy, and doing so usually takes some sort of project: baking goods, auctioning off equipment, planning and pulling off a successful hamfest—nothing is guaranteed. The ARRL Board of Directors knows this, and came up with a fund-raising plan that will guarantee your club a lucrative source of income.

Five Bucks a Member

Here's the plan: Your club will receive a $5 commission for every *new* regular ARRL member your ARRL-affiliated club recruits. Period.

As a League member, you know that a strong ARRL ensures a healthy Amateur Radio Service. A healthy membership organization is a growing one. And the best way to promote League membership is through personal, one-on-one contact.

How many non-League members do you know? Each one has the potential to gain your club $5. Are all of your club members League members? Ask them why not. You'll often discover it's just because no one asked them before. If each of the members of your club is able to bring in even *one* new League member, your club's treasury could jump up tremendously!

Don't limit your recruitment efforts to amateurs within your club. The Club Challenge gives you credit for *any* new League member, whether they live in your city or halfway across the nation.

You may want to consider an ARRL membership drive in your amateur community. If so, ARRL HQ can supply you with the names and addresses of the amateurs in your ZIP code areas who aren't yet League members. We'll help you every step of the way.

It's not necessary for your club to handle the membership applications; write in your club's four-digit code (detailed below) and distribute the ARRL brochure *Your Invitation to Membership* among the amateurs in your community.

New Rigs to Boot

In addition to the $5 commission, your

Club Challenge for the '80s Rules

Objectives: To promote new ARRL memberships, and to give additional revenue to your club treasury.

Benefits: Eligible clubs will be given a $5 commission for each new regular member signed up during 1986.

The club in each size category (small, medium, large) that recruits the most new members will earn an all-band HF transceiver at the end of the competition.

Eligibility: Only clubs actively affiliated with the ARRL.

Size categories: Small clubs—25 or fewer members; Medium clubs—26 through 75 members; Large clubs—more than 75 members.

Contest period: Only new ARRL memberships postmarked between January 1, 1986 and December 31, 1986 will count in the competition.

ID code: Each affiliated club is assigned a four-digit ID code. This code must be on each membership application when it arrives at ARRL HQ for your club to receive the commission.

To qualify for a $5 commission, you must adhere to the following:

1) Only new League members qualify for the $5 commission. Individuals whose last League membership expired prior to June 1984 are considered new members.

2) Your club's four-digit code must be written on the membership application when it arrives at ARRL HQ. If no club code is entered, no commission will be refunded.

3) Membership applications should be sent directly to ARRL HQ. No need for your club to review the application.

4) Always remit the full amount. We will send the appropriate commission.

5) Membership *renewals* are not part of this program and must be processed separately.

6) This program does not apply to reduced youth, family, life or blind memberships.

7) ARRL HQ will process all applications upon receipt, and will issue commission checks monthly.

8) This program may not be combined with any other League membership promotion.

Members of the University Radio Club, Johnson City, TN, winners of the Club Challenge for the '80s, enjoy ARRL Field Day. Shown (l-r) are KB4NVD, K9RUFF, KB4KFS club vice-president and K4SE, station trustee. *(photo courtesy K4SE)*

Marjorie Watson, N6JTJ, of the Amador County (CA) ARC, receives a Certificate of Merit for her extraordinary effort in recruiting enough new ARRL members to win the Club Challenge for the '80s. Dave Carlson, KE6NS, Amador County Emergency Coordinator, presents the certificate. *(K6BPB photo)*

Success Stories from the Past

Six clubs came out on top in 1985 as a result of their Club Challenge ARRL membership recruitment work. Each club name is followed by the type of rig they earned as a direct result of the number of League members they promoted:

Large Club Category

West Coast ARC: Icom IC-735
PHD ARA, Inc.: Yaesu FT-77 and antenna tuner

Medium Club Category

Amador County ARC: Kenwood TS-430
Owensboro ARC: Yaesu FT-77

Small Club Category

Georgia Tech Radio Club: Yaesu FT-77
University ARC: Heathkit HW-5400 HF transceiver, ac power supply/speaker/digital clock, SSB filter and control keypad

Tips from the Pros

How did these clubs do it? The Amador County ARC writes that it takes a dedicated person to spearhead the activity. Their group had such a person in Marjorie Watson, N6JTJ. Marjorie made a tremendous number of telephone calls and repeater contacts, and took every opportunity to give a sales pitch, not giving up for a moment. The club's success is directly due to her ability to raise the club's enthusiasm to win.

Another club, the PHD ARA, Liberty, MO, gave a year's free club membership to every new ARRL member. Those folks who already were club members had their club membership extended for an additional 12 months.

Bob May, K4SE, Trustee of the University ARC, wrote to ARRL HQ with this information: "Our recruitment methods for the Club Challenge were varied. First, we asked our own members who didn't belong to the ARRL to join. This wasn't as successful as originally hoped for, as most college students have to stretch their dollars quite a long way. The next effort was to ask other local clubs not participating in the Club Challenge to spread the word for us (some by giving our League membership form a "free ride" with their newsletters). Then we contacted several alumni whose calls we had on file. We found that most of the alumni were League members already. The final and most successful recruitment method was our booth at the Tri-Cities Hamfest, held in October. We were exposed to quite a few amateurs at the hamfest, many not League members. Throughout the effort, we found that new League members are recruited not five or ten at a time, but one and only one at a time. It's work—not always easy—but receiving the new rig is quite a welcome reward."

club can earn an all-band HF transceiver, if it promotes the most number of League members during 1986. For this competition, your club is placed in a category determined by your club size. You'll be competing against clubs in your size category only; the club that promotes the most new ARRL memberships in its size category will receive one of the HF transceivers.

Keeping Count

To keep track of the numbers of League members your club recruits, each club is given a unique four-digit code. This number should be written on every League membership application for which your club wants to receive credit and commission. The Club Services Department will keep track of the number of members your club recruits.

You Can Bank on It

"The check's in the mail" is an old and worn phrase, but with the Club Challenge, you can be sure of receiving your commission. If your club recruits a new member, who subsequently writes in the four-digit number on his or her application form, your club will receive a commission check for that membership. The checks are mailed monthly; we've recently mailed a few checks for $60 to some clubs—they recruited 12 new League members that month!

Give It a Try!

The Club Challenge is a League program designed to benefit everyone. Your club earns money—as much as it wants—it can earn a state-of-the-art transceiver, and your club's ARRL membership grows. A strong ARRL is listened to in Washington, and a strong ARRL is one that can support more and better programs and publications. Meet the Challenge! ist

Strays

I would like to get in touch with...

☐ anyone with schematics or other information for a DSI Instruments 50 Hz-512 MHz frequency counter, Model 5600A. Paul Johnson, ZS1BR, PO Box 108, Brackenfell 7560, Rep of South Africa.

☐ anyone with information on converting a Kenwood TS-185 with WARC for 4.517-MHz MARS operation. Dave Whaley, WB9SES, 9 Quail Run, Lake In The Hills, IL 60102.

☐ anyone with a circuit for a XITEX Corp SCT-100 terminal unit for RTTY use. John Brown, G3LPB, 45 Marlborough Ave, Falmouth, Cornwall TR11 4HS, Great Britain.

Golden Jubilee of DXCC Award

By John F. Lindholm, W1XX
Manager, ARRL Membership Communications Services

The ARRL Communications Department announces a new DX award to be made to any operator who can submit satisfactory proof that his amateur station has been in communication with 100 or more different countries. The award will consist of an attractive certificate of membership in the ARRL "DX Century Club."

So wrote F. E. Handy, W1BDI, ARRL Communications Manager, in the September 1937 issue of *QST*. The DX Century Club, which has gone on to become the benchmark for measuring DX prowess worldwide, thus marks its 50th anniversary, or Golden Jubilee, in the year 1987. To commemorate this significant Amateur Radio DXing event, the ARRL Board of Directors has called for a year-long DXing celebration open to all DXers the world over. This is highlighted by this announcement of a special Golden Jubilee of DXCC Award, a handsome four-color certificate embroidered in gold (see page 12). Amateurs may qualify by working 100 different countries on the ARRL Countries List during the calendar year 1987.

Rules

1) The Jubilee period to qualify for the Golden Jubilee of DXCC certificate is from 0000 UTC January 1 through 2359 UTC December 31, 1987. All contacts must be made during this period.

2) The Golden Jubilee certificate is awarded for working 100 or more countries on the ARRL Countries List. Contacts may consist of any combination of bands/modes (no 10 MHz).

3) No endorsements of any kind are offered. Certificates are dated, but not numbered.

4) The applicant certifies on the official application the authenticity of log extract information for contact with 100 countries. No QSL cards are required.

5) The Golden Jubilee certificate is separate and distinct from the traditional DXCC Awards program. Qualifying for the Golden Jubilee certificate does not provide credits for the traditional DXCC Awards program.

6) The Golden Jubilee certificate is available to ARRL members and nonmembers alike.

7) Applicable rules of the DXCC program, such as fair play and good sportsmanship, apply to the Golden Jubilee of DXCC Award.

8) The official application form must be used to facilitate processing. Application forms are available for a self-addressed envelope with one unit of postage (for US), or a self-addressed envelope from overseas. Send requests to:

Golden Jubilee of DXCC
American Radio Relay League
225 Main Street
Newington, CT 06111 USA

9) Send completed applications (within one year of the close of the Jubilee period) to ARRL HQ with $5 US, to cover cost of printing, postage and handling. In the case of non-US amateurs, 12 IRCs may be sent.

Moved and Seconded ...

(continued from page 66)

87) It was moved by Mr. Stafford, seconded by Mrs. Lewis, that Staff prepare a booklet entitled "On the Air." The booklet shall be aimed at new amateurs and recent upgrades and shall include, but not be limited to, the following topics: (1) operating practices on high frequency; (2) repeater operation (including a brief explanation of how a repeater works); (3) courtesy; (4) commonly used abbreviations and prefixes; (5) signal reporting system (including repeaters); (6) safety; (7) a League membership-solicitation with a list of membership benefits; (8) ARRL operating aids available. The booklet shall be made available to new amateurs and those individuals who take amateur exams under the ARRL/VEC program. ARRL-affiliated Volunteer Examiner teams shall be encouraged to distribute the booklet at their test sessions. On motion of Mr. Wangler, seconded by Mr. Carey, it was VOTED to refer the matter to the Executive Vice President for study.

88) On motion of Mr. Stafford, seconded by Mrs. Lewis, it was VOTED that the ARRL Staff contact vendors or suppliers of banners for the purpose of making available to affiliated clubs a banner that could be displayed at public service events to show that communications for the event are provided by amateur radio operators. Once Staff establishes a vendor or list of vendors for the banners, all affiliated clubs shall be notified of the availability of the banners.

89) It was moved by Mr. Stafford, seconded by Mr. Kanode, that in addition to the pin that is given to ARRL members with 25 or 40 years of membership, an appropriate certificate be sent to such individuals showing their years of ARRL membership. On motion of Mr. Wilson, seconded by Mr. Mendelsohn it was VOTED to refer the matter to the Executive Vice President for study, with a report, including an estimate of the cost, to be made to the Membership Services Committee before January 1987.

90) It was moved by Mr. Stafford, seconded by Mr. Overbeck, that the matter regarding standard operating procedures for the ARRL Awards Committee be lifted from the Table, but the motion was LOST.

91) It was moved by Mr. Overbeck that the Board hereby accepts the DXAC's recommendation to deny DXCC country status to the Vienna International Center; but there was no second, so the motion was LOST.

92) On motion of Mr. Oubre, seconded by Mr. Mendelsohn, it was VOTED that the Administration and Finance Committee study the desirability of placing all monies donated or willed to the League in an investment fund. This would exclude monies that have specific bequests. The Committee would present its findings and recommendations at the Annual Meeting of the Board in 1987. Messrs. Grauer and Frenaye requested to be recorded as voting opposed.

93) On motion of Mr. Oubre, seconded by Mr. Wilson, it was VOTED that the Emergency Communications Advisory Committee study the Emergency Coordinator (EC) Reporting System and recommend ways to make it more meaningful and to reflect the current needs of the program. The study is to include the existing monthly and annual reports. The Committee is to report its findings and recommendations to the Board by the Second Meeting of 1987. Mr. Hurlbert assumed the seat from Mr. Oubre at 8:08 PM.

94) It was moved by Mr. Hurlbert, seconded by Mr. Stafford that the Officers, Staff and Communications Counsel are directed to take such action as is necessary and appropriate to urge and induce the FCC in the Novice Enhancement proceeding, to accomplish the following: 1) Novice licenses in effect at the time of implementation of the program continue with existing privileges, including renewal;

2) To obtain "Enhanced" privileges, existing Novice class licensees must take the new written exam;

3) All Novice exams will be given by VE teams under the same conditions as other amateur exams; and

4) All Enhanced Novice licenses shall be issued for a five year term and shall be non-renewable.

Mr. Wilson raised a Point of Order, observing that the subject had been covered previously. The Chair ruled that the motion is out of order.

95) At this time the Chair invited Mr. Carey, who is not standing for reelection to another term as Director of the Rocky Mountain Division, to offer remarks. Mr. Carey briefly discussed his years on the Board and noted in particular the many friendships that had grown from his association with the ARRL "Official Family" (standing ovation).

96) There being no further business, on motion of Mr. Carey, seconded by Mr. Mendelsohn, it was VOTED that the Board adjourn *sine die* at 8:13 PM. Total time in session as a Board: 17 hours, 5 minutes; time in session as a Committee of the Whole: 1 hour, 12 minutes.

Respectfully submitted,
Perry Williams, W1UED Secretary

ARRL Board Charts Course for the Future...

...while recognizing the need to preserve our Amateur Radio past.

By Steve Place, WB1EYI
Manager, Volunteer Resources

The 1986 Second Meeting of the Board of Directors of the American Radio Relay League was held at the Farm Springs Marriott in Farmington, Connecticut on July 24-25. Representatives of each of the 16 regional ARRL Divisions were present.[1] Attending a Board Meeting for the first time as Vice Directors were Richard Whiting, WØTN, from the Dakota Division, and James Knochenhauer, K6ITL, from the Pacific Division.

In following the actions of your elected representatives in the official Minutes of the meeting that follow, bear in mind that a lot of the behind-the-scenes work is done in committees and in drafting motions both before and during the meeting. Board members who make few motions themselves generally contribute in a myriad of other ways to the smooth functioning of the League's decision-making team.

Reviewing a point at the table during a slide presentation are (left to right) K1LLU, VE3CDM and W3ABC.

Celebrating a Rich History

Among the highlights of this meeting was the growing excitement surrounding Amateur Radio's celebrating a number of milestones. Centerpiece in this tableau of celebration was the Board's approving in principle the creation of an ARRL Visitor Center and Museum at the Headquarters in Newington, Connecticut. In its discussion, the Board cited the need to preserve our Amateur Radio heritage, the need to renovate W1AW as an important artifact of this heritage, and the appropriateness of undertaking such a project to coincide with ARRL's 75th-Anniversary Diamond Jubilee year, 1989. (For more on the Visitor Center and Museum, see It Seems to Us, page 9.)

Also slated for the 1989 celebration calendar is a very special 75th-Anniversary Diamond Jubilee National Convention, to be held in Las Vegas, Nevada, and the possible production of a special 75th-Anniversary commemorative publication (now under study). Other milestones to be celebrated include the 1987 Golden Jubilee of the DXCC Award (for which a beautiful commemorative certificate was unveiled at the Board Meeting), and ARRL's participation in the 1987 bicentennial celebration of the US Constitution.

Legal...

A good deal of attention was given to ARRL's role in Amateur Radio-related legal matters: The advisory responsibilities of the Legal Strategy Committee were expanded, and a Legal Research and Resource Fund was established to provide for research, for expert opinions and for filing *amicus curiae* briefs in appropriate cases. Moreover, ARRL members seeking initial consultations with ARRL Volunteer Counsels (VCs) will henceforth be referred to two or more VCs on the same business day their request is received.

Clubs...

Clubs also received their share of attention. In the light of a number of comments and requests from ARRL Field Organization volunteers, in particular Section-level Affiliated Club Coordinators, the Board directed a thorough study of the criteria and procedures for becoming a Special Service Club and renewing SSC status each year. Also, a new category of club affiliation was created, Category 4, for groups of Amateur Radio clubs joined together in common purpose; 75% of the clubs making up a Category 4 society must be actively affiliated with the ARRL, and such societies will not be eligible to participate in club competitions.

Organizational...

Congratulations are in order to Chip Angle, N6CA, who was named the winner of the 1985 Technical Excellence Award, and to Sheila Murdock, WA7LQV, winner of the ARRL International Humanitarian Award Design Contest. The inaugural ARRL International Humanitarian Award, for 1985, was awarded posthumously to Vic Clark, W4KFC, for his lifetime commitment to the furtherance of international brotherhood and peace through Amateur Radio.

Also during its deliberations, the Board reviewed ARRL's filing in the issue of Novice Enchancement and directed Counsel to file reply comments in support of its previous position, asking only that the proposed 1240-MHz Novice segment be changed to conform with the existing band plan. In addition, the Board initiated a study of the possible complete restructuring of the DXCC program; directed that the ARRL begin paying for feature articles published in *QST* and *QEX*; and directed

[1]The names and addresses of all Directors appear on page 8 of this *QST*, under the headings of their respective Divisions.

ARRL Organizational (Regarding Articles of Association and By-Laws)

Minute	*Purpose*	*Disposition*
41	Amend By-Law 25, Board Meeting to be 3rd week of month	Adopted
48	Amend Article 8, frequency of Executive Committee meetings	Adopted
56	Amend By-Law 7(b), decease of principal family member	Adopted
57	Amend By-Law 9, transferability of Life Membership	Defeated
61/79	Amend Article 9, procedure to amend Articles and By-Laws	Tabled/ Referred to Committee

Other ARRL Organizational Matters

35	Survey former League members	Adopted
46	Study Special Service Club criteria	Adopted
47	W7WU-bequest Reserve for Museum operations/ acquisitions	Adopted
55	1987 Annual Meeting on Friday and Saturday, January 16-17	Adopted
58/68	Director/Vice Director candidate photographs with ballot	Tabled/Adopted
60	Study costs and methods of membership opinion survey	Adopted
63	Establish Legal Research and Resource Fund	Adopted
64	Establish individual incentives for recruiting new members	Adopted
67	Expand mission of ARRL Legal Strategy Committee	Adopted
70	ARRL reaffirms principles of IARU Constitution	Adopted
73	Member-referrals to Volunteer Counsels	Adopted
75	Study ARRL QSL cards for Field Organization volunteers	Adopted
76	Standard operating procedures for ARRL Awards Committee	Tabled
84	Create affiliation Category 4 for groups of clubs	Adopted
89	Study 25/40-year membership certificates	Adopted
92	Study investment fund for monies donated/willed to ARRL	Adopted
93	Study Emergency Coordinator (EC) reporting system	Adopted

Amateur Radio Operations

22	Permit analog-modulation spread-spectrum 97.71(e)(2)	Adopted
33	Endorse packet BBS software more in line with NTS format	Adopted
43	Celebration of bicentennial of US Constitution	Adopted
44	Novice Enhancement to conform with 1240-MHz band plan	Adopted
51	Study designating Health and Welfare traffic frequencies	Referred to Committee
53	Golden Jubilee DXCC Award	Adopted
54	Study allocations for automatic propagation beacons	Adopted
59	Study restructuring DXCC	Adopted
77	Improve W1AW bulletins	Adopted

Legal and Regulatory (Nonoperating)

65	ARRL opposes spectrum management fees for Amateur Radio	Adopted
78	ARRL does not support Electronic Communications Privacy Act of 1986	Adopted

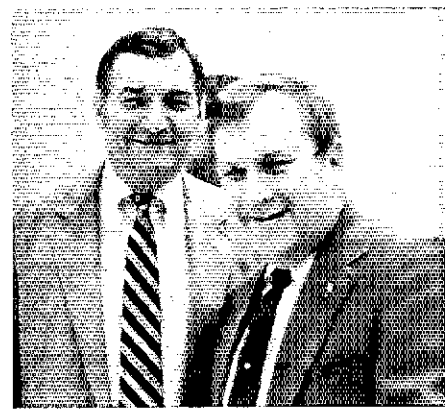
Publications/Media

18	Pay for feature articles published (*QST*, *QEX*)	Adopted
34	Slide/sound presentation for served agencies	Adopted
36	Guide to Amateur Radio publicity	Adopted
37	Updated production *The World of Amateur Radio*	Adopted
86	Study commemorative 75th-anniversary publication	Adopted
87	Study operating-skills booklet for new amateurs	Adopted

Miscellaneous

19	ARRL International Humanitarian Award Design Contest to WA7LQV	Adopted
19	Technical Excellence Award to N6CA	Adopted
40	1989 ARRL Diamond Jubilee Convention in Las Vegas	Adopted
45	ARRL Visitor Center and Museum proceed with next phase	Adopted
50	1988 ARRL National Convention dates (Portland, OR)	Adopted
52	Release W1AW schedules to other Amateur Radio publications	Adopted
62	ARRL new-ham congratulatory/welcoming letters	Adopted
66	Initiate MCI Bulletin Board Service	Defeated
72	Study cost of telephone audio news service	Adopted
80	Study providing documents at cost on all ARRL & FCC actions	Adopted
82	ARRL backdrop display banners	Adopted
83	ARRL portable tabletop booth	Adopted
85	1985 ARRL International Humanitarian Award to W4KFC (SK)	Adopted
88	Develop vendor list for emergency-communications display banners	Adopted

First Vice President Jay Holladay, W6EJJ in the Chair, with K1ZZ and W8RC to his left. In the background are W1UED and WB1EYI scrambling to keep the Minutes in line with the flurry of activity.



Directors W5CH and W4OYI eye the photographer skeptically.

Vice Directors VE3GRO and KBØZL put a coffee break to good use.

that a series of individual incentives for recruiting new members to ARRL be established.

Following This Article

A table summarizing the actions taken by the ARRL Board of Directors appears with this article. This chart and article provide only a thumbnail description of what happened, and we urge you to read the entire text of those items that interest you in the official Minutes, which immediately follow.

Moved and Seconded ...

MINUTES OF THE 1986 SECOND MEETING OF THE BOARD OF DIRECTORS THE AMERICAN RADIO RELAY LEAGUE, INC. JULY 24 - 25, 1986

Agenda

1) Roll Call
2) Moment of Silence
3) Consideration of the agenda for the meeting
4) Approval of Minutes of 1986 Annual Meeting
5) Oral reports of the Officers
6) Receive reports and consider recommendations of the committees
7) Consideration of the site for the 1989 ARRL National Convention
8) Directors' motions

1) Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc., met in session at the Marriott Hotel in Farmington, Connecticut, on July 24, 1986. The meeting was called to order at 8:30 AM EDT, with President Larry E. Price, W4RA, in the Chair and the following directors present: Thomas B. J. Atkins, VE3CDM, Canadian Division; Frank M. Butler, Jr., W4RH, Southeastern Division; Lys J. Carey, KØPGM, Rocky Mountain Division; Linda S. Ferdinand, N2YL, Hudson Division; Thomas W. Frenaye, K1KI, New England Division; Paul Grauer, WØFIR, Midwest Division; Fried Heyn, WA6WZO, Southwestern Division; Clyde O. Hurlbert, W5CH, Delta Division; Mary E. Lewis, W7QGP, Northwestern Division; Howard Mark, WØOZC, Dakota Division Edmond A. Metzger, W9PRN, Central Division; Gay E. Milius, Jr., W4UG, Roanoke Division; Rodney J. Stafford, KB6ZV, Pacific Division; Hugh A. Turnbull, W3ABC, Atlantic Division; Raymond B. Wangler, W5EDZ, West Gulf Division; George S. Wilson, III, W4OYI, Great Lakes Division.

Also in attendance as members of the Board without vote were Jay A. Holladay, W6EJJ, First Vice President; Leonard M. Nathanson, W8RC, Vice President; William J. Stevens, W6ZM, Vice President; Tod Olson, KØTO, International Affairs Vice President; and David Sumner, K1ZZ, Executive Vice President. Also in attendance at the invitation of the Board as observers were the following Vice Directors: Richard P. Beebe, K1PAD, New England Division; Thomas W. Comstock, N5TC, West Gulf Division; Rush S. Drake, W7RM, Northwestern Division; Evelyn D. Gauzens, W4WYR, Southeastern Division; John C. Kanode, N4MM, Roanoke Division; James Knochenhauer, K6ITL, Pacific Division; Harry MacLean, VE3GRO, Canadian Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; James M. Mozley, W2BCH, Atlantic Division; Lionel A. Oubre, K5DPG, Delta Division; Wayne Overbeck, N6NB, Southwestern Division; Marshall Quiat, AGØX, Rocky Mountain Division; Richard Ridenour, KB2L, Midwest Division; Allan L. Severson, AB8P, Great Lakes Division, and Richard Whiting, WØTN, Dakota Division. There were also present Harry J. Dannals, W2HD, President Emeritus; Honorary Vice President Robert York Chapman, W1QV; Secretary Perry Williams, W1UED; Treasurer James E. McCobb, K1LLU; Counsel Christopher D. Imlay, N3AKD; John F. Lindholm, W1XX, Membership Communications Manager; Stephen C. Place, WB1EYI, Volunteer Resources Manager; Paul Rinaldo, W4RI, Publications Manager; and Karl H. Muller, W3UBQ, Senior Staff Advisor for Planning and Operations.

2) The assembly observed a moment of silence in recollection of amateurs who have passed away since the previous Meeting of the Board, especially Michael Mankey, WBØTEE, Section Manager, North Dakota; Honorary Vice President Wayland M. Groves, W5NW; Rose Ellen Bills, N2RE past President, Young Ladies Radio League, and Roger Cole, W3DKX, past Section Manager of Delaware.

3) The Chair introduced Richard Whiting, WØTN, Vice Director, Dakota Division; and James Knochenhauer, K6ITL, Vice Director, Pacific Divison, both newly appointed.

4) On motion of Mr. Butler, seconded by Mr. Carey, the agenda was adopted as presented.

5) On motion of Mr. Milius, seconded by Mr. Butler, it was VOTED to approve the Minutes of the 1986 Annual Meeting in the form in which they appeared in the March 1986 issue of *QST*. Mr. Heyn requested to be recorded as voting opposed.

6) Moving now to agenda item 5, oral reports of the Officers were presented. President Price reported on the trip to the major Deutscher Amateur Radio Club hamfest at Friedrichshafen, West Germany to which he had been accompanied by Executive Vice President Sumner. Some 18,000 amateurs from most European countries were in attendance at the Convention, described as "very professionally done." Members of the Vienna International Centre Amateur Radio Club, 4U1VIC, conferred with the ARRL officials conveying information on the international status of the Centre to which some 90 ambassadors have been accredited. The Centre issues passports and postage stamps, is not subject to Austrian law, and has entered into a third-party treaty with the United States. On another subject, the President reported that the offer of the ARRL to assist the FCC in certain phases of callsign issuance had been conveyed to the Commission by letter, and an answer is awaited. There followed a report on a miscommunication which had led to the premature filing by ARRL for allocation of 18.068-18.168 MHz to US amateurs. The President concluded with a report on conversations with Mr. Richard Butler, Secretary General of the International Telecommunication Union on the likelihood of another General World Administrative Radio Conference within a decade. The Secretary General was unwilling to give a prediction of a date until sometime after the second session of a HF Broadcasting WARC early in 1987. During the course of the above, the Board was in recess from 9:58 to 10:22 AM.

7) Vice President Jay A. Holladay, W6EJJ, was next with a report on his activities as Chairman of the Special Study Committee on Advisory Committees; the effort to establish a small museum and amateur radio station as a memorial to the late Don C. Wallace, W6AM, at the site of his "rhombic farm" in Rancho Palos Verdes, California; and attendance at meetings of the Executive Committee in Charlotte and Portland, and at the OMIK Amateur Electronic Association's National Convention. Mr. Holladay recommended that programs in anticipation of new Novices entering Amateur Radio as a result of Novice Enhancement be developed. The newcomers must be provided with guidance, encouragement and good role models as they begin their amateur radio activities.

8) Vice President Nathanson reported on his assignments to the Administration & Finance Committee and as Chairman of the Legal Strategy Committee. Mr. Nathanson urged that attention be given to spectrum planning, particularly to accommodate the packet radio "explosion" in the 2-meter band.

9) Vice President Stevens's report concentrated on his work on the Volunteer Resources Committee, to be covered more fully by the Committee's extensive report later in the meeting.

10) Mr. Olson, Vice President for International Affairs, took advantage of a business trip to Europe to discuss amateur radio matters with officers of IARU Region 1 and of VERON, the IARU member society in the Netherlands, during which the concept of a World Conference on amateur packet radio for 1988 or 1989 was raised. Plans for the Region 2 Conference, October 20-25, 1986 in Buenos Aires were also covered in the report.

11) A comprehensive report of the Executive Vice President came next. Mr. Sumner covered recruitment of new amateurs (where there has been an increase of 2.3% in the number of amateurs in the past year); the program to increase the amateur radio population by 50% by the end of the decade, including Novice Enhancement; the Archie comic book with amateur radio storylines, scheduled for availability in September; the retaining of a public relations consultant; and activities of the Club Services Department. Under the heading of Publications, a report was presented on membership promotion, *QST* retail sales, *QEX*, Handbooks, and new publications, including a number of new works awaiting publication. A chart of Project Goodwill shows shipment of 352 kits to developing countries since the program began in 1978, 38 of them so far in 1986; 100 kits remain available. ARRL personnel turnover has been significantly reduced; there is improved Staff performance and attitude. A series of five seminars in supervisory skills training was very successful; a similar program will be run later in the year on the subject of performance appraisals. Mr. Sumner then made an extensive presentation regarding a proposed national amateur radio museum and visitor's center on the HQ property. During the course of the above, the Board was in recess for lunch from 11:57 AM to 12:54 PM, reconvening with all persons hereinbefore mentioned present except Messrs. Atkins, Hurlbert, Metzger and Nathanson, absent until 1:09 on business of the Administration & Finance Committee. At various times throughout the meeting, Vice Directors sat at the Table during short absences of their respective directors.

12) Treasurer McCobb reported on League investments; rates are down, but values of the portfolio are at an all time high. Equities represent 20-25% of the League's investments, with the remainder in fixed income securities. The League's financial position is strong.

13) Counsel Imlay summarized a long written report covering the ARRL petition to FCC relative to labeling of home electronic equipment; Novice Enhancement, RM 5038/Docket 86-161; the petition, RM 5434, under which the Association of Radio Reading Services is seeking 500 kHz in the amateur 220-225 MHz band; the 18 MHz matter; Docket 86-163 regarding Land Mobile operation at 421-430 MHz in Buffalo, Cleveland, and Detroit; the RF lighting devices docket, 83-806; matters concerning radio frequency interference and local cases involving antenna restrictions.

14) Mr. Grauer, as president, presented a report of the ARRL Foundation, Inc. The Goldwater Scholarship Fund continues to grow, reaching almost $60,000 by the end of May. There are 28 applications for the 1986 Goldwater Scholarship, 19 applications for other scholarships. The ARRL Foundation fund has increased by some $10,000 through the first five months of 1986.

15) The Board then moved on to agenda item number 6, reports and recommendations of committees. Mr. Metzger, as Chairman, presented the report of the Administration and Finance Committee. The Committee had the previous day viewed a presentation on the museum project and discussed it with the architects. Expense accounts and other financial matters were reviewed; aspects of hamfest travel in connection with committee meetings were discussed.

16) Mr. Carey, as Chairman, presented the report of the Membership Services Committee. Topics included packet radio traffic channels, club liability insurance, W1AW operating parameters, QSO parties, a system of taped news by telephone, and the three-tier club-competition study. Some of these studies are continuing. The committee showed a certificate which had been designed for the Golden Jubilee DXCC Award, to be issued for contacts made during 1987.

17) Mr. Wangler, as Chairman, presented the report of the Publications Committee which recommends that packet listings remain in the Repeater Directory for 1987; the study should continue in reference to the need for a separate publication at a later date. Alternatives to printed directories had been studied; action on these has been deferred until the 1987 Annual meeting. A study of combining newsletters also continues. Publications in Spanish are also under consideration, with the Buenos Aires conference in October furnishing opportunity for their discussion.

18) Mr. Wangler yielded the floor to Mr. Frenaye, who moved, Mrs. Ferdinand seconding, that effective with January, 1987, issues of *QST* and *QEX*, the Executive Vice President will pay authors appropriate honorariums for feature articles published, and will request the required amount in the 1987 budget request. It was moved by Mr. Hurlbert, seconded by Mr. Atkins, that the phrase, "the Executive Vice President will pay" be amended to read "the Executive Vice President may pay," but the motion to amend was LOST. Whereupon, a roll call vote being requested, the original motion was ADOPTED, 9 votes in favor to 6 votes opposed. All the Directors voted aye except Messrs. Carey, Grauer, Mark, Metzger, Turnbull and Wilson who voted nay, and Mr. Hurlbert, who abstained. During the course of the above, the Board was in recess from 2:53 to 3:27 PM.

19) Mrs. Lewis, as Chairman, presented the written report of the Volunteer Resources Committee. On motion of Mr. Stafford, seconded by Mr. Milius, it was VOTED that Sheila Murdock, WA7LQV, is declared the winner of the ARRL International Humanitarian Award Design Contest for the "hands clasped in friendship" design concept, which aptly depicts the spirit of the Award: the furtherance of international understanding and goodwill through Amateur Radio (applause). Discussion of the committee report continued, concerning activities for young and new members of the amateur radio fraternity; ways of acquiring video tapes which depict amateur radio activities; final draft of local memoranda of understanding; continuing study on hamfest and convention matters, including a guidebook; "fine tuning" on the callsign badge program (since then announced in July *QST*); recommendation for creation of a West Texas section (already adopted by the Executive Committee in June); the creation of new

adhesive stickers replacing the yellow and black convention buttons; creation of new backdrop banners for hamfest and convention booths; availability of amateur radio magnetic signs for motor vehicle doors; and discussions leading to selection of nominees for the 1985 ARRL International Humanitarian Award. On motion of Mr. Heyn, seconded by Mrs. Lewis, it was unanimously VOTED that E.R. "Chip" Angle, N6CA is named recipient of the 1985 Technical Excellence Award and is awarded the Pewter Cup for his two-part article, "A Quarter-Kilowatt 23-cm Amplifier" that appeared in the March and April issues of *QST* (applause).

20) Mr. Price, as Chairman, presented the report of the Executive Committee. In response to Minute 57 of the 1986 Annual Meeting the committee adopted ethics guidelines for Section Managers at its June meeting. Recommendations for changes in the mailing list guidelines were also reported in the Minutes of the June Executive Committee meeting. A third action is the creation of a West Texas section in response to the Volunteer Resources Committee recommendation.

21) Mr. Atkins, as Chairman, presented the report of the Ad Hoc Committee on the Strengthening of CRRL. The committee had reviewed progress in implementing the five-year plan for CRRL autonomy and considered changes which would be necessary in the ARRL Articles of Association and By-Laws to complete this transition.

22) Mr. Butler, as Liaison, presented the report of the Ad Hoc Committee on Spread Spectrum. The thrust of the report was that interoperability standards are not called for at this time since they would lock in technology at a primitive level. On motion of Mr. Butler, seconded by Mr. Carey, it was VOTED that Counsel is directed to petition the FCC to correct a technical oversight in section 97.71(e)(2) to permit analog modulation and simpler generation of direct-sequence spread-spectrum signals.

23) Mr. Comstock, as Chairman, presented the Interim Report of the Blue Ribbon Committee formed to study all aspects of amateur communication following a widespread disaster such as the Mexico earthquake. Action items already adopted by the committee include recommendations that Headquarters develop a written contingency plan; another recommendation that ARRL should combine all emergency activities (ARES, RACES, Skywarn, etc.) under the ARRL umbrella and that it should, in conjunction with FEMA, Red Cross and other agencies, develop an emergency communications team capability. Tasks have been assigned to subcommittees on emergency communications teams and on large volume traffic in NTS, as a continuation of the committee's studies.

24) Mr. Turnbull, as Chairman, presented a report of the RFI Task Group, which has been involved in ANSI C.63 Ad Hoc Committee on Public Law 97-259 studying standards for immunity to interference of consumer electronic products.

25) Mr. Wangler, as Chairman, presented the report of the Bio-effects Committee. The Committee monitors local ordinances and state statutes in the field of biological effects, studies proposed changes in standards such as ANSI Standard C95.1 and reviews literature in the field. Its Headquarters Liaison, Bruce Williams, attended the Symposium of the Electromagnetic Energy Policy Alliance in Washington during May. Mr. Wangler also reported on impending personnel changes on the committee.

26) The Board was in recess from 5:29 to 8:35 PM, reconvening with First Vice President Holladay in the Chair, and all members hereinbefore mentioned present except Mr. Price, temporarily absent on Board business, and Mr. McCobb who returned to his home.

27) Mr. Holladay, as Chairman, presented the Interim Report of the Special Study Committee on Advisory Committees. Initial responses to a questionnaire circulated to Directors were that ARRL should continue to have advisory committees; Directors want to continue appointing AC members; smaller working groups are desirable; the mission of each committee should be studied; and better feedback is necessary. The work of the committee continues.

28) Mr. Olson, as Liaison, presented the report of the Ad Hoc Committee on Amateur Radio Digital Communications. The committee estimates that the number of packet stations worldwide has increased to 18,000. Field trial of networking and transport protocols is underway. A petition for reconsideration in Docket 85-105 was filed by the League, and "Extraordinary Relief" from some of the provisions adopted in that proceeding was sought from FCC and granted by that body. The committee currently is researching the special temporary authorizations that are to be sought by the League for a number of packet gateway stations to operate under automatic control below 30 MHz. The committee is also studying changes to the amateur regulations that may be desirable in light of FCC adoption of new emission designators to conform to the ITU Radio Regulations.

29) Mr. Nathanson, as Chairman, presented a report of the Legal Strategy Committee. The committee recommended that Directors maintain lists of Volunteer Counsels (VCs) in their divisions and furnish the names of at least two VCs to each amateur needing legal assistance. To support efforts of VCs, Headquarters should maintain an archive of case materials. The committee plans a revised model *amicus curiae* brief on zoning issues. Other topical reports are needed and plans have been made for their preparation. At 9:08 PM, Mr. Price returned to the meeting and resumed the Chair.

30) Mr. Oubre, as Liaison, reported briefly for the VHF Repeater Advisory Committee, which had not been given any tasks at the last meeting.

31) The report of the Contest Advisory Committee was presented by Mr. Kanode, as Liaison. On recommendation of the committee, a rule has been adopted discouraging the use of non-amateur radio means for the solicitation of contacts during contest periods. A new category of low-power portable stations has been instituted for the September VHF contest to encourage operation from rare "foot-access" grid squares.

32) Mr. Drake, as Liaison, presented the report of the DX Advisory Committee. DXAC voted overwhelmingly in favor of ARRL's sponsoring a special event to commemorate the 50th Anniversary of DXCC. The matter of country status for Aruba is being studied. The history of discussions over the country status of 4U1VIC was reviewed, with the committee still of the view that the station does not meet criteria for country status.

33) Mr. Beebe, as Liaison, presented the report of the Emergency Communications Advisory Committee. The committee's work had centered on two matters: protocols of packet radio message handling and matters concerned with the support of the National Weather Service by amateur operators. On motion of Mr. Butler, seconded by Mr. Frenaye, it was unanimously VOTED that, in light of the ECAC report, the Board support in principle the direction of current Packet Bulletin Board System (PBBS) software development which is bringing it more in line with standard NTS format.

34) Mrs. Gauzens, as Liaison, presented the report of the Public Relations Advisory Committee. Work on the amateur radio comic book for distribution in September is nearly completed. There is progress toward production of a slide show for served agencies. On motion of Mr. Butler, seconded by Mr. Heyn, it was VOTED that funding previously approved for the special committee producing the slide/sound presentation for served agencies be extended and continued through final production stages.

35) On motion of Mrs. Lewis, seconded by Mr. Stafford, it was VOTED that the Executive Vice President initiate a survey of former League members to determine why they quit and what might bring them back; and, based on the results, develop a campaign aimed at reinstating former League members.

36) On motion of Mr. Butler, seconded by Mrs. Ferdinand, it was unanimously VOTED that in an effort to help section Public Information Officers, Public Information Assistants and Affiliated Clubs assure maximum public exposure for Amateur Radio, the Public Relations Advisory Committee, in cooperation with Headquarters Staff, write a comprehensive guide to Amateur Radio publicity; and that said committee report on the progress or completion of the guide by the Board's second meeting of 1987.

37) On motion of Mr. Stafford, seconded by Mr. Atkins, it was unanimously VOTED that the Executive Vice President include funds for an updated production of "The World of Amateur Radio" on videotape in the 1987 capital budget.

38) Mr. Overbeck, as Liaison, reported for the reactivated VHF/UHF Advisory Committee. Several committee members were expected to hold an in-person meeting in St. Louis contemporaneously with this Board meeting.

39) The Board was in recess for the night at 10:33 PM, reconvening the following day at 8:30 AM, with all persons hereinbefore mentioned present except for Messrs. McCobb and Chapman.

40) Turning to Agenda Item 7, consideration of the site for the 1989 ARRL National Convention in observance of the ARRL Diamond Jubilee/75th Anniversary, it was moved by Mr. Butler, seconded by Mr. Milius, that the decision be delayed until the 1987 Annual Meeting of the Board in January. After discussion, a roll call vote being requested, the motion to delay was LOST, 6 votes in favor, 9 votes opposed and 1 abstention. The following Directors were recorded as voting in favor: Mr. Butler, Mrs. Ferdinand, and Messrs. Frenaye, Mark, Milius and Turnbull. The following Directors were recorded as voting opposed: Messrs. Atkins, Carey, Grauer, Heyn, Mrs. Lewis, and Messrs. Metzger, Stafford, Wangler and Wilson. Mr. Hurlbert abstained. After discussion, moved by Mrs. Ferdinand, seconded by Mr. Carey, it was VOTED to take up consideration of sites. There were found to be two applicants eligible and qualified under the guidelines laid down by the Board at the Annual Meeting. Mr. Stafford spoke in favor of Las Vegas; Mr. Wangler spoke in favor of Oklahoma City. After extended discussion, moved by Mr. Stafford, seconded by Mrs. Lewis, it was VOTED that the 1989 ARRL Diamond Jubilee National Convention will be held in Las Vegas, Nevada.

41) Moving then to Agenda Item 8, Directors' Motions, Mr. Grauer moved, Mr. Carey seconded, that By-Law 25 be changed as follows: The first sentence, after the word Connecticut, be changed to read "beginning on the 3rd Thursday of January," and the second sentence, after the word Connecticut, be changed to read "beginning on the 3rd Thursday of July." It was moved by Mr. Wilson, seconded by Mr. Frenaye, to amend the motion, changing the word "Thursday" to "Friday" in both instances. After discussion, the motion to amend was LOST, 8 votes in favor, 8 votes opposed, with President Price casting the deciding vote in opposition. The question then being on the original motion, with 11 votes necessary for adoption, the question was decided in the affirmative, 15 votes in favor to 1 opposed. All Directors voted aye except Mr. Butler, who voted nay. So the By Laws are AMENDED.

42) It was moved by Mr. Wangler, seconded by Mr. Atkins, that By-Law 25 be further amended for the meetings to begin on Fridays. Mr. Grauer raised a Point of Order. The Chair ruled that the motion was out of order, since the question had been decided in the negative during the previous motion.

43) On motion of Mr. Turnbull, seconded by Mr. Hurlbert, the following resolution was ADOPTED:

WHEREAS, September 17, 1987 marks the 200th anniversary of the adoption of the United States Constitution; and

WHEREAS, the US Constitution embodies the ideals of liberty and freedom cherished by this nation's citizens and serves as the anchor for the most successful experiment in democracy known in the history of mankind; and

WHEREAS, the Bicentennial of the Constitution presents an opportunity for the nation's Radio Amateurs to join all Americans in honoring the great and enduring achievements of our Founding Fathers and the authors of the US Constitution;

NOW THEREFORE, BE IT RESOLVED that the American Radio Relay League formulate appropriate plans to join in this nation's celebration of the bicentennial of the US Constitution.

44) It was moved by Mr. Wilson, seconded by Mr. Atkins, that Counsel is authorized to file reply comments in regard to the Notice of Proposed Rule Making in PR Docket 86-161 (Novice Enhancement) supporting the position previously adopted by the Board, with the exception that the Novice segment in the 1240-MHz band be changed from 1246-1260 MHz to 1270-1295 MHz, to conform with the existing bandplan. It was then moved by Mr. Frenaye, seconded by Mr. Metzger, to amend the motion to include in the reply comments that Novice examinations should be administered exclusively within the VEC Program. A roll call vote being requested, the motion to amend was LOST, 5 votes in favor and 10 opposed with 1 abstention. The following Directors were recorded as voting in favor: Messrs. Frenaye, Heyn, Hurlbert, Metzger and Stafford. The following Directors were recorded as voting opposed: Messrs. Butler and Carey, Mrs. Ferdinand, Mr. Grauer, Mrs. Lewis, and Messrs. Mark, Milius, Turnbull, Wangler and Wilson. Mr. Atkins abstained. It was then moved by Mr. Stafford, seconded by Mr. Frenaye, that the motion on the floor be amended to include in the reply comments that the Novice license be non-renewable and good for a term of three years, but the motion to amend was LOST. The question then being on the original motion, it was unanimously ADOPTED. During the course of the above, the Board was in recess from 9:52 AM to 10:16 AM.

45) On motion of Mr. Hurlbert, seconded by Mr. Heyn, the following resolution was unanimously ADOPTED:

WHEREAS, radio has a rich heritage expressed in artifacts of the past, in the written and recorded word and in the memories of practitioners, and

WHEREAS, this history in its totality is in danger of fading from our institutional memory as the remaining pioneers join Silent Keys, and

WHEREAS, the history of Amateur Radio traces the history of electronic communication itself, and highlights the contributions of individual experimenters to the progress made in this vital field, and

WHEREAS, the Hiram Percy Maxim Memorial Station, itself an important artifact of this heritage as well as an instrument of service to ARRL Members and radio amateurs generally, is in need of physical renovation and expansion of its capabilities for service, and

WHEREAS, the ARRL will observe its Diamond Jubilee, the seventy-fifth anniversary of its founding, in 1989, and

WHEREAS, the Members should be given the opportunity and privilege of participating in all facets of the Jubilee celebration, to preserve the heritage of

Amateur Radio, and to honor with enduring public recognition the significant contributors and special events of the past in electronic communication, and

WHEREAS, the Board of Directors of the ARRL has previously appropriated funds for the study of the feasibility and the planning for a Visitor Center and Museum, and

WHEREAS, the ARRL Board of Directors has reviewed the proposals of Mr. Tai Soo Kim and Associates, architects, of Hartford, Connecticut and

WHEREAS, the Board has received reports, recommendations, and cost estimates, and has viewed and considered preliminary plans, models, slides and drawings, and

WHEREAS, this Board has determined to give the Officers and Staff of the ARRL specific authority to proceed to the next phase of the Visitor Center and Museum project, now therefore, it is hereby

RESOLVED, by the Board of Directors of the American Radio Relay League in meeting assembled this twenty-fifth of July, 1986, that the Board approves in principle the creation of an ARRL Visitor Center and Museum at the Headquarters of the League in Newington, Connecticut, and it is further

RESOLVED: That the Officers and Staff of the ARRL are hereby authorized to proceed without further funding, with the project of the construction of a Visitor Center and Museum, to accomplish the following:

1. The funding sources for this project should be studied and surveyed. Consideration should be given the following techniques:

(a) Use of a nationally known person, identified with radio or electronics, to chair a fund-raising committee;

(b) Identification of membership contributions; and

(c) Identification of potential corporate, governmental and private sources of capital contributions.

2. Establish a special investment fund for the accumulation of capital contributions to the project;

3. Utilize the services of the Treasurer and Administration and Finance Committees in the interim investment of contributed funds;

4. Identify and resolve all questions involving zoning, land use, and tax exemptions;

5. Establish liaison and working relationships with all governmental agencies concerned with the project;

6. Maintain close liaison with the Administration and Finance Committee;

7. Report fully on this project to the Board at its January, 1987 meeting;

8. There shall be no deviation from this plan of the Board for the implementation of this project without the prior approval of the Board.

46) On motion of Mr. Wilson, seconded by Mr. Grauer, it was unanimously VOTED that the Volunteer Resources Committee completely review the criteria for a club's obtaining and retaining Special Service Club status in the light of several comments that have been received from Field Officials, and report what, if any, changes should be made to the next regular Board Meeting.

47) It was moved by Mr. Olson, seconded by Mrs. Ferdinand, that the recently received $85,000 bequest from Thomas Lowery, W7WU, be set up in a Reserve to be used to establish two equal Trust Funds, earnings from which would be used to fund day-to-day operations of the proposed Visitor Center/Museum and to acquire artifacts to be shown in the museum. It was then moved by Mr. Hurlbert, seconded by Mr. Atkins, to strike the text of the motion and substitute therefor the following: "That the Administration and Finance Committee study the desirability of placing all monies donated or willed to the League in an investment fund. This would exclude monies that have specific bequests. The Committee would present its findings and recommendations at the Annual Meeting of the Board in 1987." After further discussion, Mr. Hurlbert withdrew the motion to amend with the consent of his second. The question then being on the original motion, it was unanimously ADOPTED.

48) It was moved by Mr. Carey, seconded by Mr. Milius, to amend Article 6 of the Articles of Association and By-Laws by substituting "semi-annually" for the word "quarterly" in the third sentence. A roll call vote being required, the motion was decided in the affirmative, 14 to 2, with all Directors voting in favor except for Messrs. Butler and Grauer. Article 6 is, therefore, so AMENDED.

49) Moved by Mr. Frenaye, seconded by Mrs. Ferdinand, that Article 9 of the Articles of Association be modified by substituting the following text: "These Articles may be amended by a two-thirds vote of all Directors, provided the text of the proposed amendment shall have been published in *QST*. The Board of Directors may from time to time adopt By-Laws not inconsistent with the Articles and applicable statutes. By-Laws may be amended by a two-thirds vote of all Directors provided the text of the proposed amendment shall have been published in *QST*." Following extended discussion, Mr. Frenaye WITHDREW the motion with the consent of his second.

50) On motion of Mrs. Lewis, seconded by Mr. Stafford, it was unanimously VOTED that July 21-24, 1988 will be the date of the ARRL National Convention in Portland, Oregon and that the hotel will be the Lloyd Center Red Lion.

51) It was moved by Mr. Stafford, seconded by Mrs. Lewis, that ARRL Staff is directed to study and make recommendations to the Board designating specific HF frequencies for operational Health and Welfare traffic within the US and between the US and foreign countries, Staff to report back to the Board at the January 1987 Annual Meeting. On motion of Mr. Butler, seconded by Mr. Hurlbert, it was VOTED to refer the matter to the Emergency Communications Advisory Committee. Mr. Frenaye requested that he be recorded as voting against the referral.

52) On motion of Mr. Milius, seconded by Mr. Carey it was VOTED that the Headquarters Staff release WIAW schedules to other amateur publications on a regular basis.

53) It was moved by Mrs. Ferdinand, seconded by Mr. Grauer, that the report of the Membership Services Committee regarding the Golden Jubilee of DXCC is accepted, and that Staff is directed to proceed with implementation along the guidelines of that report. On motion of Mr. Wangler, seconded by Mrs. Lewis, it was VOTED that the motion be amended by adding "and that the certificate be signed by the ARRL President only." The question then being on the motion as amended, it was unanimously ADOPTED. The Board was in recess for lunch at 11:52 AM, reconvening at 12:50 PM with all hereinbefore mentioned present except Messrs. McCobb and Chapman.

54) On motion of Mr. Heyn, seconded by Mr. Wangler, it was VOTED that the VHF-UHF Advisory Committee is directed to study the appropriateness of current frequency allocations for VHF-UHF automatic propagation beacons and report back to the Board at its 1987 Annual Meeting.

55) On motion of Mr. Wangler, seconded by Mr. Frenaye, it was VOTED that under By-Law 25 the January 1987 Meeting of the Board will be held on Friday and Saturday, January 16-17.

56) It was moved by Mr. Turnbull, seconded by Mr. Atkins, that By-Law 7(b) be amended by adding the following: "In the event of the decease of such principal member, his or her spouse will continue to receive *QST* until the expiration of the current family membership." A roll call vote being required, the matter was decided in the affirmative, 15 votes in favor to 1 opposed, with all Directors voting aye except for Mr. Carey who voted nay. Therefore, the By-Laws are so AMENDED.

57) It was moved by Mr. Turnbull, seconded by Mr. Grauer that By-Law 9 be amended to read as follows: "Life Membership is not transferable except that in the event of the decease of a Life Member, the membership, including receipt of *QST*, of a spouse who has paid dues as a Family Life Member in accordance with By-Laws 7(b) and 8 shall continue for the balance of his or her life." It was moved by Mrs. Ferdinand, seconded by Mr. Hurlbert, to amend the motion by substituting at the end: "for no more than 5 years," but the motion to amend was LOST. The question then being on the original motion, a roll call vote was required with 11 votes necessary for adoption. There were 8 votes in favor, 7 votes opposed and 1 abstention, so the motion to amend By-Law 9 was LOST. Directors recorded as voting in favor were: Messrs. Atkins and Butler, Mrs. Ferdinand, Mr. Heyn, Mrs. Lewis, and Messrs. Turnbull, Wangler and Wilson. Directors recorded as voting opposed were: Messrs. Carey, Grauer, Hurlbert, Mark, Metzger, Milius and Stafford. Mr. Frenaye abstained.

58) It was moved by Mr. Hurlbert, seconded by Mr. Carey, that a candidate for Director or Vice Director be permitted to include on the 300-word statement mailed with the ballot, a black-and-white photograph of himself or herself, not to exceed 2 inches by 3 inches, effective with the election for the 1987-1988 term. The ARRL will not be responsible for the clarity of the photograph as printed in the election material. After discussion, on motion of Mr. Frenaye, seconded by Mr. Stafford, the motion was AMENDED to become effective with the election for the 1988-1989 term. It was moved by Mr. Wangler, seconded by Mr. Mark to further amend the motion to include Section Manager elections beginning in 1988. It was moved by Mr. Metzger, seconded by Mr. Milius that the motion be laid on the Table. Mr. Heyn raised a Point of Order concerning the motion to Table saying that there was no "obvious, urgent and immediate need" for the action. the Chair ruled that the motion was in order, whereupon it was VOTED that the matter is laid on the Table.

59) On motion of Mr. Wilson, seconded by Mr. Olson, it was VOTED that the DXAC consider the advisability of restructuring DXCC. This group will not be precluded from considering any possibilities, up to and including even a "fresh start" award, replacing the present DXCC. If restructured, the award might take any form, but should include:

1) Ease in administration, including countries criteria, and,

2) If the present DXCC is replaced, there should be a closeout period to achieve an additional level of recognition and to receive final confirmations.

3) Opinions of other DXers, particularly those in other nations of the IARU, should be invited.

It is understood that the Board may or may not adopt a restructured award, but is interested in the input of the amateur community as to whether one is desired and the form it should take if implemented.

Progress reports should be made by DXAC 60 days in advance of each Board meeting, with the final report expected by December 31, 1988.

60) On motion of Mrs. Ferdinand, seconded by Mr. Heyn, it was VOTED that the Executive Vice President be requested to investigate the cost of various methods of holding a membership opinion survey. He should report his findings to the Board at the 1987 Annual Meeting.

61) It was moved by Mr. Frenaye, seconded by Mrs. Ferdinand, that Article 9 of the Articles of Association be amended to read: "These articles may be amended by a three-fourths vote of all directors, or, provided due notice of the proposed amendment shall have been published in *QST*, by a two-thirds vote of all directors. During the course of the above Mr. Quiat took the seat for Mr. Carey, at 2:01 PM. The Board of Directors may from time to time adopt By-Laws not inconsistent with the Articles and applicable statutes. By-Laws may be amended by a three-fourths vote of all directors present, or, provided due notice of the proposed amendment shall have been published in *QST*, by a two-thirds vote of all directors." It was then moved by Mr. Quiat, seconded by Mr. Atkins, that the motion be amended by adding "at a Board Meeting" after the word "amended" on the first line, substituting "at least 30-days notice" for 'due notice' on the second line, substituting "submitted for publication in *QST* with notice by mail to the directors" for "published in *QST*" in line 3, and adding to the first sentence "further, that any amendments to the original motion shall be governed by the 2/3 requirement." It was moved by Mr. Milius, seconded by Mr. Mark, that the matter be laid on the Table. Mr. Heyn again raised a Point of Order concerning "obvious, urgent and immediate need," but the Chair ruled that the motion to Table is in order. Whereupon, the Chair called the question; it was VOTED that the matter is laid on the Table. Mr. Frenaye and Mrs. Ferdinand requested to be recorded as voting against the motion to Table. During the course of the above, the Board was in recess from 2:10 to 2:28 PM.

62) On motion of Mrs. Lewis, seconded by Mr. Frenaye, it was unanimously VOTED that the Executive Vice President is directed to develop for the 1987 fiscal year an effective program of congratulating and welcoming all newly-licensed radio amateurs to Amateur Radio on behalf of the ARRL (for example, by making periodic mailings to new licensees), with the following additional objectives: (1) encouraging early and ongoing active participation in Amateur Radio and (2) encouraging ARRL membership.

63) On motion of Mr. Stafford, seconded by Mr. Milius, it was unanimously VOTED that the Board of Directors establish a "Legal Research and Resource Fund" to provide for research and expert opinions, and recommend filing of *amicus curiae* briefs in amateur radio-related legal proceedings. Any such assistance shall be upon recommendation of the Legal Strategy Committee. The fund shall be supported by voluntary member contributions, and shall be augmented by funds previously collected in the Legal Defense Fund. Staff is instructed to appropriately modify the ARRL membership form to allow League members to contribute $1.00 or more to the fund over and above the membership fee.

64) On motion of Mr. Milius, seconded by Mrs. Lewis, it was unanimously VOTED that the Executive Vice President establish and publicize a series of appropriate individual incentives for recruiting new members; and that future League membership applications include a line to read: "Referred by:".

65) On motion of Mr. Butler, seconded by Mr. Metzger, the following resolution was unanimously ADOPTED:

WHEREAS, traditionally, spectrum management activities have been performed at no cost to those served, and

WHEREAS, spectrum management is an important continuing activity of Amateur Radio,

NOW, THEREFORE, BE IT RESOLVED that the ARRL Board of Directors, assembled at Newington, Connecticut on July 25, 1986 does go on record as opposing the imposition of fees for spectrum management by any spectrum management body or individual within Amateur Radio.

66) It was moved by Mr. Heyn, seconded by Mr. Butler that the Executive Vice President is directed to initiate MCI bulletin-board service on an experimental basis, with the cost of connection not to be borne by the League, and to investigate other means of electronic

communication with the membership that may be cost effective. After discussion, the motion was LOST.

67) On motion of Mr. Hurlbert, seconded by Mr. Frenaye, the following resolution was ADOPTED:

WHEREAS, the Legal Strategy Committee is a resource of the League that should be utilized to the fullest advantage; and

WHEREAS, each member of the Committee should be kept fully advised as to all legislative and regulatory matters that may affect Amateur Radio in order to effectively utilize the expertise available,

NOW, THEREFORE, IT IS HEREBY RESOLVED, that the President, Executive Vice President, Washington Area Coordinator and Communications Counsel maintain strict liaison with the Legal Strategy Committee and inform its Chairman and members of all legislative and regulatory matters which may affect Amateur Radio, furnishing copies of bills, notices, proposals, *et cetera*, as they may come to the attention of these officials.

IT IS FURTHER RESOLVED, that on all legal, legislative and regulatory matters, the advice and recommendations of the Legal Strategy Committee may be sought.

IT IS FURTHER RESOLVED, that Officers and Staff of the League are not to be bound by any advice or recommendations made by the Legal Strategy Committee, nor shall the Committee's advice and recommendations constitute League "Policy." At this point, 3:00 PM, Mr. Carey returned to his seat at the table.

68) On motion of Mr. Wilson, seconded by Mr. Stafford it was VOTED that the motion dealing with candidate photographs be lifted from the Table. It was then moved by Mr. Hurlbert, seconded by Mr. Carey, to strike the text and substitute therefor the following: "Moved, that the biographical sketches for candidates for Director or Vice Director provide for inclusion with the 300-word statement mailed with the ballot, a black-and-white photograph not larger than 2 inches by 3 inches. This shall take effect with the current election. Submission of the photograph shall be subject to the same deadline for filing as the biographical script. Further, that a Section Manager election photograph be similarly included, to apply beginning in the 1988-1989 term. ARRL will not be responsible for the clarity of the photographs as printed in the election material." Mr. Holladay assumed the Chair for Mr. Price at 3:22 PM. It was moved by Mr. Heyn, seconded by Mr. Frenaye, that the matter be referred to the Executive Committee, but the motion to refer was LOST. Mr. Frenaye requested to be recorded as voting in favor. It was moved by Mr. Butler, seconded by Mrs. Ferdinand, that the motion be amended to take effect on 1 January 1988, but the motion to amend was LOST. Whereupon, the question being on the substitute motion, and a roll call vote being requested, it was ADOPTED 9 votes in favor to 7 votes opposed. Directors recorded as voting in favor were Messrs. Carey, Grauer and Hurlbert, Mrs. Lewis, and Messrs. Mark, Metzger, Milius, Stafford and Wilson. Directors recorded as voting opposed were Messrs. Atkins and Butler, Mrs. Ferdinand, and Messrs. Frenaye, Heyn, Turnbull and Wangler. The Board was in recess at 3:33 PM, reconvening at 3:58 PM with Mr. Price once again in the Chair. Mr. Mendelsohn took the seat for Mrs. Ferdinand, who left the meeting because of a family emergency.

69) On motion of Mr. Olson, seconded by Mr. Mendelsohn, it was VOTED at 3:59 PM to assemble into a Committee of the Whole for the purpose of discussing Region 2 IARU matters. The Committee rose and reported to the Board at 5:11 PM, and Mr. Kanode took the seat for Mr. Milius at this time.

70) On motion of Mr. Olson, seconded by Mr. Kanode, the following resolution was unanimously ADOPTED:

WHEREAS, a fundamental reason for the existence of the International Amateur Radio Union is to support its member-societies in the effective representation of Amateur Radio in their respective countries (Article I.2), and

WHEREAS, the IARU Constitution states that only one member-society may represent Amateur Radio in each country (Article II.1), and

WHEREAS, the IARU Constitution assigns to each member-society the right to represent IARU in its country (Article II.5c), and

WHEREAS, the IARU Constitution states that each member-society retains complete autonomy with respect to its internal affairs (Article II.4), and

WHEREAS, the IARU Constitution states that each regional organization must operate in accordance with the IARU Constitution (Article IV.4), and

WHEREAS, respect by each entity of the IARU (Member-Society, Regional Organization, Administrative Council) for the fundamental and exclusive right of each member-society to represent Amateur Radio to its telecommunications administration is an essential element of the mutual support that must exist if the IARU is to function smoothly, be it

RESOLVED, by the Board of Directors of the American Radio Relay League, in meeting assembled July 25, 1986, that the principles outlined above are hereby affirmed in the strongest possible terms;

Further RESOLVED, that the officers of the ARRL are hereby commended for their firm commitment to these principles; and

Further RESOLVED, that the Officers are instructed to seek reaffirmation of these principles by the IARU Region 2 Conference in Buenos Aires and by the IARU member-societies through all other processes.

71) It was moved by Mr. Mendelsohn, seconded by Mrs. Lewis that the Executive Vice President study the feasibility of a newsletter for beginners and report options and recommendations to the Board at the 1987 Annual Meeting. After discussion the motion was WITHDRAWN. Mr. MacLean took the seat at 5:24 PM for Mr. Atkins who returned to his home.

72) On motion of Mr. Mendelsohn, seconded by Mrs. Lewis, it was VOTED that the Membership Services Committee study and report to the Board at its 1987 Annual Meeting on costs associated with the establishment of a telephone audio news service, such service to carry DX and propagation bulletins, ARRL and FCC news of interest to amateurs and items of interest to League members.

73) It was moved by Mr. Mendelsohn, seconded by Mr. Stafford, that all member-referrals to Volunteer Counsels (VCs) shall be made by the Director of the Division where the member resides. All referrals shall include the name of at least two VCs. Staff is directed to periodically provide Division Directors with names, addresses and telephone numbers of all VCs with their Divisions so that the Director will have an up-to-date roster. In addition, all member requests shall be referred to the director within 24 hours of receipt. On motion of Mr. Wilson, seconded by Mr. Carey, it was VOTED to amend the motion by striking the text and substituting therefor the following: All referrals to Volunteer Counsels shall include the name of at least two VCs and be responded to on the same business day as the request is received. The vote then being on the main motion as amended, the same was unanimously ADOPTED.

74) It was moved by Mr. Heyn, seconded by Mr. Wangler that Article 9 of the Articles of Association be amended by deleting the last sentence which reads, "Notices shall be sent by First-Class Mail, and to all directors residing more than 250 miles from Newington, Connecticut, by Air Mail." Mr. Frenaye raised a Point of Order observing that a motion on the Table strikes the same sentence; the Chair ruled that the motion is out of order. At 5:46 PM Mr. Ridenour took the seat for Mr. Grauer.

75) It was moved by Mr. Ridenour, seconded by Mrs. Lewis that ARRL-logo QSL cards be made available to ARRL Field Officials and volunteers in the same background colors as the corresponding special membership pins and special membership badges, with corresponding design and quality control by Headquarters Staff and authorization by appointing officials. On motion of Mr. Frenaye, seconded by Mr. Mendelsohn it was VOTED to refer the matter to the Volunteer Resources Committee for study.

76) It was moved by Mr. Frenaye, seconded by Mr. Stafford that Staff in conjunction with the DX and Contest Advisory Committees expeditiously develop standard operating procedures to be used by the ARRL Awards Committee in evaluating proposals for changes or interpretations. The purpose of such rules should insure that such proposals are handled in a consistent and timely manner, and that Awards Committee evaluation be limited to a technical review. On motion of Mr. Carey, seconded by Mr. Grauer it was VOTED that the motion is laid on the Table. Mr. Frenaye requested to be recorded as voting opposed to the motion to Table. During the course of the above, Mr. Oubre took the seat for Mr. Hurlbert, at 5:53 PM.

77) Moved by Mr. Frenaye, seconded by Mr. Grauer, it was VOTED that Staff undertake a program to improve W1AW bulletins, including but not limited to measuring the size of the current audience, determining the organizational needs, increasing the number of different bulletins transmitted, increasing the quality of the voice-transmission audio and improving the distribution of bulletins via other networks.

78) On motion of Mr. Frenaye, seconded by Mr. Heyn it was unanimously VOTED that the Board affirm the policy that while the proposed Electronics Communications Privacy Act of 1986 appears to protect current amateur radio interests in its present state, the Act fails to protect adequately the services it intends to, and represents an unneeded change from current rules that prohibit the disclosure of most encrypted electronic communications. The ARRL does not support the proposed legislation because of these defects. At 6:05 PM, Mr. Overbeck took the seat for Mr. Heyn, who departed from the meeting.

79) On motion of Mr. Frenaye, seconded by Mr. Kanode, it was VOTED that the motion dealing with the proposed changes to Article 9 be lifted from the Table. It was moved by Mr. Frenaye, seconded by Mr. Overbeck, to amend Article 9 of the Articles of Association by striking the text of the motion on the floor and substituting therefor: "These articles may be amended by a three-fourths vote of all directors, or, provided due notice of the proposed amendment shall have been placed in the mail to each director and published in *QST* at least 30 days in advance, by a two-thirds vote of all directors. The Board of Directors may from time to time adopt By-Laws not inconsistent with the Articles and applicable statutes. By-Laws may be amended by a three-fourths vote of all directors present, or, provided due notice of the proposed amendment shall have been placed in the mail to each director and published in *QST* at least 30 days in advance, by a two-thirds vote of all directors." It was moved by Mr. Wangler, seconded by Mr. Stevens, to refer the matter to the Executive Committee. A roll call vote being requested, it was VOTED to refer the matter to the EC, with 13 votes in favor, 3 opposed. All Directors voted in favor except Messrs. Metzger, Frenaye and Kanode.

80) It was moved by Mr. Frenaye, seconded by Mr. Overbeck, that it be the policy of the ARRL to inform members through W1AW bulletins and ARRL publications of all FCC and ARRL actions that impact Amateur Radio regulations and that official copies of FCC and ARRL documents filed on pending matters be made available to ARRL members at cost. After discussion, it was moved by Mr. Overbeck, seconded by Mr. Mendelsohn that the scope be narrowed to include FCC official Notices and selected Petitions for Rule Making only. On motion of Mr. Holladay, seconded by Mr. Kanode, the matter was referred to the Membership Services Committee for study. During the course of the above, at 6:40 PM Mr. Metzger departed from the meeting.

81) At this point the Chair commended the administrative staff support to the Board provided throughout the meeting by Ms. Becky Lindholm and Mr. Leo Kluger, WB2TRN (standing ovation). The Board was in recess from 6:50 PM to 7:03 PM, and Mr. Butler departed for his home. Mrs. Gauzens took the seat for Mr. Butler.

82) On motion of Mrs. Lewis, seconded by Mr. Mendelsohn, it was VOTED that the Executive Vice President is directed to include in the 1987 fiscal budget the purchase of twenty-five 8-foot by 3-foot heavy vinyl backdrop banners with the League diamond and the words "American Radio Relay League" in yellow lettering on black background and twenty five (25) in black lettering on yellow background of the type displayed at this meeting. Moreover, that two such banners be given to the Director of each ARRL Division with the use of the remaining banners to be scheduled from ARRL Headquarters.

83) It was moved by Mrs. Lewis, seconded by Mr. Stafford that the Executive Vice President is directed to include in the 1987 capital budget the purchase of two additional portable, tabletop ARRL booths identical to the two booths purchased in 1985 (including panels, header, ARRL logo, bookholders, shelves and shipping crate). On motion of Mr. Mendelsohn, seconded by Mr. Overbeck, it was VOTED to amend the motion by limiting the proposed purchase to one additional booth. The question then being on the motion as amended, it was ADOPTED.

84) It was moved by Mrs. Lewis, seconded by Mr. Stevens that the Rules and Regulations Concerning Affiliated Societies, paragraph 1, be amended to include a fourth category of affiliation as follows: "Category 4 — Groups of Amateur Radio clubs joined together in common purpose." Furthermore, that paragraph 4 of the Rules and Regulations Concerning Affiliated Societies be amended by adding the following: "In a Category 4 society, at least 75% of the member clubs must be actively affiliated with the ARRL for affiliation status to be granted." It was moved by Mr. Frenaye, seconded by Mr. Grauer, that the motion be amended to require 100% of member clubs to be affiliated with the League for affiliation status to be granted, but the motion was LOST. On motion of Mr. Wilson, seconded by Mr. Kanode, it was VOTED to amend the motion to provide that Category 4 clubs not be eligible to participate in club competitions. The question then being on the motion as amended, a roll call vote being required, it was ADOPTED, 15 votes in favor, none opposed, with the Central Division absent. So the rule was AMENDED.

85) On motion of Mr. Kanode, seconded by Mr. Grauer, it was unanimously VOTED that the 1985 ARRL International Humanitarian Award be awarded posthumously to Mr. Vic Clark, W4KFC, for his lifetime commitment to the furtherance of international brotherhood and peace through Amateur Radio (applause).

86) On motion of Mr. Stafford, seconded by Mr. Holladay, it was VOTED that the Publications Committee of the ARRL Board of Directors study the feasibility of printing and selling a commemorative publication as a "Special 75th Anniversary" publication.

(continued on page 60)

Happenings

Conducted By Phillip Sager, WB4FDT
Manager, Regulatory Information Branch, ARRL

FCC Proposes Fees; Amateurs Exempted

In its Consolidated Omnibus Budget Reconciliation Act of 1985, Congress amended the Communications Act of 1934 by adding a new Section 8 prescribing fees by the FCC. The Commission has begun to comply with the Act by adopting, on June 25, a Notice of Proposed Rule Making, General Docket 86-285. Fees would range from $20 for certain renewals through $2250 for a TV station construction permit, $6000 for a hearing on a TV license and $18,000 for some space-station applications. Comments are due August 15, and reply comments September 2, 1986.

The news release contained a listing of certain services that would be exempt from the fees. None of the personal radio services were mentioned at that point, leading to speculation in parts of the amateur press that there *might* be fees for amateurs.

Not so! Footnote 81 on page 26 of the 95-page document reads:

"81. We note that section 8 (d) (1) of the Communications Act, and the Conference Report language, by no means includes all of the services exempt from fees. This explicit statutory language was necessary to exempt specific users in the private radio services that would otherwise be subject to charges. By its failure to establish a specific fee, the statutory schedule of charges exempts whole categories of radio services, such as. . . *Amateur Radio.*

In the past, fees have ranged from $4-9 to renew an amateur license to $25 for special call signs.

ARRL SEEKS 18 MHz

Within the past few months, the League learned that a special Government committee had been charged with responsibility for finding new frequency assignments for radio stations that had been displayed by the decisions of the World Administrative Radio Conference (WARC) in 1979. For instance, the new band promised amateurs at 18.068-18.168 MHz had been carved out of a Fixed Service band. Point-to-point services that had been operating in that band basically have until July 1, 1989 to find new homes. The special committee had been appointed to assist in that project, particularly as concerns US Government fixed stations.

Along comes an official report that this committee has wound up its work and has been discharged. Eureka! Perhaps that means amateurs could have access three years early. We went down and talked to the people involved and emerged with the understanding that Government operations had ceased in 18-068-18.168 MHz. Based on that assumption, the ARRL filed a Request for Rule Making to get early access.

Among the arguments used with Federal Communications Commission were the understanding we had that Government fixed operations had ceased, that no civil activity was in progress under FCC licenses, and that amateurs in 57 other nations already were able to use at least a portion of the band.

A few days after the filing, we learned from several sources that our information was incorrect: important Government operations still were carried on in 18.068-18.168 MHz, and were likely to remain there through June 1989! Thus, our petition, while founded on what we understood to be fact, was actually premature from the Government viewpoint. Nevertheless, the ARRL is still seeking to find ways in which US amateurs can join others in operations on at least a portion of "17 meters." Should there be further progress, we'll let you know by bulletin and in these pages. Meanwhile, we must just listen to the DX 17 meters!

ARRL FILES COMMENTS IN OPPOSITION TO RADIO READING SERVICES 220-MHz PETITION

The ARRL has filed comments in opposition to the Petition filed by the Association of Radio Reading Services (ARRS) for the Blind RM-5434, which requests 500 kHz of the 220-225 MHz band for reading services. The ARRL stated that the Petition was inappropriate and should be dismissed for the following reasons:

1) It is inappropriate at the present time to consider new specific allocations in the 220-MHz band due to the ongoing NTIA-FCC long-range of allocations for the band.

2) The ARRS proposed use of the band is not consistent with the international and domestic allocations table, as radio reading services are not fixed or mobile services, but rather are more closely akin to broadcasting.

3) The ARRS argument in its Petition that the cost of establishing and operating all new radio stations for its service would be $5000-10,000 per facility is not even close to actual costs involved.

4) ARRS can find channels available to them via cable systems, subcarriers on broadcast FM stations, and a television station's second audio channel. This would save them the cost of new stations.

5) The ARRL argues that the very high level of amateur occupancy of the band (over 1200 repeaters listed in the 1986 *Repeater Directory*) makes it impossible to share a segment of the band with a broadcast-type of service.

The League's comments conclude that while the goals and principles of ARRS are admirable, their proposal is impractical, and is based on lack of understanding of the cost involved in establishing a separate service with respect to the modest charges presently levied by noncommercial FM stations for use of their subcarriers.

300 AMATEURS PROVIDE COMMUNICATIONS

On July 8, a train carrying chemicals derailed and burned near Miamisburg, Ohio, in the suburbs of Dayton. The chemical clouds from the fire eventually caused the evacuation of an estimated 35,000 people. The Mound ARC, W8DYY, together with the local ARES, had previously devised a disaster plan for such an emergency and immediately put it into effect.

Police and fire units from other localities responding to the disaster were unable to communicate with the main command post. The National Weather Service needed weather reports every 15 minutes in order to predict what directions the chemical-laden clouds would drift. Hospitals and state and local officials also needed communications. Eventually, over 300 radio amateurs from as far away as Cincinnati provided primary communications for these groups. An amateur was placed in every police car and fire truck, and several stations were set up at the central command post. Amateurs accompanied various local officials, as well as the governor when he toured the disaster site. The Mound ARC repeater was in continuous operation for 99 hours. Amateurs were highly praised for their organization and discipline. More details will appear in the Public Service column in October *QST*.

NOVICE AND EXTRA CLASS QUESTION POOLS

The ARRL multiple-choice version of the 1986-87 Extra Class (Element 4B) question pool has been completed and was released to all VECs who requested it and Amateur Radio publishers on July 1.

The ARRL/VEC will put the new pool, which the FCC released in early April, into use starting with October 1 sessions. This conforms with the FCC's *Instructions to the VECs*, which says that the old (1985-86) question pool may not be used for more than six months after the issuance of the new pool. July 1 was the deadline for comments to the FCC on the Novice question pool. The ARRL filed six pages of suggested changes with FCC.

ATTENTION JUNIOR HIGH SCHOOL TEACHERS!

We've got what you need to promote Amateur Radio among your students. ARRL and the Amateur Radio industry are offering a new publication targeted especially for your students, a comic book that introduces them to many of the more exciting aspects of Amateur Radio.

Remember Archie, Jughead, Betty and Veronica? The comic book, based on these popular Archie characters and their friends, is ready for distribution. You qualify if (1) you'll distribute copies to your students and

(2) you arrange for follow-up support for those students who want to become hams themselves.

Send your request to ARRL HQ, Archie Program, 225 Main St, Newington, CT 06111. Please state your mailing address, the subject(s) you teach, your class of license and the number of students you have in each class, and briefly explain who will provide the follow-up training support (you, a local Novice instructor, or a local radio club, for example). Please note that quantities are limited.

VICTOR C. CLARK YOUTH INCENTIVE PROGRAM

At the request of the family of Vic Clark, W4KFC, the ARRL Foundation has established the Victor C. Clark Youth Incentive Program with the objective of providing support for the development of Amateur Radio among high-school-age youth.

Funded by an endowment, the program will make mini-grants to groups which demonstrate a serious intent to promote this objective. This will not be an award or scholarship, but rather a source of support for efforts (no doubt mostly local) to bring young people into Amateur Radio and enrich the Amateur Radio experience of amateurs under age 18. Groups which may qualify for mini-grants will include, but not be limited to, high school radio clubs, youth groups and general interest radio clubs which sponsor subgroups for young people or otherwise make a special effort to get them involved in club activities.

Mini-grants, probably in amounts not exceeding $500 per grant, will be made for such projects as securing antennas for club stations, purchasing training material, supporting local service projects which bring favorable public exposure, and similar activities, preferably by matching funds raised locally. Applications should be sent to: ARRL Foundation, 225 Main St, Newington, CT 06111.

INTERFERENCE THREAT TO WEATHER SATELLITE RECEIVERS

The National Oceanic and Atmospheric Administration (NOAA) operates weather satellites that produce data used in the study of the earth, its weather and resources. Among these satellites are those in the TIROS-N series, whose data are sent down to earth by radio on frequencies in the 1700-1710 MHz band. This band is currently used only by these satellites, and by other systems that do not interfere with the satellite receivers.

An unknown number of receiving ground stations for these signals have been built by weather forecasters, TV broadcast operators, universities and private individuals. FCC regulations don't require licensing or registration of these receivers, so their existence and locations may be unknown to NOAA. Because they are unknown, NOAA can take no steps to protect them from interference. So far, this has not caused a problem.

Now, however, the situation may be changing rapidly. The FCC is considering a proposal to allow an entirely new type of radio device in the band, which has the potential for causing severe interference to weather satellite receivers. These receivers can be protected only if they are identified. NOAA is appealing to anyone who knows of such a receiver, or who may be aware of plans to build one, to notify it. NOAA will provide additional information on how operators of such receivers can protect themselves from potential interference from these new devices.

There is no charge for this information, according to NOAA, nor will anyone be obligating themselves in any way by asking for it. NOAA wishes to register such stations in a government master file, to help prevent interference from occurring. Whether operators register their receivers or not, they are free to continue listening to NOAA's weather satellites. If they don't register, however, they may someday be unable to monitor them through the interference.

For information, contact Richard Barth at 202-377-0635 in Washington, DC, or write to Office of Radio Frequency Management, US Department of Commerce, Room 6106 Main Commerce Building, Washington DC 20230.

AMSAT PHASE 3C LAUNCH DELAYED

The launch failure of a European Space Agency Ariane-2 rocket May 30 will delay the launch of AMSAT's Phase 3C until 1987.

A third stage failure is being blamed for the fourth Ariane failure in 18 launches. Arianespace immediately suspended all plans for future launches pending investigation of the failure.

AMSAT is manifested to fly on the first Ariane-4 launch. This launch had been scheduled for early November. Ariane officials said it would now be at least 6 months or more before launches could resume.

NORTHERN KENTUCKY TOWER FUND

The Northern Kentucky Tower Fund has been established to help defray the legal expenses of John A. Thernes, WM4T, as he continues his battle against the city of Lakeside Park, Kentucky. The legal battle began in August 1982, when Thernes filed a formal application with the city to put up a 70-foot tower to support Yagi antennas. The initial application was denied by Lakeside Park in September 1982, stating that the antenna structure was not in accordance with existing ordinances of Lakeside Park. The city further stated in its denial that only those accessory structures and uses specifically identified in this ordinance shall be permitted. The city's list of permitted accessory uses included swimming pools, fences and walls, signs, and home occupations, but not Amateur Radio antennas! An appeal in May 1983 to the Lakeside Park Board of Adjustment was also denied. Consequently, Thernes filed suit against Lakeside Park in Federal District Court (for the Eastern District of Kentucky), in September 1983.

Unfortunately, the Federal District judge dismissed the case and ruled in favor of Lakeside Park on October 10, 1984. The Judge ruled that the FCC has not preempted regulation of tower height, which a local legislative body may do to promote the aesthetic appearance of a community. But Thernes disagreed with this decision and filed an appeal with the United States Court of Appeals for the Sixth Circuit on January 8, 1985. The outcome of the appeal was in favor of Thernes in that the District Court's decision was vacated and remanded (sent back) to the District Court for further consideration. This was partially the result of the FCC's ruling on PRB-1 which called for a limited preemption of radio antennas.

At this point, Thernes must now go back into District Court and wait for the judge to determine what constitutes a reasonable antenna in light of PRB-1. Unfortunately, the City of Lakeside Park rushed through a new antenna ordinance within a two-week period in December 1985. This new ordinance provides for satellite receiving dishes but not a reasonable Amateur Radio antenna system and is totally unacceptable to Thernes and local amateurs. So the fight for a reasonable antenna structure at WM4T is far from over. Despite legal and technical research and advice provided by ARRL, without which the bills would have been thousands of dollars more, the cost has been heavy and the end is not in sight.

As a result, the Northern Kentucky Tower Fund has been established to assist Thernes in his continuing battle for himself and all amateurs, since any Federal Court ruling can have vast consequences for amateurs throughout the nation. Your support of this effort would be greatly appreciated. If you, or your local radio club, would like to assist in this struggle, please send your support to Northern Kentucky Tower Fund, PO Box 17721, Lakeside Park, KY 41017.

W1AW OPERATION

Over the weekend of July 12 13, W1AW was on the air as part of the first IARU HF Championship. W1AW (as well as the other IARU member society HQ stations) counted as additional multipliers.

Four transmitters were operated simultaneously (three at W1AW and one in the lab at the HQ building). During the 24-hour period, a total of 15 operators

Are You a Lawyer? Amateur Radio Wants You!

Your legal expertise is needed in the Amateur Radio community to help build and maintain the legal foundations for our hobby. The League's Volunteer Counsel Program is designed to help stem the tide of overly restrictive regulations on Amateur Radio. You can help. If you have an interest in this exciting area of communications law, are a reputable member of the bar of at least one state and are a League member, please contact us. As a Volunteer Counsel, you will be kept well informed about areas of law affecting Amateur Radio. For further information, write to the ARRL Volunteer Counsel Program, 225 Main St, Newington, CT 06111.

If you live in one of the following ARRL Sections, your legal experience is especially needed: Alaska, Arkansas, North and South Carolina, North and South Dakota, North Florida, Idaho, Maine, Mississippi, Montana, Nevada, Utah and West Virginia.

stopped by to lend support. HQ staffers WB9RRU, KB9NM, WA4CMS, N1CIX, KJ4KB, KA1CV, KH6CP, NJ2L, KU7G, AK7M, N7IAL and W1OD participated. AK4L, KA2MXO and K1KI also showed up to help. In all 2731 stations copied the ARRL multiplier. W1AW also had 300 QSOs on Field Day.

NOVICE ENHANCEMENT

The ARRL has filed its comments concerning the Novice Enhancement Notice of Proposed Rulemaking (NPRM), PR Docket 86-161. In its opening statement, the ARRL noted that, unfortunately, the due date for Comments in the NPRM fell just prior to the semiannual meeting of the League's Board of Directors, who have received extensive input from their constituents on this subject. The Directors will thus have an understanding of any fine tuning that needs to be done. Any fine tuning will be addressed in the League's reply comments to FCC following the July Board meeting.

The ARRL did comment extensively in three areas: the need to make the 220-MHz band available to Novices immediately; the need for two examiners, rather than one, for the Novice class examination; and the possibility of interference to the existing worldwide network of amateur beacon stations operating in the 28.2-28.3 MHz segment under the auspices of the International Amateur Radio Union (IARU).

In the Novice Enhancement Docket, the FCC had commented that until the future of the 220-MHz band was resolved (there are presently two pending Petitions for Rulemaking concerning use of the band by radio services other than amateur) "we will not finalize the matter of permitting Novice amateurs in the 220-225 MHz band until these petitions are resolved." The ARRL argued that the two Petitions for Rulemaking were not intended to affect present amateur use of the band, and that the Novice Enhancement NPRM had no connection with allocating frequencies, but was a proposed amendment to the Amateur Radio Service rules. "Novice licensees are no different in kind than the other amateur licensees now authorized to use the band, and there is no logical reason why Novice access to the band should be delayed pending future allocation decision."

The ARRL concluded that access to the 220-225 MHz band by Novices should be permitted immediately when the FCC acts on the proceeding.

The League continued to press for the requirement of two examiners for the Novice examination. It stated, "With the increase in operating privileges proposed for Novice class licensees comes an attendant increase in responsibility on the part of the operator...and for increased procedural protection of the...examination." The ARRL noted that this requirement would not be overly burdensome on the newcomer, so the integrity of the examination remains at a high level.

There has been some concern about the possibility of interference to the existing worldwide network of beacon stations operating in the 28.2-28.3 MHz segment. The League encourages US amateurs to avoid operating in this segment so as not to cause interference to beacon reception, and no complaints of interference had come to ARRL's attention. A plan for improving the beacon system is being developed by the IARU for implementation by 1990. The plan calls for the present 100-kHz subband to be compressed to a 25-kHz segment (28.200-28.225 kHz). This plan has the support of the League. The ARRL made it clear that it intends to make every effort to encourage all amateurs to respect the existing beacon segment, and subsquently to respect whatever beacon segment is included in voluntary band plans to which the League is a party through its participation in the IARU. "Amateurs...who value the present 28-MHz beacon system need have no fear that the proposed Novice Enhancement will inconvenience them in any way."

The League comments concluded that except for the above modifications, the League supports the general plan for Novice Enhancement as stated by the NPRM. See Moved and Seconded, this issue, for more information.

Amateur Radio Call Signs

Amateur Radio operators often ask the FCC what call signs have been assigned lately. This list shows the last call sign in each group to be assigned for each district, as of July 1, 1986.

Radio District	*Group A Am. Extra*	*Group B Advanced*	*Group C Tech/Gen*	*Group D Novice*
0	NTØA	KEØGG	NØHFA	KAØYCL
1	NF1N	KB1YW	N1EFH	KA1OQG
2	NS2F	KD2TV	N2GJJ	KB2AYF
3	NB3P	KC3XR	N3EZD	KA3PTH
4	AA4UB	KJ4VP	N4OFO	KB4TQE
5	WM5U	KF5NP	N5JJA	KB5ADD
6	WU6O	KI6GS	N6NUF	KB6NFA
7	NU7Y	KE7RH	N7IHP	KA7ZDC
8	NS8G	KE8GC	N8HNY	KA8ZWY
9	NM9E	KD9XP	N9FWW	KA9VRC
Alaska	—	AL7IA	NL7IQ	WL7BKK
Hawaii	—	AH6HD	NH6GK	WH6BJG
Virgin Is.	KP2O	KP2AZ	NP2BT	WP2AEW
Puerto Rico	WP4R	KP4KK	NP4VX	WP4FRP

NEW WEST TEXAS SECTION

The ARRL Executive Committee has approved the creation of a new West Texas Section, comprising the western 40% of the state, effective January 1, 1987. The remaining sections are restyled North Texas and South Texas Sections, respectively. The area encompassed by the new West Texas Section presently includes 952 ARRL members.

AO-10 RETURNS TO SERVICE

Recovery efforts aimed at restoring AMSAT-OSCAR 10 to service met success July 15 when the Mode-B transponder was enabled for limited use. This favorable development capped two months of intensive work by spacecraft engineers and controllers. It marked the culmination of a process of subtle diagnostic testing, rewriting the Internal Housekeeping Unit (IHU) software and cautious evaluation of the results.

AO-10's computer memory had been showing evidence of accumulating radiation damage for nearly a year. The error correcting software hit counter had been incrementing regularly. Last fall, the first major hard failure became evident. But the software was able to accommodate it. On May 17, the quantity and location of errors in the IHU memory overwhelmed the error-correction mechanism and caused the operating system to crash. This took AO-10 off the air, catching most users by surprise.

At the time the situation looked bleak; controllers were able to reset the IHU only with the master reset command. Ominously, they were unable to gain a foothold in reloading the IPS operating system.

Karl Meinzer, DJ4ZC, the principal architect of the IPS operating system, designed a memory diagnostic package that produced a memory map of the failed and marginal memory cells. The memory map proved to be a veritable road map to AO-10 recovery. Based on this chart of the affected memory areas, Karl was able to rewrite the IPS operating system so as to avoid the affected zones. To reduce the probability of errors from marginal areas, the refresh cycle was shortened too. Ian Ashley, ZL1AOX, working with Karl, soon reported the new IPS-C4 package seemed to be working. The IHU wasn't crashing as it had been.

By about July 12, the decision had been made to turn on Mode B, beginning July 15. This was done with a reduced operating schedule being put into effect.

The overall situation on AO-10 is now stable and generally favorable. However, due to the reduced memory capacity, it will no longer be possible to support the CW and RTTY sections of telemetry. Bulletins henceforth will be sent in PSK "M" blocks.

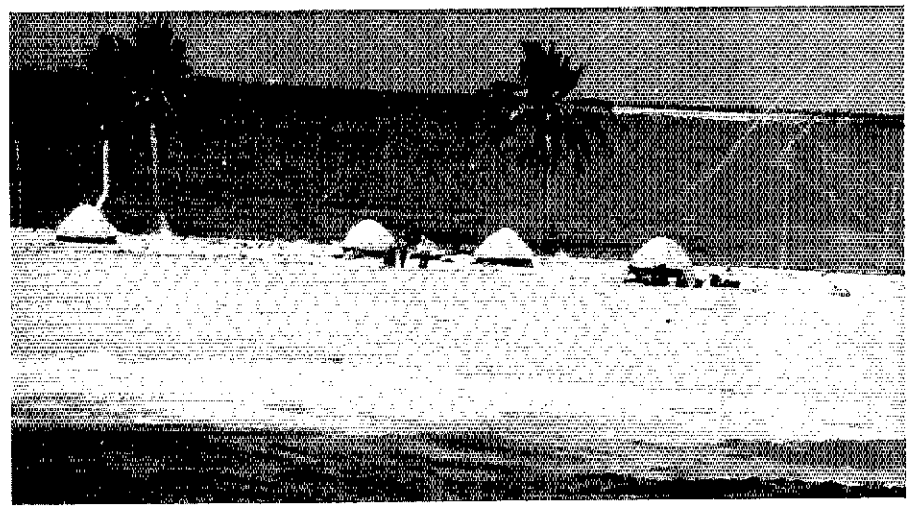
The amateur satellite community welcomed the news of AO-10's return with broad applause and admiration for the superb efforts of those who first fathomed the problem and then applied the highest skills in developing work-around methods. Congratulates to all those who worked the problem—in particular, DJ4ZC and ZL1AOX for their brilliant work! Thanks also to WØPN, KA9Q, WD4FAB, W2FPY and W3GEY.

(continued on page 100)

Conducted By Ellen White, W1YL/4
19620 SW 234 St, Homestead, FL 33031

Clipperton Diary

In a generous attempt to satisfy Europe's demand for Clipperton, five West Coast hams decided to return to this quintessential DX location for a second DXpedition in 1986. (In 1985, 16 operators activated FO0XX from Clipperton Island, making over 31,000 contacts in 130 ARRL DXCC listings, the majority with stations in the Western Hemisphere or Japan. Conditions to Europe, in particular, were poor.) The group again had the opportunity to tag along on the *Royal Polaris*, a 115-foot sportfishing vessel with 20 fisherman going to Clipperton in hopes of catching the world-record tuna. Thus, they were able to secure transportation at a fraction of the cost of chartering their own boat. By now, the captain and crew of the *Royal Polaris* were well-experienced in the unique demands of getting hams on and off Clipperton! What follows are notes from W6OAT's diary, supplemented by notes from a similar diary kept by W6SZN.



A view of the 1986 FO0XX operating site, as seen from the *Royal Polaris*. *(W6OAT photo)*

Wed, April 23: To our amazement, everything fits in the truck which Carl and Wayne have agreed to drive to San Diego, where we'll all board the *Royal Polaris*. They leave the San Francisco area about 11:30 AM, and I devote the rest of the day to buying last-minute items. I finish my packing about 10:30 PM.

Thu, 24th: We catch a 6:30 PM flight from San Jose to San Diego. On arrival, the 2-meter hand-held quickly locates Wayne and Carl, who are already there. A nice surprise to learn that N6CW is also meeting us. After claiming baggage we head for Fisherman's Wharf and board the *Royal Polaris*, unload supplies and take off for dinner.

Fri, 25th: The fishermen begin arriving. By 9 AM N6CW shows up with a complete 2-meter station, amplifier and 5-element beam, convincing us to activate grid squares for the Southern California VHFers. We'll be going through "water only" squares, so working us for these guys will be like working new countries for the HF DXer. It sounds like fun. The ship pulls away from the wharf at 11 AM. By 1 PM we clear the harbor with the automatic pilot set for 170 degrees, on a beeline course to Clarion Island in the Revilla Gigedo (XF4) group. With this direct course, the 2-meter beam behind the ship stays aimed at San Diego. At a speed of 11.2 knots, we quickly hand out contacts from grid squares DM12, DM11 and DM10. Below deck, W6RGG and N7NG have set up a transceiver in the galley, running about 100 watts into an upper-deck vertical. Hourly schedules on 144.2-MHz sideband produce amazingly strong signals from San Diego and Los Angeles stations. We chalk up grids DL19 and DL18. N7NG has a good run of Asiatic Russians on 20 CW.

Sat, 26th: At sea. W6RGG is making lots of contacts on 20. The 2-meter skeds are still going strong.

Sun, 27th: Still at sea. Our last 2-meter contact is KS6A, worked from grid DL22, a distance of 592 nautical miles from San Diego. (Earlier we had worked W6CPL near Los Angeles, at a distance of well over 600 nautical miles.)

"It must have been frustrating for FO0XX to find that stations were next to impossible to hear, especially on 40 meters. They called for Europe, Africa, Russia, etc, while hundreds of NA/SA stations patiently waited. I hope all the deserving outside this hemisphere were able to make at least one contact. If they didn't, then propagation (which we have no control over)...is to blame, not FO0XX. Well done, guys!"— Canadian DX Association

Long Skip

Mon, 28th: Clarion Island comes into view about 5 PM. It is frustrating to be this close to a relatively rare spot, but unable to operate for lack of a license. Below deck we've a good EU opening (about 0500Z) on 40 meters.

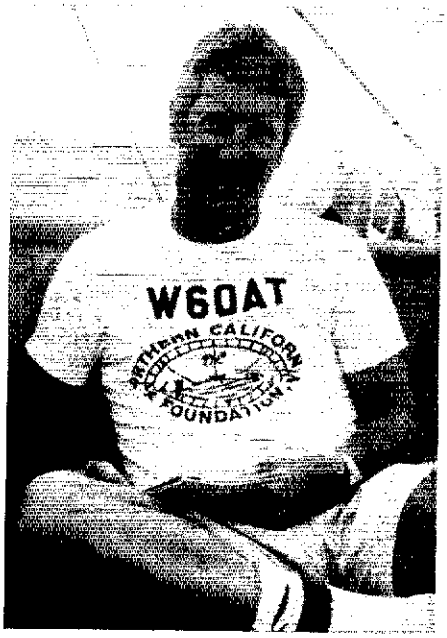
Tue, 29th: We spend the day fishing at Clarion. Whales frolic alongside. Up close they don't look as big as I expected! One of the fishermen also happens to be a scientist from the Tuna Commission, with lots of material about Clipperton collected from various scientific and military sources. Much of this was new to me, and made fascinating reading. We departed Clarion just before midnight.

Wed, 30th: Isla Roca Partida, another of the XF4 islands, was sighted about 10:30 AM local. It is a rocky pinnacle rising vertically from the ocean, snowy white in color from bird droppings, and absolutely devoid of vegetation. There are whales here, too. We fish for several hours and then take off for San Benedicto, the third island of the XF4 group, arriving just at dusk. With fishing sparse, the captain says we'll spend another day here.

Thu, May 1: Signs of the 1952 volcanic eruption are everywhere, including a huge lava spill into the ocean. We can't see vegetation on this island, either. The evening is spent fishing for more bait, but it's another bad night. Still not enough bait for Clipperton. That means yet another day.

Fri, 2nd: We cross the 26 miles over to Socorro, the last of the XF4 islands. The catch isn't worth writing about, but the whales—big ones! These are even bigger than I thought whales were supposed to be! Lots of picture taking.

Sat, 3rd: About 1 AM, the captain says let's call it quits on bait fishing and get underway to Clipperton, ETA 1039Z May 6, a voyage of about 50 hours. The Great Armadillo Run of 1986 is going hot and heavy on 20 phone, so we pass out a few contacts from "Ocean" County. I even manage to snag a rare phone



W6OAT hard at work on the Diary enroute to Clipperton. *(N7NG photo)*

QSO with W1YL. She claimed it is only one of a handful of sideband contacts since I worked her from KP6KR, Kingman Reef, in 1974. She'll probably want another card. Good news. Two of the fishermen also play bridge, enabling a hot game all the way to Clipperton. Hard-luck W6RGG gets feet badly sunburned.

Sun, 4th: Flat, calm seas, but hot and humid, a sure sign we're getting closer to the equator. We disassemble N6CW's beam and stow it away. 75 sideband is poor, with horrendous static crashes, but a quick CQ nets QSOs in short order with EA4, EA8, EA9 and F.

Mon, 5th: Foul weather offshore of Clipperton, but with good fishing. The seas calmed down and, at about 1600Z, we lowered the first skiff, spending an hour or so searching for a landing spot on the east side of the island, near a big clump of coconut trees halfway between Clipperton Rock and the spot where we were last year. Too many rocks and coral heads here, damaging the prop. AI6V plays blacksmith to repair the prop while the rest of us go fishing again. I finally catch two 40-pound wahoo. Fun, but not as much as working a new country. We're now near the 1985 operating site. The place now looks awful, with gigantic breaking waves. A half mile closer to Clipperton Rock we see what might be a good place, checked out by three crew members in the skiff. They land. Two stay on shore while the third comes back out through the surf. The skiff is hit by a huge wave, nearly going vertical. He finally clears the surf and searches for potential landing spots. One is found, all sand, without rocks or coral, and with land quickly dropping away. That means the surf breaks closer to the shore; we'll have to get through only 10-15 yards of breakers (instead of the usual 50 encountered at most other sites). It is now mid-afternoon and we have to postpone landing until tomorrow. Carl, Kip and I pass the time playing poker, and I quickly discover that there are more sharks here than just those in the water!

Tue, 6th: The captain circles the island looking for a landing place. The tide has now changed, and we can't locate the exact spot the crew found yesterday. About 9 AM local time we do find a place which looks about as good as anything we've seen so far (that's not much comfort!). W6RGG got jostled a bit in the surf, just like last year, and a crew member incurs an ugly gash. Except for these two incidents, the 8 or 10 ship-to-shore trips go smoothly. Well, we're here, grinning ear to ear while we wave goodbye to the *Royal Polaris*, which will spend the next few days fishing around the island. We head inland toward the lagoon and the three palm trees. Because we're relatively out in the open there are fewer birds and crabs to deal with than at last year's camp. The ground is also sandier, with less coral. The site is pretty flat, about 100 yards from the ocean. Hopefully, we are far enough away to avoid the salt spray which was so damaging to our equipment last year. Before we can do anything a big rainstorm sweeps in. Quickly we unpack a few tarps and get everything covered before possible damage. We erect two of the AV-5 verticals and FO0XX comes alive on 20-meter SSB at 0227 UTC May 7. The S-meter pegs with the big signal from Pat, WA7N1N, one of last year's ops. We're off and running—what a pileup!

"I thought I should write you a couple of lines, just to thank all of you for a super job from FO0XX. Although the propagation was quite poor, I think everybody who wanted to work you really made it."—OH2BMH

Wed, 7th: We erect a 160-meter vertical and a Cushcraft A3 tribander on a push-up mast. AI6V's muscle gets it about 38 feet above ground. We point it at Europe and leave it there. The W stations can work us no matter where the beam is pointed. (In fact, they probably could work us even if we didn't have an antenna!)

Thu, 8th: W6RGG has been on 20 CW with a great opening into Europe. We're in a heavy downpour, but the fresh water feels good. I swap places with Bob and continue to run Europeans. We're asking the USA to QRX during this opening, and they do! We get terrific cooperation for hours on end (the W stations have learned a lot of savvy technique in recent years). About 1:30 PM local time, Bob and I set off to explore Clipperton Rock. Besides the ever-present booby birds, frigate birds and crabs, we observe one small sandpiper, a few sow bugs, a fairy tern and a creature resembling a dark-colored earwig. On our return we find that Wayne, Carl and Kip have erected slopers on 160 and 80.

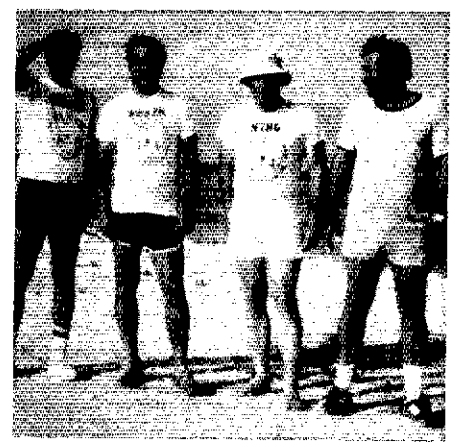
Fri, 9th: Bob and I stay at the rigs, with good EU openings. When Kip, Wayne and Carl return from their around-the-island hike, they report that the automatic weather station on the north side of the island has been refurbished since last year and is now working. They also found a couple of vine-like plants, at a location diagonally across the island, the only other land-based vegetation on the island (except for the coconut palms). At our sunset, 40 comes alive to Europe. Signals are there on sideband, but it is next to impossible to work anything on that mode. Many of the operators are about the same signal strength, obliterating each other and refusing to follow our directions. In spite of less than great operating techniques by many "on the other end," the transceiver filters permit us to have a good two-hour CW run.

Sat, 10th: Everyone sticks close to camp and gets in a lot of operating time prior to Sunday's departure.

Sun, 11th: I'm up just before sunrise, and 40 CW is great to Japan. But, there's a loud bang, and the amplifier "goes west." We continue barefoot, and the rate doesn't even drop. Carl is running them hot and heavy at the other station on 20 sideband. We plan to leave Clipperton at noon. But, surf conditions are unusually calm, and a quick VHF confab with the captain indicates that now might be a better time to leave. Carl is just finishing a QSO with WA6AHF when we tell him to pass the word that we're going off the air. FO0XX shuts down at 1459Z. To increase the safety factor, we leave many things on the island (antenna, tents, cots, etc). Even so, we still have 20 or 30 items to load into the skiffs. Our departure from Clipperton begins at 1515Z. A prop on one of the skiffs gets badly mangled, but otherwise we leave without incident. Except, that is, for the one skiff with W6RGG, which came completely out of the water as it cleared a big wave. (I'm sure glad I wasn't in his boat!) We made the island departure in two-and-a-half hours, one-fourth the time it took us last year. Back aboard the *Royal Polaris*, we meet with cheers from the fishermen, iced tea from the galley crew and a good shower. We quickly set up the FT-1 to relay word that everyone is safe and we're headed for home.

Random Thoughts

The equipment consisted of two Yaesu



W6RGG obviously took this photo of the other FO0XX operators (l-r): W6OAT W6SZN N7NG and AI6V.

FT-1s; SB-200, MLA-2500 and Clipperton-L amplifiers; Heil microphone/headsets; Cushcraft A-3 tribander and five-band verticals, and one Butternut vertical for 40-80-160. Thanks to a copious supply of wire courtesy of K4TEA, we had four 160-meter full-length radials to use with the Butternut. But in retrospect, I think they added little (thanks to the already excellent salt-water ground). We erected sloping dipoles for 80 and 160, but never used them. Our power source came from two 3-kW diesel generators.

Conditions

Conditions were fairly good on both 20 and 40, and we worked nearly 1700 Europeans. [*The DXpress Bulletin*, of the Dutch Society, notes that the 1985 Clipperton expedition was frustrated by lack of propagation into Europe, resulting from a major solar storm with A-indices above 100 and a K of 8.—Ed.] In total, we made nearly 16,000 contacts, of which 46% were on CW and 54% on sideband, working a total of 112 DXCC listings. The European objective was to give as many as possible a "first time new one," vis-à-vis new "band countries." This meant concentration on the mode producing the numbers.

Band	*EU SSB*	*EU CW*
80	9	6
40	38	365
20	119	974
15	93	25
10	5	7

Operating Critique

In our discussion of the various operating practices observed, our general impressions are that the W/VE gang were excellent about standing by while we worked other areas of the world, even when it meant they had to wait for several hours. In pileups they were good about coming back to "partial calls" (ie, only one station replying when we called for, say, "the Yankee Lima station"). It seems that the W stations have developed their abilities well ahead of many of the Europeans in responding to our specific instructions. We felt that our EU rate could well have doubled had the direction KN been followed, had the partial-call requests been observed and had stations QRXed while we finished contacts with others. Additional problems arose with the barrage of questions asking when we were going to move to another band or another mode, and with the QRP stations who (fearful they wouldn't get through) would insist on calling out of turn.

QSLs: Card requests go via the Yasme Foundation, PO Box 2025, Castro Valley, CA 94546.

The 1986 Cast of Five

Carl Cook, AI6V; Rusty Epps, W6OAT; Bob Vallio, W6RGG; Kip Edwards, W6SZN and Wayne Mills, N7NG.

AVES, WE TRY HARDER

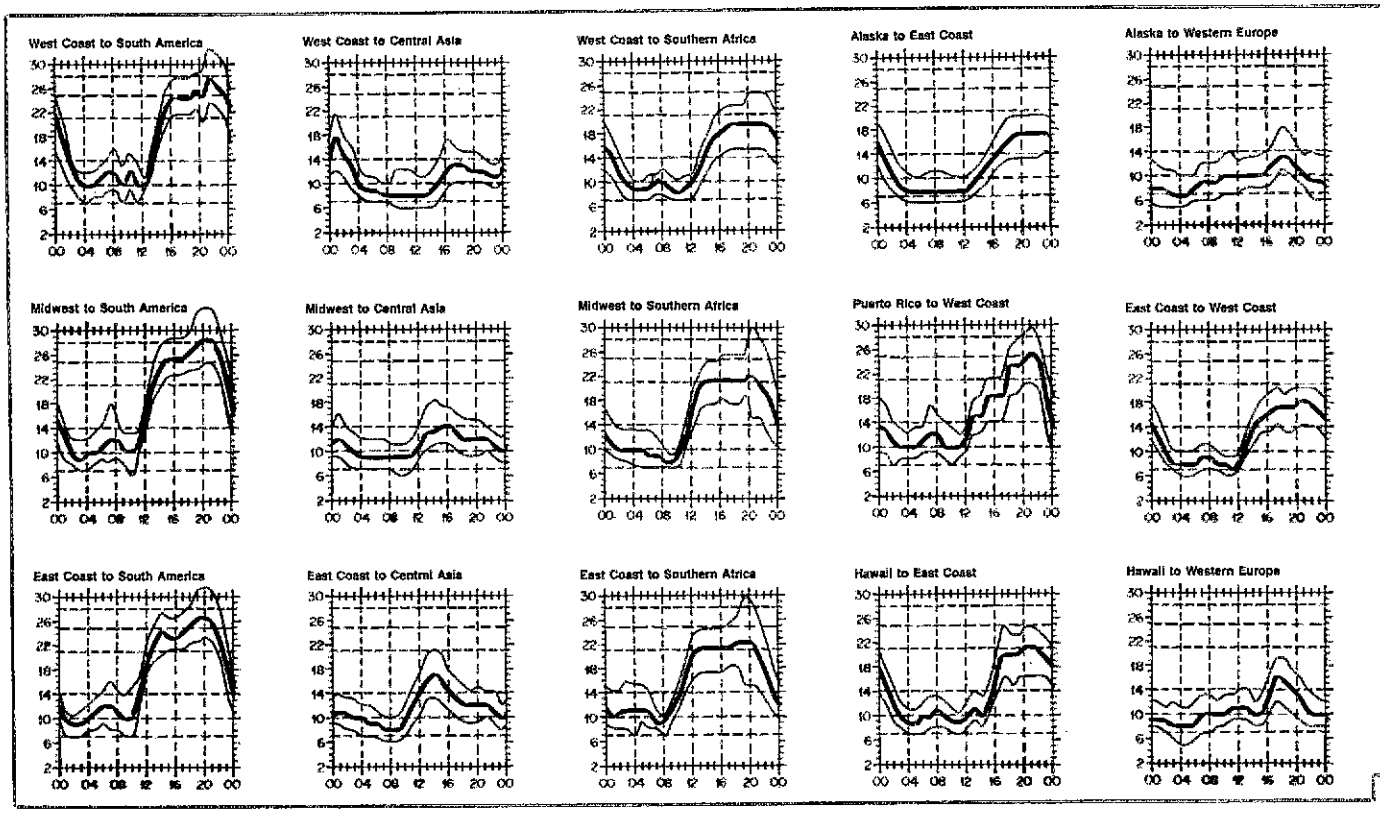
The following is courtesy of W6BDN

Take a piece of string and hold one end at Aves Island on your globe. Grasp the loose end between the thumb and forefinger of your hand so that your thumbnail is over San Francisco. Now swing an arc; north, south, and around. You'll easily see that most of the US, Canada, Central and South America is closer to YVØ than I am. At least half a million hams live within that circle. Yes, I know, Europe and Asia are worse off. And, at another time and another target, I might have the advantage (but this is not much consolation).

For several evenings from after work 'til bedtime (with a short break for dinner), I battled in the pileups on 20 meters and was badly outgunned. It was as if my beam had fallen down! There was a very considerable geographic disadvantage to be overcome. Unless I brewed up some sort of equalizer to improve my chances, the DXpedition log would not include *my* call.

Unlike most people, I would not be working on the following day. Does this help? There are many retired hams in the Sunbelt. Would they, plus others, be calling during the daytime and make it just as bad as the evenings? Quite likely. Hey, wait a minute! What about the very early-to-predawn hours? There's no rule saying that you have to get a new one on 10, 15 or 20. Why not 40 or 75? By midnight, nearly everybody (*even* DXers) should be asleep on the night before a work day. The Eastern early-bird types probably won't be up before 5 AM (He's right.—Ed.). That gives me a two-hour window when my chances should be very substantially improved, that is if YVØAA is on the air then! It's a major effort. They'll be on then, won't they? My mighty inverted V can do it, right? No choice. It's the best shot I've got. I can try all night if necessary.

Business was still booming into the late evening. I relaxed and saved my strength. Around midnight, the pursuit began in earnest. By about 2 o'clock local time, they were in the log on both 40 and 75. The plan worked! Good



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

thing, too. I tried the daytime bands for a couple of hours the next morning without any luck.

Now, that's three for the price of one: an all-time new one (and a sportsmanlike insurance contact) plus two new band-countries where I need them the most.

QSL Corner

Administered By Joanna Hushin, KA1IFO

ARRL-MEMBERSHIP OVERSEAS QSL SERVICE

Send outgoing cards: American Radio Relay League, QSL Bureau, 225 Main St, Newington, CT 06111, USA.

This is an "outgoing" service that allows ARRL members to send DX QSL cards to foreign countries at minimum cost and effort. While QSLing direct to foreign amateurs is faster, it is also more tedious. Time spent searching for addresses in the foreign *Callbook*, addressing and stuffing envelopes, and mailing could be better spent operating DX. And, the cost of IRCs, airmail postage and envelopes can be prohibitive.

An unlimited number of QSLs may be sent for distribution 12 times per year. The fee is just $1 per pound or portion thereof (155 QSL cards average a pound). Recommended size of QSL cards is 3½ × 5½ in (90 mm × 140 mm).

The ARRL-Membership Overseas QSL Service operates *only* in an outgoing capacity. To receive QSLs from DX stations, see "The ARRL DX QSL Bureau System" (Incoming), June 1986 *QST*, page 57, or send an SASE to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.

US amateurs may send SWL reports to foreign shortwave listeners. Unlicensed (associate) members may send SWL cards to foreign amateurs. QSL managers: write for details.

Note: The ARRL QSL Service should not be used to exchange QSL cards within the 48 contiguous states.

Requirements

1) Presort your DX QSLs alphabetically by call-sign prefix (AP, C6, CE, DL, F, G, JA, LU, PY, 5N, 9Y, and so on).

2) Enclose the address label from your current copy of *QST*. The label shows that you are a current ARRL member.

3) Enclose payment of $1 per each pound (or less) or cards—approximately 155 cards weigh one pound. In other words, $1 is the *minimum charge* whether you send 1 card or 155 cards. Please pay by check (or money order) and write your call sign on the check. Do not send cash.

4) Include only the cards, address label and check in the package. Wrap the package securely and address it to the ARRL Outgoing QSL Service, 225 Main St, Newington, CT 06111.

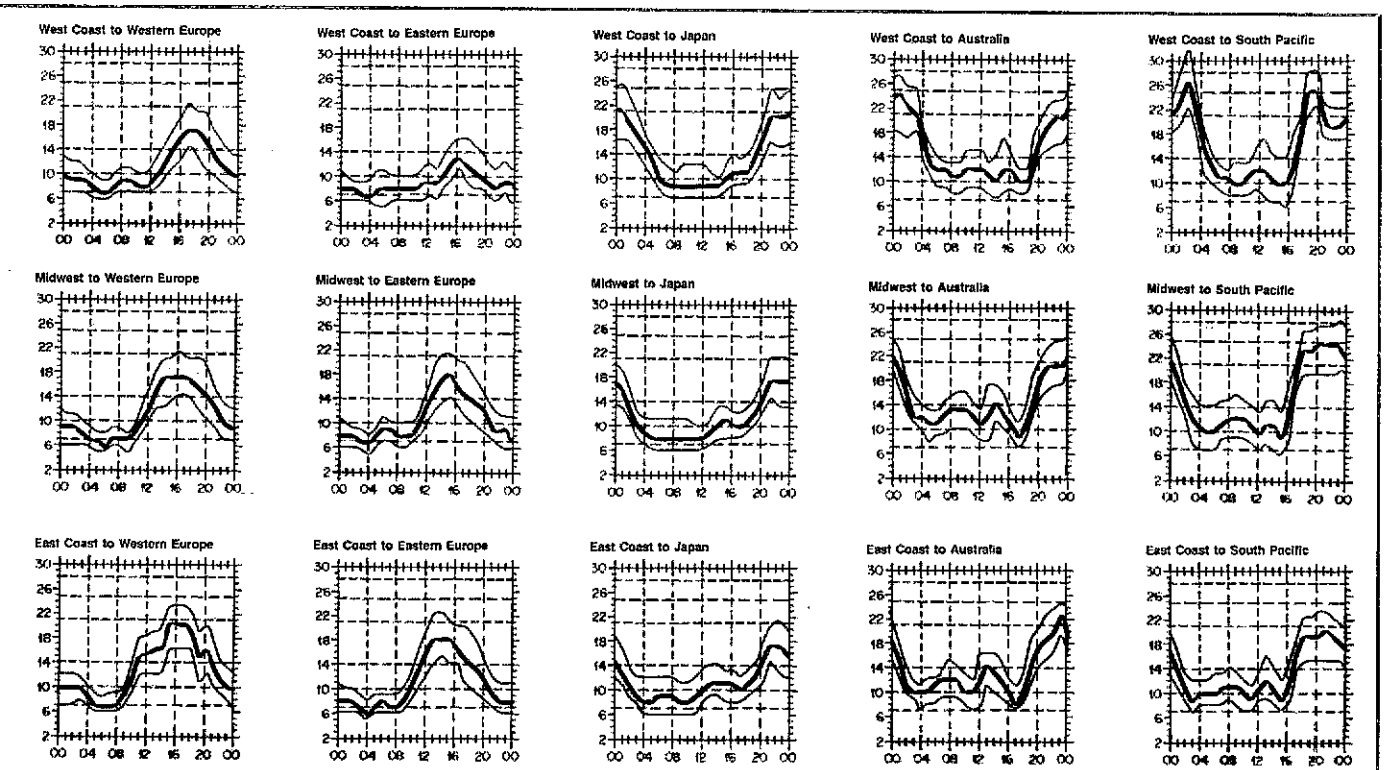
5) Family members may also use the service by enclosing their QSLs with those of the primary member. Include the appropriate fee with each individual's cards and indicate "family membership."

6) Blind members who do not receive *QST* need only include the appropriate fee along with a note indicating that the cards are from a blind member.

7) ARRL affiliated-club stations may use the service when submitting club QSLs by indicating the club name. Club secretaries should check affiliation papers to ensure that affiliation is current. In addition to sending club station QSLs through this service, affiliated clubs may also "pool" their members' individual QSL cards to effect an even greater savings. Each club member using this service must also be a League member. Cards should be sorted "en masse" by prefix, and a *QST* label enclosed for each ARRL member sending cards.

Countries not Served

A5	Bhutan	TZ	Mali
A6	United Arab Emirates	V4	St. Christopher and Nevis
A7	Qatar	VP2E	Anguilla
BV	Taiwan	VR6	Pitcairn Is
C9	Mozambique	XT	Burkina Faso
D6	Comoros	XU	Kampuchea
ET	Ethiopia	XW	Laos
HZ	Saudi Arabia	XX9	Macao
J5	Guinea-Bissau	XZ	Burma
KC4	US bases in Antarctica	YA	Afghanistan
		ZA	Albania
KC6	Belau	ZD7	St Helena
KC6	Micronesia	ZD9	Tristan da Cunha
KH1	Baker and Howland Is	ZK2	Niue
		ZK3	Tokelau
KH3	Johnston Is	3C	Equatorial Guinea
KH5	Palmyra and Jarvis Is	3V	Tunisia
KH7	Kure Is	3W	Vietnam
KH9	Wake Is	3X	Guinea
KP1	Navassa Is	4W	North Yemen
KP5	Desecheo Is	5A	Libya
P5	North Korea	5H	Tanzania
SU	Egypt	5R	Madagascar
T2	Tuvalu	5U	Niger
T3	Kiribati	5X	Uganda
T5	Somalia	7O	South Yemen
TJ	Cameroon	7Q	Malawi
TL	Central African Rep	8Q	Maldives
		9G	Ghana
TN	Congo	9N	Nepal
TT	Chad	9U	Burundi
TY	Benin		



month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). See April 1983 *QST*, page 63, 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 September 16 to October 15, 1986, assume a sunspot number of 10, which corresponds to a 2800-MHz solar flux of 72.

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 5-country increments above 300. The totals shown below are exact credits given to DXCC members from June 1 through June 30, 1986. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DJ3MZ/106	HA8KVB/105	JA2KVB/110	3D2ER/156	K3RMX/106	KI4UZ/104	KF5DA/103	NZ6N/208	KA9UGA/102
DU9RG/289	HA8ZO/108	JA0AOO/257	9H4R/110	KZ3H/114	N4FVN/103	NA5Z/100	WA7VYJ/100	KD9WK/150
F6HJR/269	HK3HFQ/104	LZ1HA/242	KA1GQW/137	N3BDW/104	WN4G/110	WB5STU/106	KD8LH/104	W9NTU/202
FD6IFF/149	JA1KNS/249	ON4ACB/202	KB1NS/101	W3RQU/121	KA5MQH/120	WB5TGL/102	K9EIJ/111	KØQC/253
HA5OG/175	JA1NGM/110	PY7OO/118	NA1A/105	WA3GSN/100	KB5NO/101	KG6EE/116	K9UTO/122	WØAWP/102
HA8CW/102	JH1OCC/106	TR8DR/226	W2DW/260					

Radiotelephone

A92F/208	G4OUT/103	J73LC/108	LZ1HA/241	YCØDLG/165	KA2IVS/101	N3EHD/114	N5HRX/102	K9UTO/119
C53CR/112	HK3HFQ/104	JA1KNS/137	ON4ACB/196	YCØTG/100	KB2HN/122	AA4NK/103	WB5ZRD/102	KØQC/189
DU9RG/289	HL1AQB/104	JA1MDK/302	TR8DR/157	ZP5FGS/109	NB2Q/105	KI4UJ/101	AK6T/147	KØYXU/108
F6HJR/258	I2QMU/277	JA1NGM/110	V44KQ/105	YU2GG/101	W2DW/146	KN5A/105	NZ6N/208	KB0LB/105
FD6IFF/147	IKØFEW/120	JAØAOO/257						

CW

F6BEE/234	JA1KNS/193	JA9FPI/118	SP5AA/110	K2TWI/206	KN5A/128	WK6E/107	KD8KY/102	N9DPL/102
G3LPS/148	JA2CXK/107	PY2GCW/108	KA1KPH/118	W2DW/232	AK6T/154	WB6IYS/100	W8CHJ/128	KØQC/204/20
G4SSH/100	JA2KVB/110							

RTTY

CE3BBW/106	W7KS/104							

160 Meters

UA3PFN/104	K9GX/101	K9RJ/100						

5BDXCC

LZ1HA	SM3GSK	OH2VD	SP5AA	W5PWG	DU9RG	KØGUG	W5KFN	W1EW
JAØAOO	WA6OET	DK2XX	G3LPS	KC3X	ABØP	SM6DHU	AB0M	

Endorsements

Mixed

CT4BD/311	HB9CWA/129	JA4IYL/140	XE1VV/293	K2PZ/301	WB3EFQ/259	KC5WB/300	KV7Q/126	KD9FY/126
DF2CD/185	HB9MO/349	JA7MFL/179	VE6BBI/150	K2UKM/202	AA4MA/182	NA5U/224	NM7V/126	KG9J/298
DF2PW/265	HB9NU/309	JA8QR/277	YS1RRD/325	KA2UTV/206	K4HP/283	NJ5X/263	W7GXC/315	KG9N/297
DF3EK/238	I4BAC/322	JA9FPI/299	YS1UL/228	KB2XL/267	K4JPD/304	W5INL/290	W7HX/225	KM9G/200
DJ1UR/210	I4MKN/332	JT1BG/225	YU1DZ/321	KN2N/300	NK4Q/202	W5LFK/327	W7ND/275	KT9P/233
DJ9HX/252	IT9JLA/312	KH6CD/361	YU2AKL/311	NN2F/252	WA4NQG/270	W5ZPA/313	W7OEV/324	KQ9O/225
DK3GI/330	IT9OSF/209	LA8XM/152	YU3BQ/255	W2ELH/287	WA4QBX/330	WB5TFM/132	K8RWL/329	N9DPL/229
DL1DC/352	JE1MGE/315	OZ1ABA/251	YU3QI/310/53	W2NY/304	WA4SKE/304	AK6T/211	KD8KY/181	W9MP/250
DL2HD/268	JE1QYI/303	OK1ACT/328	YU4AU/231	W2PSU/325	WA4VCC/305	K6JR/331	N8BLZ/246	W9NA/349
DL3EAP/250	JA2CXK/288	OZ7OP/328	AD1V/225	WA2TMP/128	WB4NFO/299	N6EA/352	W8FN/231	W9OKL/300
DL5BAN/298	JA2DC/270	SM7CMY/271	K1DRN/340	K3RV/291	WD4IKI/250	N6JV/320	W8KKF/310	WA9AQN/210
DL9OT/197	JF2UOP/128	SP5AA/142	K1YHM/281	KC3X/297	WT4T/305	W6KFV/315	W8NDO/138	KWØA/321
F6IFE/208	JH2CJW/305	SP6BFK/197	KB1W/226	KE3A/308	AK5B/298	K7RS/256	W8WOJ/313	KØXB/176
G3LPS/239	JR2QKH/208	SP6BZ/324	W1WW/300	W3DBA/125	K5BDX/286	KB7F/230	K9NB/315	WBØNHD/309
G3UKH/152	JA3PXH/303	UQ2MU/310	WB1EAZ/297	W3PVZ/335	KC5CR/270	KC7LZ/125	KC9CQ/294	

Radiotelephone

CP8IH/150	I6GAS/286	JT1BG/222	WA1IRN/260	KE3A/307	KR5D/187	WB6LHW/125	KJ8G/314	KT9P/233
CT1LF/150	JE1MGE/312	OZ7OP/328	WB1EAZ/297	N3AZU/270	NJ5X/263	K7UT/318	W8ILH/270	N9DPL/218
DF2CD/185	JE1ZSK/172	XE1VV/290	K2PZ/286	AA4MA/180	NW5K/272	KB7F/225	W8KKF/310	W9OKL/300
DL5BAN/296	JI1WLL/210	YB3CDL/207	KA2UTV/204	K4JDJ/270	W5INL/289	KB7UH/288	W8VHY/332	KNØL/261
F6IFE/207	JA2CXK/286	YB3CEV/227	KB2XL/263	KB4CWO/250	W5LFK/309	W7GXC/314	W8WOJ/293	WØHBH/292
G3VOF/303	JH2CJW/290	YS1RRD/325	KN2N/286	WA4QBX/323	K6JR/331	W7KOI/282	WA8SXM/150	WØKXZ/250
G4MBT/160	JR2QKH/208	K1DRN/340	W2ELH/281	WD4IKI/249	K6RK/305	W7OEV/308	KD9WK/150	WBØNHD/309
G4ULC/237	JA3PXH/293	K1YHM/273	W2PSU/314	WT4T/300	W6AEQ/252	K8MID/250	KG9J/291	WBØOQV/300
HB9NU/309	JA9FPI/288	W1EED/284	K3RV/238	KC5CR/269	W6NGZ/224	KD8KY/148		

CW

DF2PW/251	DL3MQ/149	JH2CJW/286	OZ1ABA/215	K2PZ/258	WA4QBX/254	K5CON/153	KY7M/201	W8NPF/250
DF3EK/235	I2IWM/215	JA3PXH/289	OZ7OP/286	KN2N/229	WT4T/225	NF5Z/175	W7YS/200	KG9N/207
DK5PR/260	IK5DEY/205	JA7AZJ/165	PY2FK/225	W2ELH/175	AK5B/239	K6RK/279	KF8N/226	KM9G/194
DL2HBX/158	JA1AAT/201	OH2VD/239	SM5DAC/202	KE3A/152	K5BDX/253	N6JV/300	W8FN/202	WBØOQV/183
DL2HD/244	JA2DC/229	ON5CW/154	YB2BNJ/137					

RTTY

W1DA/151								

160 Meters

AA4V/125	WD5ELJ/128							

DXCC Notes

Reminder: Those wanting to update their totals for the December 1986 *QST* DXCC listing must submit confirmations during the month of September. They must reach HQ on or before September 30, 1986 to be listed. You must comply with DXCC rule 5, including the once-a-year exception, to update the listing.

Honor Roll Corrections: Phone-N4NX 307/316, W8NXF 308/333.

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716
CompuServe ID no. 70645,247

When the Frequency Coordinator Doesn't...

Recently, I received a letter from the frustrated trustee of a club-sponsored 220-MHz repeater. He is frustrated because for over a year he has tried unsuccessfully to get his repeater coordinated. Correspondence he has sent to the coordinator goes unanswered. Promises he receives over the telephone go unfulfilled. He is at a dead end.

Meanwhile, his club found a clear frequency and has been operating its repeater without interference and without coordination. However, without the protection afforded by coordination, they may be forced off the air if they interfere with any coordinated repeater (according to the new FCC regulations). The letter from the frustrated correspondent ends with "I hope you will be able to provide some assistance in resolving this issue."

Looking into this matter, I discovered something extraordinary after consulting the latest edition of *The ARRL Repeater Directory*. Forty-four percent of the 220-MHz repeaters listed under the jurisdiction of this particular frequency coordinator are uncoordinated! This is extraordinary. Usually, you will find one or two repeaters within a jurisdiction are uncoordinated; but in this jurisdiction, nearly half the repeaters are uncoordinated!

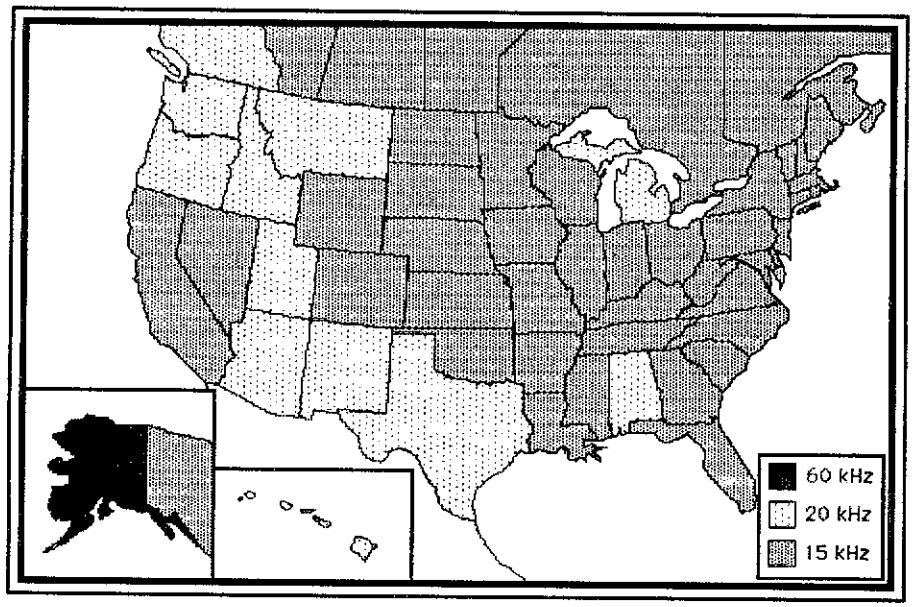
If you take these two facts—the lack of response from the coordinator and the unusually high number of uncoordinated repeaters—the clear assumption is that the frequency coordinator is not doing his job. Among the uncoordinated 44% likely are other frustrated hams who tried to obtain coordination, but ran up against the same stone wall. Failing to get coordination, they put their repeaters on the air anyway. Other representatives of that uncoordinated 44% were likely aware of the unresponsive coordinator and went on the air without trying to get coordinated.

We can assume that the coordinated 56% were either coordinated when the coordinator was doing his job or they were grandfathered into a coordinated status because they were on the air before coordination existed.

What Is the Solution?

I suggest that all of the uncoordinated 44% get organized and confront the coordinator. Demand that he do the job or resign and get someone else who will do the job.

As far as the status of these repeaters in the eyes of the FCC is concerned, I suggest that they ought to have the same status as the repeaters that predated the coordinator and were grandfathered into the coordinated status because they were on the air before a frequency coordinator existed. The present situation is the same. Although a coordinator claims to exist, in reality there is no coordination; therefore, the uncoordinated 44% should be granted coordinated status via grandfathering, assuming no interference problems exist.



The state of the 146-148 MHz band plan in the US and Canada in the summer of 1986.

TEN FM

Edward Buckley, N1BOJ, wrote recently that "today more radios on the low bands are coming stock with FM. Ten-meter FM is becoming very popular, and there is just not enough frequency space allocated for 10-meter FM. There are too many FM repeaters sharing a limited amount of frequencies. There is also too little space provided for simplex activity.

"...I think it is essential to print the 10-meter band plan in *QST*. Because of the crowded conditions on 10-meter FM, operators are using 29.5 [MHz] for a simplex channel, and this is not good for satellite users. They are also going below 29.5 to find simplex space. I really don't think that they would go below 29.5 if they were more familiar with the 10-meter band plan. Please give this matter some consideration."

The 10-meter band plan follows.

Band Segment (MHz)	*Mode*
29.300-29.500	Satellites
29.520-29.580	FM-repeater inputs
29.600	FM simplex
29.620-29.680	FM-repeater outputs

FM repeater frequency pairs:

Input (MHz)	*Output (MHz)*
29.520	29.620
29.540	29.640
29.560	29.660
29.580	29.680

(source: *The 1986-87 ARRL Repeater Directory*)

REPEATER LOG

According to May 1986 reports received, repeaters were involved in the following public-service events: 232 vehicle emergencies, 19 medical emergencies, 16 fire emergencies, 15 drills/alerts, 12 public-safety events, 8 criminal activities, 6 weather emergencies, 3 search-and-rescues and 2 power failures.

The following repeaters were involved (followed by the number of events): WA2ZWP 4, W2UL 35, WA6BJY 8, W6FNO 210, KH6H 2, WB6JP1 5, K8DDG 23, KD8GL 5, WA8ULB 9, WD8IEL 8, WØBLK 4.

Strays

I would like to get in touch with...

☐ anyone with a manual/schematic for a Dycomm Model Super E solid-state, mobile 2-m amplifier. Charles Jekofsky, WB3DRF, 6307 N Capitol St, Washington, DC 20011.

☐ anyone with a schematic or manual for a Montgomery-Ward Model 62-358 Series A-9 receiver. Stan Barczak, K8MJZ, 11220 Churchill Rd, Rives Junction, MI 49277, or call collect 517-569-3740.

☐ anyone with information on a Pathcom/Pace Communicator II 2-meter FM rig, Measurements Model 80 signal generator and Santec HT-1200. Jim Aspinwall, WB9GVF/5, 3046 Creekbend Cir, Grapevine, TX 76051.

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to PO Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

Calling-Frequency Etiquette: Some Progress, but Still Room for Improvement

Much has been written in this column and elsewhere about the use of calling frequencies on the VHF bands. By now, most of us should be familiar with their concept and intent. They provide a common meeting place so that those monitoring for activity do not have to be tuning the band continually. Thus, if you want to call CQ or a specific station, the calling frequency is the logical place to do so.

If there is a QSO already in progress on the frequency, you are presented with somewhat of a dilemma. You can, of course, break in and ask to join the conversation. However, you may be one of those who do not particularly care for roundtables. You can wait until the QSO is finished, but that can be a long time. You can move to a nearby frequency and make your call. But, since VHFers are accustomed to monitoring calling frequencies, your chance of getting a reply on any other frequency will probably be slight. Of course, you can opt, as some do, for calling CQ right on top of the QSO in progress. That is certainly discourteous, and possibly illegal. By engaging in a protracted conversation on the calling frequency, those holding the QSO are guilty of preventing others from availing themselves of the benefit of the calling frequency. On the other hand, their use of it is probably not necessary for the maintenance of their communication. It is very likely that their conversation could just as easily be held anywhere else in the band. Except for quick exchanges or when signals are very weak, a QSY is very easy to accomplish.

Perhaps, you are not interested in calling a CQ yourself, but only in monitoring for the presence of weak DX stations. Use of the calling frequency by people engaged in a long-winded QSO seriously interferes with your ability to hear the faint, faraway signals, and may even disrupt the peace and quiet of your shack or possibly the entire household. Your only recourse may be to turn the thing off and run the risk of missing out on a good DX contact.

Table 1
Calling Frequencies

6 Meters	
50.110	(SSB DX calling frequency)
50.200	(SSB National calling frequency)
50.400	(AM calling frequency)
50.700	(RTTY calling frequency)
52.525	(National simplex frequency)
2 Meters	
144.200	(National calling frequency)
146.520	(National simplex frequency)
1¼ Meters	
220.100	(Calling frequency)
222.100	(Calling frequency [California only])†
223.500	(National simplex frequency)
70 cm	
432.100	(Calling frequency)
446.000	(National simplex frequency)
33 cm	
903.100	(CW/SSB calling frequency)
906.500	(National simplex frequency)
23 cm	
1294.500	(National simplex frequency)
1296.100	(CW/SSB calling frequency)

†originally established in California to combat interference to the Amateur Radio Service. 220.100 MHz is now generally accepted.

In some parts of the country, at least, many VHFers have come to appreciate the use and benefits of calling frequencies. Very often, one hears "let's QSY off the calling frequency" as the initial statement in a QSO. Such was not the case only a few years ago. So, there has been significant progress, but far from total perfection. That is certainly unattainable. People just are not perfect. They do forget. This conductor cannot make any claims to perfection in this regard. On more than one occasion I've had to be reminded that we should "QSY off the calling frequency." But, forgetfulness is one thing and intransigence is something else.

I really don't know how to convince those who just don't appreciate the use and need for calling frequencies; surely there is not much one can do about the few who have no regard for the rights of others. One would like to think that there are only a few such persons in VHF. After all, there are always a few in any collection of people. One can only conclude that, after informing them in a friendly manner a number of times, the last resort is to ignore them when they come on the air and urge others to do the same. This is an extreme measure, and I hesitate to mention it, but sometimes it is the only solution to a particularly flagrant situation.

An especially ideal time not to monopolize a calling frequency is when the band is wide open. The best example of this is 144.200 during an E-skip session. There is often so much QRM on that frequency that no one can work anything. But when one calls even 10 kHz either side, there are often no responses. If we can only learn to tune around more and call on other frequencies at such times, we will all work more.

What has been said involves mainly the SSB/CW calling frequencies, as those modes are more in the tradition of HF-band Amateur Radio, where incremental variable frequency control is the norm. For FM, where channelization is the usual practice, somewhat different considerations apply. Nevertheless, even with that mode, those engaged in contacts on popular frequencies such as 146.52 should always be on the alert for other traffic that may require the use of the channel.

For the rest of the summer/fall season, and throughout the lean months ahead, let's resolve to use the calling frequencies more intelligently and courteously. Then, when the DX returns next spring, we will all benefit from more pleasant operating conditions and an increased number of contacts. For reference, the calling frequencies for the various VHF/UHF bands are listed in Table 1.

ON THE BANDS

2 Meters—As it was for the May period, 2 meters is the star for early June. It's exciting enough to encounter several good openings between many points within the US and southern Canada. But when E skip enables contacts with several Caribbean countries, it's nothing short of fantastic. That's exactly what early June served up for 2-meter operators in the Southeastern states. A number of stations worked HI8DAF and several other Caribbean stations. The first such contact reported to me was by AA4KP southern Virginia, who worked the Dominican station at 2335Z June 10. Carol says that he was 5×5, and she received a 5×5. KB3QM Delaware capitalized on the same opening, but Ron worked slightly different DX. His log shows contacts with KP4EOR at 2252Z June 10 and KP4EKG three minutes later. The other session with the Caribbean occurred Saturday morning, June 14. HI8DAF called on 6 meters to announce that he was in the midst of a 2-meter opening to the southern US. At the same time, a number of US stations reported working KP4EOR. There was also a report that KP4EOR's 2-meter beacon on 144.175 was heard in Quebec by an unknown station, but no confirmation has been received on this.

June 11 represented the biggest E_s day of the period in terms of number of stations participating and length of time the band was open. KB3QM comes up with a list of 15 contacts in Louisiana, Texas and Oklahoma between 1800 and 2040Z. Even with his relatively modest station, consisting of 100 W to a 5-element Yagi in the attic, W3EP/4 Athens, GA managed 11 QSOs with stations in the Houston, San Antonio and Fort Worth areas of Texas. Emile's contacts were all between 1715 and 1925. WA4AHZ Sarasota, FL was quite surprised and happy with the June 11 opening. It displayed a double-peaked nature to him. The first began about 1510Z with stations in Missouri, Oklahoma, Kansas, Iowa, Nebraska and Colorado. The last two are new states for Ron and represent a good haul from Sarasota. The next phase got underway about 2025 and lasted until 2045. It brought contacts with western New York and several Canadians around Toronto. One station worked was VE3WAS, who was mobile and stuck in Toronto traffic at the time. This was Ron's third E_s opening, and already he has 19 states.

WA4MVI sends along a note discussing the weather conditions for June 11. Once again, the occurrence of 2-meter E_s seems to correlate very well with very intense thunderstorm activity. Two such centers are clearly seen on the map that Jim draws—one in the East Texas/Louisiana area, and the other just south of the Great Lakes. This fits particularly well with WA4AHZ's two-peak description.

While the East was enjoying sporadic-E

70-cm Standings

For WAS holders, listings are WAS number, call state or province, call areas worked and grid squares worked. For others, call, state, or province, US states worked, call areas worked and grid squares worked. Call areas are the 10 US call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. Grid squares are those Maidenhead designators worked since the VUCC award was instituted, January 1, 1983. Those not showing some indication of activity or interest within the past two years are subject to being dropped. They will be reinstated upon presentation, in writing, of a statement that they are still interested in being listed in the 70-cm Standings. It is not necessary to have worked any new states or grid squares in order to remain listed or be reinstated. Compiled July 10, 1986. Deadline for next update is January 5, 1987.

WAS Holders

1	WØYZS*	MO	—	—
2	K2UYH*†	NJ	55	—
3	K5JL*†	OK	48	—
4	WB5LUA*	TX	41	—
5	W5FF*†	NM	28	—
6	W1JR*†	MA	46	134
7	WA4MVI*†	SC	26	—

K1FO*	CT	43	39	165
W2SZ/1*	MA	29	12	79
K1PXE	CT	25	11	—
K1LPS*	VT	22	12	—
W1RIL	MA	14	7	26
W1GXT	MA	13	6	—
W1QXX	MA	13	5	20
N1AIS	MA	11	5	—
K2RIW*	NY	28	12	—
W2VC	NJ	27	11	67
K2GK	NY	24	9	59
WA2FGK	NJ	22	9	—
W2PGC	NY	20	10	—
K2YCO	NY	17	8	—
K2OVS	NY	16	6	13
N2WK	NY	15	9	41
N2BJ	NY	15	5	32
NB2T	NY	10	5	—
W2WW	NY	10	3	14

W3RUE	PA	30	10	47
W3IP	MD	27	7	—
WB3LJK	MD	24	10	50
KB3QM	DE	23	—	54
W3ZZ	MD	22	9	57
WA3FYJ	PA	22	9	45
AE3T	PA	21	7	—
K3HZO	MD	20	9	14
K3IUV	PA	19	5	—
W3XO	MD	13	5	12
AC3T	DE	12	4	16
WA3DMF	MD	10	5	13
K4QIF*	VA	39	21	—
W5HUQ/4*†	FL	36	39	—
WB4NXY	KY	29	8	90
WA4PCS	KY	27	9	—
W4FJ*	VA	25	8	—
W4ISS	GA	25	8	—
WS4F	GA	22	8	54
KC4EG	KY	21	8	—
K4QF	AL	21	—	—
WA4SBC	VA	20	7	—
W3IY/4	VA	19	7	—
WD4DGF	TN	15	6	29
K4KAE	SC	14	6	—
WB4RUA	GA	14	3	28
K4LHB	VA	13	6	—
WA4OFS	FL	10	3	20
WA4OWC	FL	10	—	—
NI4Z	FL	9	3	—
KB4CRT	FL	9	2	31
WB4SLM	GA	6	2	13
NA4I	GA	5	1	9
WØRRY/5*	OK	41	35	—
K5FF*	NM	38	29	—
WB5AFY*	TX	35	26	120
W5UKQ*†	LA	30	11	—

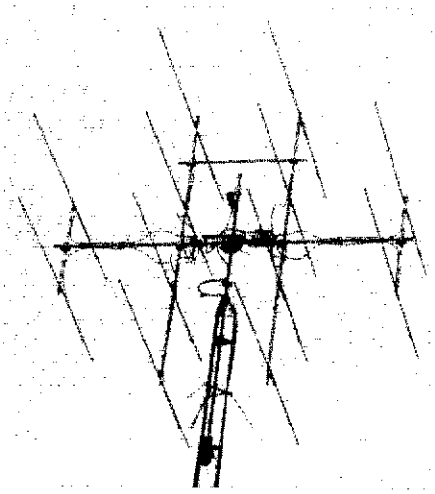
W5HN	TX	25	7	—
W5RCI	MS	25	7	—
K5YY	AR	23	6	91
K5SW	OK	22	7	66
KB5MR	OK	21	5	71
WA5HNK*	TX	19	6	—
K5JRH	TX	17	4	—
K5UR	AR	18	5	76
K5WE	OK	15	4	35
K5DHU	TX	14	5	44
WA5DBY	TX	14	4	—
WA5VJB	TX	15	4	—
N5BBO	TX	12	3	46
W5ASH	TX	11	4	38
W5DFU	OK	10	4	10
W5UWB	TX	10	3	16
W5NZS	OK	6	—	50
W6ABN*		43	34	—
N6AMG*		9	16	—
K6JYO		9	6	—
K6QXY		4	3	—
WA6HXM		4	2	—
W4WD/7*	UT	38	33	—
W7JF*†	MT	34	25	—
W7HAH*	MT	18	17	31
K8WW*	OH	45	34	—
W8IDU*	MI	41	11	—
WB8BKC	MI	30	9	73
NI8O	OH	31	10	107
WB8PAT	OH	23	9	—
WA8MIL	MI	18	9	41
WB2DIN/8	WV	13	6	—
WB9SNR	IL	34	11	65
W9ZIH	IL	33	11	—
W9UD	IL	28	10	—

K9XY*	WI	21	11	—
NC9F	IL	20	9	51
K9SM	IL	16	7	16
WB9MSV	IL	14	5	49
W9YCV	WI	8	4	13
WØUC/9	WI	7	2	7
KØTLM*†	MO	47	24	74
WØRAP*†	IA	45	32	136
WBØTEM*	IA	42	—	—
WØPW*	CO	28	10	—
KØDAS	IA	26	7	—
WØFY	MO	24	8	46
KØALL*	ND	23	12	—
WBØDRL	KS	21	6	74
WØRT	KS	21	5	54
WØOHU	MN	20	6	—
WØVB	MN	17	6	—
KFØM	KS	16	6	60
WAØTKJ	KS	15	5	50
KCØQR	NE	14	5	53
WBØDGF	NE	10	3	25
WØJRP	MO	9	4	15
WAØNOK	MO	9	3	—
WBØZKG	IA	9	3	—
WØRWC	IA	8	3	—
KCØOG	NE	7	2	17
NØBTN	NE	4	2	7
KH6HME		2	2	6
KL7WE*†		28	25	—
VE1UT	NS	14	6	—
VE2DFO		12	7	1
VE3LNX		15	6	43
VE4MA*†		43	40	—
G3SEK*		19	38	152
JA9BOH*		18	31	—

*some contacts made via EME
†WAC
—information not supplied.

openings, VHFers along the Pacific Coast were being treated to one of those phenomena only they are privy to—a Hawaii tropo duct. W6PJA comes up with his usual very detailed account of the event. Bob notes that the KH6HME 2-meter beacon was heard from San Diego to the Bay Area and inland 50 to 100 miles. What made the event particularly exciting this time was that it occurred, in part, during the ARRL June VHF QSO Party. Actually, the path opened up about 1030 Pacific Time June 11 with W6PJA hearing both the 2-meter and 70-cm beacons about S1 or less. By June 13, signals had built up somewhat, and two-way contacts began. Two-way contacts require KH6HME to drive to the beacon site, 8000 ft up the slope of Mauna Loa, overlooking Hilo on the Big Island. His efforts paid off in KH6 QSOs for K6HCP Gilroy, 60 miles south of San Francisco, W6PJA Fullerton near Los Angeles, W6NGN Buena Park, WB6FCS West Covina, N6DG Del Mar near San Diego, N6CW, NJ6A, N6ABU and WA5BNH/6 also in the San Diego area. On June 14, the 2-meter, 70-cm and 23-cm beacons all peaked S5 at W6PJA's QTH between 0630 and 0730 Pacific Time. After the contest got underway, N6CW, N6XQ, AB6H, N6XO, N6ND, WA6BDC, WBØTTW/6, WA6IPW, WB9DJZ and KS6A, all in the San Diego/Los Angeles areas, came up with 2-meter QSO Party exchanges with Hawaii. W6PJA also reports that KØKV/6 on Mt Pinos, 50 miles east of San Diego, heard the KH6HME signal as did W6YKM, whose QTH is located 6000 ft up Mt Blue, 150 miles from the coast. W6PJA notes there were no particularly outstanding weather conditions present in the Pacific at the time of the three-day opening.

It is not only those on the Hawaiian end who must leave home to be able to span 2500 miles of Pacific Ocean. NJ6A and N6ABU had a similar problem. Living in a valley as they do, neither was able to hear the signals from KH6. So they pooled their resources, taking an IC-211, a 160-W amplifier and a 4-element beam to a vantage point about 700 feet above the ocean. Not only were they successful, but their efforts demonstrate how easy it is to put together a simple, portable station.



The array of 12 RIW-19s for 70 cm at K1FO. The somewhat unusual arrangement, chosen for ease of assembly, turns out to be a disadvantage for tropo work. It results in the first side lobe being pointed ± 45 degrees to the horizon. Thus, they are not useful for locating weak stations to the side of the 8 degree main lobe.

The Higher Bands—WD4MBK writes describing the beacon system he has recently put into operation at Lookout Mountain, 115 miles north of Atlanta. The system has outputs at 432.0715, 1296.2145, 2304.3575, 3456.572 and 5760.9295 MHz. A 10,369.716-MHz unit will be added soon. All are A1A keyed with the message DE K4MSK/BCN EM85MD EM85MD. Charles says that the beacons do well in Atlanta, and notes that he has even heard the 5760 output two out of the three times he has set up the needed equipment. That consists of a 24-inch dish placed in his shack window, 2.5-dB-NF GaAsFET preamp to a home-brew cavity converter feeding a 2-meter IF. The 70-cm beacon has been heard as far away as Oak Ridge, TN and Huntsville, AL, and the 23-cm output has been heard in Atlanta as loud as S9 plus 20 dB. For more details on this unique and ambitious system, see The New Frontier, page 78, this issue.

Another piece of beacon news comes from N3CX. David says that he has put a beacon on 903.070 that transmits a carrier for 35 seconds followed by DE N3CX GRID FN20, then another 35 seconds of carrier, and then DE N3CX PENNSBURG, PA. The transmitter runs 10 W through 50 feet of 9913 to a 33-cm big (little?) wheel. The N3CX 33-cm home station runs 40-W output to a single loop Yagi. He is looking for skeds on the band. David offers to provide information on his home-brew equipment to anyone interested. For details, send an SASE to David Hackford, Box 138, RD 2, Pennsburg, PA 18073.

The New Frontier

Conducted By Bob Atkins, KA1GT
103 Division Ave, Millington, NJ 07946

Multiband Beacon from North Carolina

Charles Osborne, WD4MBK, has sent along details of a multiband beacon system he built and placed in operation at the QTH of K4MSK, EM85md in North Carolina (4777 ft ASL). The beacon identifies on CW (A1A) as DE K4MSK/BCN EM85md EM85md and is capable of operation on the following frequencies:

432.0715 MHz	1 W	EIRP omnidirectional
1296.2145 MHz	2 W	EIRP omnidirectional
2304.3575 MHz	100 mW	EIRP beamed SW
3456.572 MHz[1]		
5670.9295 MHz	8 W	EIRP beamed SW
10369.716 MHz[2]		

[1]Not yet operational; 10 mW to a 4-ft dish is planned.
[2]Not yet operational; 400 mW EIRP beaming SW is planned.

The beacons are all phase locked to a 108.01788-MHz ovenized crystal oscillator with a rated frequency stability of ±3 PPM over a 0-60° C temperature range (± 324 Hz at 108 MHz) and a drift of less than ±3 PPM per year. The master oscillator will be adjusted as necessary to maintain the 70-cm frequency at 432.0715 MHz. The 1296.2145-MHz signal is obtained by tripling from 432.0715 MHz. This should make finding the 1296-MHz signal frequency easy if the 432-MHz beacon is audible. The procedure would be to locate the 432-MHz beacon, and then transmit into a dummy load on exactly that frequency while looking for the third harmonic of your signal on 1296 MHz. The frequency where you hear it should be the exact frequency of the beacon.

The way in which the various beacon frequencies are derived is quite complex, involving much power splitting, mixing and multiplying. A very much simplified summary is as follows:

432.0715 MHz—108.01788 MHz × 4
1296.2145 MHz—108.01788 MHz × 4 × 3
2304.3575 MHz—108.01788 MHz × 20
(phase lock) + 72 MHz × 2
3456.5720 MHz—108.01788 MHz × 20
(phase lock) + 1296.2145 (see above)
5760.9295 MHz—108.01788 MHz × 52
(phase lock) + (72 MHz × 2)
10369.716 MHz—108.01788 MHz × 96
(phase lock)

From these frequencies it can be seen that only two oscillators are involved: one at 108.01788 MHz used on all bands, and a second at 72 MHz that is used only on 2304 and 5760 MHz. A beacon at 904 MHz may be added later by mixing the 72-MHz × 2 signal at 144 MHz with a 760-MHz synthesized LO that is already built.

The same beacon site, Mt Toxaway, also carries a 220-MHz repeater belonging to the Fourland VHF Contest group (224.72 MHz), and is represented on 144 MHz by K4MSK himself. Even under poor conditions, K4MSK can work into Washington, DC, Orlando, FL, Indiana and New Orleans on 144 MHz!

This beacon system is probably the most complex and comprehensive in the US, if not the world. Reception reports would be appreciated, and should be sent to WD4MBK or K4MSK.

3456-MHz NEWS FROM THE SOUTHWEST

Kent Britain, WA5VJB, has sent in details of 3456-MHz activity by the North Texas Microwave Society. On May 24, several stations exchanged weak signals on 3456.1 MHz. By June 14, there were six stations active on the band; by June 16, five 3456-MHz VUCC applications were submitted to the ARRL. Rapid progress by any standard!

Four of the stations (WA5DBY, WB5LUA, W5UC and KD5RO) are mixing 2160 MHz (LO from their 2304-MHz stations) with 1296-MHz SSB to generate their 3456-MHz signals. They are all using 1-2 W TWT amplifiers for their final output. WA5TNY is using the same mixing scheme, but with a solid-state 2-W amplifier. WA5VJB uses a different mixing scheme, mixing a 3312-MHz LO with a 144-MHz SSB signal, with a 500-mW solid-state final.

The flurry of VUCC applications was thanks to the efforts of WA5TNY. On June 15, he traveled through five grid squares, completing contacts with WB5LUA, W5UC, KD5RO and WA5VJB from each of the five grids. Contacts were completed at distances of up to 125 miles, with most of the QSOs being made easily on SSB.

On June 24, W7CNK Oklahoma City joined the activity, working most of the Texas stations. He is also using a 2160 + 1296 MHz mixing scheme with a 2-W TWT and a mast-mounted preamp, and can work regularly into the North Dallas area at a distance of 150 miles.

Kent also sent along details of recent microwave DX record attempts. The first took place on June 7, when WA5JCW/5 at the HamComm Convention in Arlington, TX tried to work K5PJR near Tulsa, OK. Signals were heard both ways, but a contact was not completed. The second was on June 29, when KA5JPD and WA5TNY traveled to a spot 80 miles southwest of Dallas in an attempt to work W7CNK over a 250-mile path. Again signals were heard, but a QSO was not complete. (Kent adds "this time!" and I would not be surprised to hear of the contact being made soon).

As a final note, Kent points out that 8 of 11 VUCCs on 2304 MHz, 5 of 6 VUCCs on 3456 MHz, and 3 of 5 VUCCs on 5760 MHz have gone to members of the North Texas Microwave Society!

N5MP, WA5TNY and KA5JPD (l-r) take a break during their 3456-MHz "gridpedition" June 15.

10-GHz NARROWBAND OPERATION IN CALIFORNIA

Bill Troetschel, K6UQH, and Art Lange, W6RXQ, have sent along details of some 10-GHz narrowband work they have been doing. Their home-constructed equipment consists of the following stages:

- Crystal oscillator at 91.259259 MHz × 4 to 365.037037 MHz
- 365.037037 MHz × 3 to 1095.111111 MHz amplified to 225 mW
- 1095.111111 MHz × 9 with step recovery diode to 9856 MHz (~22 mW)
- 9856 MHz + 144.1 MHz IF in DBM (doubly balanced mixers) to give ~0.5 mW at 10000.1 MHz
- 2 DBMs are used,: 1 for TX and 1 for RX.

Bill and Art have been using 30-dB dishes (~18 inches) and horizontal polarization in their tests, and to date have worked several long paths of up to 91 miles on SSB and CW, which may be the US 10-GHz SSB record to date. (As far as I am aware, the first 10-GHz narrowband SSB contacts took place in the fall of 1979 between KA1GT and WB1VUW, the best DX being 50 miles.)

Bill and Art's system for generating narrowband 10-GHz signals differs from the G3JVL system that some readers may be familiar with, in that it uses Watkins-Johnson doubly balanced mixers in place of the waveguide mixers. This produces a more compact transverter and is probably easier to tune up, the only disadvantage being the higher cost of the mixers (~$200 each).

Both Bill's 10-GHz transverter and the G3JVL waveguide 10-GHz transverter will be described in detail in the ARRL *Microwave Handbook* (to be published in 1987).

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
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London, ON N6H 2R7
Tel 519-473-1668

Moved and Seconded...

MINUTES, CRRL BOARD MEETING No. 9 1986 May 24

1) Pursuant to due notice, the Board of Directors of the Canadian Radio Relay League, Inc, met in annual session at the Airport Holiday Inn, Toronto, Ontario, on 1986 May 24. President Tom Atkins, VE3CDM, called the meeting to order at 0900 EDT. The following were present: Vice President and Secretary Harry MacLean, VE3GRO; and Directors William Kremer, VE7CSD (Pacific Region), William Gillespie, VE6ABC (Midwest Region), and Raymond Perrin, VE3FN (Ontario Region). Also present, as observers or to present reports, were Honorary Vice President Noel Eaton, VE3CJ; Counsel Robert Benson, QC, VE2VW; General Manager Raymond Staines, VE3ZJ; Assistant Directors Al d'Eon, VE3AND, William Loucks, VE3AR, George Spencer, VE3OZW, and Jack Strangleman, VE3GV; and ARRL President Larry Price, W4RA.

2) President Atkins welcomed everyone and announced that Directors Albert Daemen, VE2IJ (Quebec Region) and Andy McLellan, VE1ASJ (Atlantic Region) would be unable to attend because of family and job commitments. Secretary MacLean asked to go on record as being responsible for Mr McLellan's absence. There had been a mixup over suitable dates for the meeting. Everyone then observed a moment of silence for amateurs who had passed away.

3) It was agreed to follow the agenda that had been provided. Moved by Mr Atkins, seconded by Mr Perrin, the Board VOTED to adopt the minutes of CRRL Board Meeting No. 8 as issued by the Secretary and printed in *QST*.

4) President Atkins then called on each Director to present a brief report on activities and developments in his region. Counsel Benson reported on his continuing work with Revenue Canada to ensure that tariff exemptions on amateur equipment would remain when tariff laws are rewritten, the upcoming appeal in the Jack Ravenscroft case, and antenna and tower by-laws in the Greater Montreal area and Rossland, British Columbia. ARRL President Price then brought greetings from the ARRL Board and expressed his pleasure at being able to attend the meeting. The Board recessed from 1030 to 1045.

5) General Manager Staines then reported on developments at the CRRL Headquarters office in London, Ontario, the current status of CRRL budgets and the need to promote CRRL to offset a small but steady decline in membership since the last membership-development campaign. Mr Staines felt that the number of members could be increased if a form of voting membership were made available without *QST*. After lengthy discussion, moved by Mr Kremer, seconded by Mr MacLean, that CRRL membership, at an appropriate rate, be made available without *QST*. However, the motion was LOST. Then, moved by Mr MacLean, seconded by Mr Kremer, the Board VOTED to refer the matter to a committee consisting of Mr Atkins, Mr Perrin and Mr Kremer, who would report on their findings in one year.

6) The Board then discussed CRRL membership dues. The present dues structure, based on $36 per year regular membership, had been in effect since November, 1981. Since that time, because of the decline in the Canadian dollar, the cost of *QST* had escalated. Postal costs had doubled and inflation had taken its toll. At the same time, CRRL was providing more and more new services. Moved by Mr Perrin, seconded by Mr MacLean, the Board VOTED, effective 1987 January 01, to increase CRRL membership dues to the following: Regular (Full or Associate) Membership: $39 for one year, $75 for two years and $105 for three years. Student or Senior (Full or Associate) Membership: $36 for one year, $69 for two years and $96 for three years. The Board recessed for lunch from 1210 to 1240.

7) Mr Strangleman then presented an overview of the CRRL Field Organization. It seemed desirable to have Regional Directors and their Section Managers work as a team. Some simplification of the present Section structure might be appropriate in the smaller Sections. The role of Assistant Directors needed attention. Finally, there was a need for Field Organization personnel to have a point of contact at the CRRL Headquarters office in London. Moved by Mr Atkins, seconded by Mr Gillespie, the Board VOTED to appoint Mr Strangleman as CRRL Field Services Manager, to become a contact person for Field Organization personnel, to bring their concerns to the CRRL Board, and to form a committee that would develop a model for the Canadian Field organization and produce supporting materials and reporting forms for that organization.

8) The Board then made its other appointments for the 1987 calendar year. Moved by Mr Atkins, seconded by Mr Gillespie, the Board VOTED that Mr Staines continue as General Manager. Moved by Mr Perrin, seconded by Mr Atkins, the Board VOTED to appoint Mr Loucks as Treasurer. Moved by Mr Gillespie, seconded by Mr Kremer, the Board VOTED that Mr Benson continue as Counsel. Moved by Mr MacLean, seconded by Mr Perrin, the Board VOTED to appoint Mr Garry Hammond, VE3XN, as Awards Manager. Finally, moved by Mr Kremer, seconded by Mr Perrin, the Board empowered Mr Atkins and Mr MacLean to appoint an auditor for the CRRL financial records. The Board recessed from 1505 to 1520.

9) Mr Perrin then reported on developments related to DOC. Contacts were being made for the purpose of establishing RF susceptibility standards for Canadian consumer electronic equipment. There was no progress on releasing the 18- and 24-MHz bands. DOC still seemed intent on deregulating mode subbands and, of course, restructuring the Canadian Amateur Service. The Board then discussed the IARU-recommended practice (which would affect only foreign amateurs visiting Canada and not Canadian amateurs themselves) of placing the prefix of the country of operation before rather than after the visiting amateur's call sign (eg, VE3/G3SMB). Moved by Mr Atkins, seconded by Mr MacLean, the Board VOTED to recommend this practice to DOC.

10) The Board then discussed recent work with CARF on the Joint Comments on the DOC Restructuring Proposal. In the past, CRRL (and before that, ARRL) had received considerable bad press in the CARF journal, but this was coming to a halt. Among many CARF officials, there was now a genuine interest in a true merger of CARF and CRRL. Moved by Mr Perrin, seconded by Mr MacLean, the Board VOTED to appoint Mr Loucks as a fact finder, to work with a representative from CARF, to study the organizational structures, services provided and relative financial positions of the two organizations, and, if possible, to identify any basis for merger.

11) The Board then discussed 1987 budgets. In CRRL's first year of managing its finances from within Canada, some Section Managers had received inordinately low budgets. Moved by Mr MacLean, seconded by Mr Perrin, the Board VOTED that, in the future, no Section Manager would receive a budget less that $300 annually. Also, moved by Mr Perrin, seconded by Mr Kremer, the Board VOTED that draft budgets developed by the Management and Finance Committee be distributed to all directors with adequate time for input and comment before any request for final approval.

12) The Board then discussed upcoming CRRL Director elections. Moved by Mr Gillespie, seconded by Mr Kremer, the Board VOTED to have the following committee conduct 1986 elections: Mr Eaton as Chairman, Mr MacLean and Mr Spencer. Finally, moved by Mr Perrin, seconded by Mr Kremer, the Board VOTED to ratify all Executive Committee decisions made on behalf of the Board since the 1985 Board Meeting.

13) During the course of the meeting, the Board discussed the following with no formal actions being taken:

a) CRRL Life Membership: More time was required to ensure that the program would be attractive and self-sustaining,

b) updating the CRRL Headquarters computer program,

c) producing additional copy for club mailings of the *CRRL News* bulletins,

d) distribution of *CRRL News* bulletins via packet radio,

e) guidelines for CRRL incoming QSL bureaus,

f) Intruder Watch: Trained watchers continue to be difficult to find; CRRL's role might best be relaying information from watchers outside of Canada to DOC,

g) possible candidates for Maritimes-Newfoundland Section Manager,

h) 1986 CRRL Amateur of the Year,

i) making *QST* available on Canadian newsstands, and

j) packet operation on 14.11 MHz.

14) There being no further business, the Board adjourned at 1740 EDT. Total time of meeting: 7 hours, 40 minutes.

Respectfully submitted,
Harry MacLean, VE3GRO
Secretary

NOMINATIONS OPEN

Nominations are now open for 1986 CRRL Amateur of the Year. Please send your nomination with supporting documentation to CRRL before September 30.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

JA1AN Honored

Mr Shozo Hara, JA1AN, president of the Japan Amateur Radio League, has received a high honor from his country. We can do no better than quote portions of a letter received from JM1UXU, Secretary of IARU Region 3.

"...The Ministry of Posts and Telecommunications, Japan, announced on April 28 last that a 'Ranjuhosho'—Blue Ribbon Medal—is awarded [to Mr Hara] in recognition of his distinguished service in the telecommunication world, particularly to promotion of amateur radio in Japan in the past three decades.

"In Japan, a Blue Ribbon Medal is awarded by the state for [a person's] distinguished social work, scientific achievement or invention, or some other meritorious services or achievements. There are not so many people who have received this Medal and this...is seen as the highest honour for a private citizen. Those Medal winners in the Japanese telecommunication world were mostly presidents or high-ranking executives of public telecommunication corporations such as NTT, KDD, NHK, and commercial broadcasters or major electronics enterprises whose great and long services were recognized.

"[Mr Hara's] interest in amateur radio goes back to 1939 and it has continued unabated ever since. After WW II, he was the prime promoter of reopening amateur radio in Japan, which was realized in 1952. At the same time, his best efforts were dedicated to reorganizing the national amateur radio society in Japan, JARL, not only in organizational aspect but in financial aspect so as to run the organization in most appropriate manner. Thanks to the efforts, the JARL succeeded in its readjustment and obtaining the government approval for a juridical body in 1959.

"[Mr Hara] has been president of JARL without a break for more than 15 years, since 1970. Meanwhile, as you know well, he has actively worked for attaining our goals both domestically and internationally."

All of us in IARU extend our hearty congratulations to JA1AN for this recognition of his outstanding leadership.

JARL President Shozo Hara JA1AN (right), received the Blue Ribbon Medal in Tokyo on May 28. Minister Bunsei Sata of the Japanese Ministry of Posts and Telecommunications made the presentation.

SPECIAL ARGENTINIAN CALL SIGNS

In commemoration of the IARU Region 2 Triennial Conference to be held in Buenos Aires October 20-25, Radio Club Argentino, the host society, is operating special-event station AZ1ARU. In addition, more than a dozen local club stations in Argentina are signing AZ1ARU/1, AZ1ARU/2...AZ1ARU/15, respectively. These operations will continue until October 30.

Strays

I would like to get in touch with...

☐ anyone with a manual for the Cubic Astro-150A transceiver. Richard McIntyre, K4BNI, 611 Coral Dr, Cape Coral, FL 33904.

☐ anyone with specifications for the feedback transformer of an EICO-752 switching power supply. Martin Berkofsky, TF3XUU, Seilugrandi 7, 107 Reykjavik, Iceland.

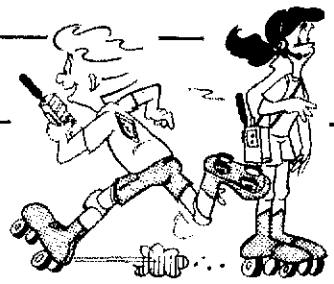
☐ anyone with a circuit diagram and parts list for an EICO oscilloscope, Model 460. Don Burr, AJ6X, 1503 W Cornell, Fresno, CA 93705.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*

Advisory Committee Members	May 1986, p 48
Can-Am Contest Rules	Aug 1986, p 84
Club Contest Rules	Jan 1986, p 94
DX Contest Awards Program	Feb 1986, p 83
Emergency-Traffic Committee	Apr 1986, p 69
Frequency/Mode Allocations	Jan 1986, p 62
Hamfest Calendar Rules	This issue, p 84
License-Renewal Information	Jan 1986, p 62
Major ARRL Operating Events and Conventions—1986	Jan 1986, p 61
MARS Information	Jul 1985, p 46
Novice-Enhancement NPRM	Jun 1986, p 49
OSCAR-10 Band Plan	Jul 1986, p 27
QSL Bureaus	
Incoming	Jun 1986, p 56
Outgoing	This issue, p 73
Reciprocal-Operating Agreements	Jun 1986, p 52
September VHF QSO Party Rules	Aug 1986, p 82
Spread-Spectrum Rules	Apr 1986, p 45
Third-Party-Traffic Agreements	Jun 1986, p 52
10-GHz Cumulative Contest	Jun 1986, p 84
902-MHz Interim Band Plan	Jan 1986, p 74

Making Waves



Conducted By Scott Springate, N7DDM
2095 Broadview, Eugene, OR 97405

YOUTH FORUM THIS MONTH

A new feature of the 1986 ARRL National Convention in San Diego will be a Youth Forum. This forum will provide an opportunity for young folks to hear about the exciting hobby of ham radio from a blue-ribbon panel of experts and to see and operate Amateur Radio gear incorporating the latest high-tech features. The objective is to share views *with* youth about ham radio, not *about* youth and ham radio.

The panel will be headed by Dr Anthony "Tony" England, WØORE, whose operation of two-way slow-scan television from the orbiting space shuttle *Challenger* during the Spacelab mission last year provided thrills in many classrooms. Joining Tony are Julian Macassey, N6ARE, telecommunications consultant and writer; Jerry Boyd, KG6LF, Chief of Police, City of Coronado; Gordon West, WB6NOA, ARRL Instructor of the Year; and Harold Price, NK6K, computer communications consultant.

The forum is 1-4 PM Saturday, September 6. There will be one hour each of formal discussion, a visit to the convention ham shack and a question-and-answer period.

Bob Zakoski, WA6MTF, a high school science teacher in Encinitas, California, is handling the arrangements for the panel. Bob says, "We are seeking youngsters of junior-high and high-school age who have scientific curiosity to attend this forum. Because it will be necessary to limit the attendance to about 600, we are asking that attendance be by invitation and preregistration. There will be an access list and badges at the entrance to the Youth Forum meeting room entitling participants access to the whole convention area. There will be no attendance fee for participants 18 years and under. Participants must provide transportation to and from the convention site."

Individual and group registrations can be made through Bob Zakoski, WA6MTF, 1986 ARRL National Convention Youth Forum, PO Box 3026, Olivenhain, CA 92024.

Bob has put together a videotape promoting the event that has been circulated in the San Diego County School District and is currently being shown to youth groups such as the Young Astronauts and Boy Scouts. The tape includes the ARRL productions *Amateur Radio's Newest Frontier* and *SAREX: The Shuttle Amateur Radio Experiment*. Contact Bob if you have a youth group that you want to bring to the convention, and he will arrange the loan of a copy for you. Write to the address above, or call 619-436-6752 or the convention hotline: 619-292-7918.

HOW ARE THE CLUBS?

For those of you trying to start a ham radio club at your school (and I hope many of you are), I would like to offer some more advice. (Original suggestions appear in this column in Oct 1985.) I attempted to start one at my school; but nobody showed for the first meeting, and I felt a little disappointed. I had done just about everything in my power to get the club rolling. I drew up a constitution, and it passed through the student council without any problem. I put notices up in the halls and in the daily bulletin stating the time and place for the first meeting, and a nice display in one of the showcases in the halls.

The more I thought about the club afterward, the more I realized what may have gone wrong. Even though students knew about the Churchill Ham Radio Club, I think many just didn't know what ham radio is and weren't about to become involved in something they didn't understand. I am now going to try to get an article published in our school newspaper that will help to clear up some of the gray areas.

If you want to try the same sort of thing, here are some important points to include: what ham radio is, what it is used for (disaster relief, traffic handling, etc), how to get a license, what is needed in the way of inexpensive equipment to get started and the different modes of operating. Be sure to stress that the hobby is not just for "brains" and that anyone with enough motivation and desire can attain a license. Most of all, let them know that ham radio is fun.

If possible, set up a station in an empty classroom after school one day so students can have a first-hand look at ham radio. Good luck to all of you, and I hope my advice has been helpful for many of you trying to start a school club.

NON-HAM TO EXTRA IN NOTHING FLAT

Christine Grandinetti is a very remarkable 14-year-old. In less than a year, she has gone from non-ham to Extra Class licensee.

In August 1984, Chris and her parents were vacationing in their van. Jim, KZ2P and Patricia, N2FPM, had a station in the vehicle and were participating in the County Hunter's Net. Chris started to listen for her dad's call sign and became hooked.

That September, she enrolled in a Novice class given by the Fort Monmouth (New Jersey) Amateur Radio Club. Daily practice and study paid off in December with a Novice license and then an upgrade to General class in March 1985.

On May 4, 1985, Chris earned her Extra Class license and the call NN2Q. She was just 11 days past her 13th birthday.

During this eight-month period, she managed, with the support of her parents, to maintain her honor roll status in 7th grade. As her curriculum includes Latin and algebra, this is not an easy task. Chris also plays the piano, is a cheerleader during the basketball season and writes articles on ham radio for her school newspaper.

Chris, NN2Q, splits her limited operating time between DXing and rag chewing, CW and phone, in the family ham shack.

Christine enjoys both DXing and rag chewing. She splits her limited operating time equally between phone and CW. During summer months, she has more time to operate, and prefers talking to other amateurs and finding out about their family and jobs, rather than just sending and receiving signal reports. Chris says the common denominator of hams seems to be their desire to help others and their strong sense of camaraderie. If you hear Chris on the air, she asks that you give her a call.

THE RESULTS ARE IN, BUT ...

Thank you to all who sent in the questionnaire from the May *Making Waves*. I have spent many hours tallying all the mail, but due to lack of space, the results won't be published in this column until November.

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465
Waterbury, VT 05676

A Smiling Voice from New Brunswick—VE1BWP

Just when the children are growing up and moving out into their own world and establishing their own families, just when all the hard work in preparation for retirement is beginning to pay off, just when life seems to be quieter and full of more leisure time, sure as there will be night and day, something will come along to rain on the parade! How many times have each of us experienced the jolt that reminds not to take peace and quiet for granted. Jeannine Cote, VE1BWP, of Grand Falls, New Brunswick, didn't let an untimely accident turn into a tragedy. Instead, she permitted the change in her and her husband's life to lead them to new adventures and enjoyment through Amateur Radio.

After her marriage to Roger Cote, Jeannine traded her teaching career for a full-time job as mother of five children. During those early years, her life (and house) was full of children and relatives. She and Roger focused on the activities of the children and their own hobbies, and together they had enjoyed biking and snowmobiling. In 1979, Roger had a serious accident with subsequent complications that forced him into early retirement from his chiropractic profession. "Because Roger could not participate in biking and snowmobiling, we had to find activities that would suit us both. Amateur Radio was the one we chose." The only other licensed amateur in Grand Falls at the time was Rene, VE1CB, and he made himself available to instruct the Cotes in their first course of study. Together they passed their first tests in June 1979. "When the word got out that we were studying to become hams, the guys from south of us, from Perth-Andover and from Plaster Rock, all came to help raise the antennas,." she recalls.

Jeannine Cote, VE1BWP, with her "contest companion," OM Roger, VE1BWQ.

Jeannine's first QSO was with KAØDMZ, who kept her on the air long enough so that she qualified for the Rag Chewer's Award. "That certificate was the first one, and suddenly I was hooked on earning more." In 1980, Jeannine and Roger went to Nova Scotia to attend the Maritime Amateur Convention, where she won a trophy for being the first-year ham with the most contacts. Soon afterward, she entered a CW contest for YLs and won another trophy.

"I loved CW and was content, but Roger encouraged me to upgrade," she says. In February 1983, she passed her second round of tests and earned full Canadian privileges. "Since I already had my DXCC on CW, I started working for it on SSB. Today, I have over 250 countries confirmed."

VE1BWP has become a familiar call during contests because Jeannine discovered that jumping into a variety of radio competitions can be great sport. After finishing close to the top of the Canada Day Contest several times, she finally took top honors in 1984. She has attained blue-ribbon status in the Canadian Ladies Amateur Radio Assn (CLARA) AC/DC contest, a prize she deeply treasures. "When I am serious about operating in a contest, Roger is always standing by to keep me supplied with food and drink!" When she is not contesting Jeannine ragchews with her friends on the YL System, and checks into the CLARA 40- and 20-meter nets, the Maritime Net and the 3.905 Century Club.

Both Roger and Jeannine grew up in large families. It is only natural that they feel a part of the international family of radio amateurs. "I have made many friends over the years because of Amateur Radio. Some have visited our home; others we have met at conventions. What a joy to meet the 'face' behind the 'voice' or the distinctive CW signal." A *joie de vivre* radiates from the station of VE1BWP. Those of us who have worked Jeannine are routinely greeted with a smiling voice and a few words that make our day just that much brighter. One of her friends commented, "Jeannine's cheerful, warm voice makes you feel as if she has been waiting all day to talk with you." If you are looking to work a YL in New Brunswick, VE1BWP is an excellent choice.

PJYL CELEBRATES 30 YEARS

On September 13, the PJYLs (Pennsylvania-Jersey YLs) will commemorate their 30th anniversary with a special luncheon celebration. Although 30 years has passed since the group was originally organized, many of the charter members are still active in the organization. The group's current officers are President Bertha Kenas, W3TNP; Vice President Mollie Silverstein, K3FYS; Secretary Jane Jones, K3ZDN; and Treasurer Carolyn Currens, W3GTC. Other members include W3AAU, WB3FQH, WB3JUT, WA3NGV, N2AKC, W3SLF, KA3FRG, W3VNN, K3YPH, WA2QYZ and W3SBE.

During April of this year, PJYLs teamed up with SAYLARC (Second Area YL Amateur Radio Club) for their spring meeting, which featured YLRL Vice President NM7N. Mary Lou presented a slide show of highlights from her birdwatching adventures in Kenya. The two YL organizations are also teaming up to work on arrangements for the Mini-YL "Spring Fling" in Hershey, Pennsylvania during April 1987.

The interim convention is open to all YLs, and will afford everyone an opportunity to renew old acquaintances as well as to make new friends. Coordinators of the mini-convention are N2AKC and WB2JCE. A lot of time and effort is being put into this gathering, so make your plans now to attend. There will be a chance to tour the Hershey Company facility. Anyone wanting more information about this wonderful opportunity to take a spring vacation in Pennsylvania Dutch Country can write to Myrtle Farnsworth, N2AKC, 142 Kihade Trail, Medford Lakes, NJ 08055.

HOWDY DAYS

1400Z Sep 3, 1986-2000Z Sep 5, 1986. Sponsored by the YLRL.

Eligibility: All licensed women operators throughout the world are invited to participate.

Procedure: Call "CQ YL."

Operation: All bands and modes of emission may be used. No crossband operation. A station may be counted *only once* for credit. Participants may operate only 24 of the 36 hours of the contest. Operating breaks must be indicated in the log.

Exchange: YLRL member or non-YLRL member. Entries in log must also show date, time, band, call of station worked and operating breaks.

Scoring: Score 2 points for each YLRL member worked and 1 point for each non-YLRL member worked. No multipliers.

Logs: All logs must show if operator is YLRL or non-YLRL member to be eligible for awards. Do *not* send carbon copies of logs. Please print or type. Logs must be signed by the operator. No logs will be returned. Logs must show score, and be received by Oct 6, 1986. Send logs to: Mary Lou Brown, NM7N, 504 Channel View Dr, Anacortes, WA 98221, USA. Please mark your return address clearly.

Duplicates: For each duplicate contact that is removed from the log by the Vice President, a penalty of 3 additional and equal contacts will be exacted.

Awards: Top-scoring YLRL member will receive her choce of a YLRL pin, charm or stationery. Top-scoring non-YLRL member will receive a 1-year membership in YLRL.

Suggested Frequencies: CW—3.540-3.570; 7.040-7.070; 14.040-14.070; 21.180-21.210; 28.180-28.210 MHz. SSB—3.940-3.970; 7.240-7.270; 14.280-14.310; 21.380-21.410; 28.580-28.610 MHz. Note: Since band allocations in other countries are often different than in the US, North American YLs should look for DX YLs in other parts of the bands, especially on 40 and 80 meters.

Coming Conventions

DAKOTA DIVISION CONVENTION
September 19-21, Fargo, North Dakota

The Red River Radio Amateur Club will sponsor their convention at the Holiday Inn, I-29 and 13th Ave S, Fargo, ND, tel 701-282-2700. Registration begins at 4 PM Friday, Sep 19, and the fun runs all weekend until 12 PM Sunday. NASA Astronaut Dr Tony England, WØORE, and ARRL President Larry Price, W4RA, are convention guest speakers. Featured are large flea-market and commercial display areas. Flea-market tables are $5 each; the more you buy, the cheaper they are. Friday evening program has Mick, WA7GVT, with "Ham Radio and The Olympic Torch Relay" at 7:30 PM. Saturday begins with breakfast at 8 AM and registration opening at 9 AM. Events include: technical seminars, packet radio, ATV display, AMSAT display, SKYWARN, club displays, MARS, Section meetings, shopping at West Acres, ARRL Forum and many, many more. Going to upgrade? Send your completed 610 Form along with $4.25 to Mike Beaton, KDØA, 2267 Flickertail Dr, Fargo, ND 58103. (No walk-ins.) Saturday evening begins at 6 with a social hour, followed at 7 with a very special banquet with our guest speakers present. Sunday begins with breakfast at 8 AM, with flea market and commercial exhibits opening at 9. A 2-meter hidden transmitter hunt is planned for 9:30 AM. At 10:30 AM bring all your leftover junk. We'll be having an old-fashioned flea-market auction to get rid of all those goodies. Talk-in will be on 16/76. For additional information, contact Robert "Tiny" Dablow, WBØBIN, 251 Main St, Box 120-RR1, Sabin, MN 56580, tel 218-789-7609.

September 19-21
Dakota Division, Fargo, North Dakota

October 3-5
Pacific Division, San Jose, California

October 11-12
Kansas State, Wichita

October 18-19
New England Division, Boxboro, Massachusetts

October 18-19
Central Division, St Charles, Illinois

October 18-19
Southern Florida Section, St Petersburg

November 7-8
Nevada State, Las Vegas

November 16
Illinois State, Rockford

ARRL NATIONAL CONVENTIONS

September 5-7, 1986—San Diego, California

July 10-12, 1987—Atlanta, Georgia

July 21-24, 1988—Portland, Oregon

PACIFIC DIVISION CONVENTION
October 3-5, San Jose, California

The Pacificon 86 Convention will be held at the Le Baron Hotel, 1350 North First St. Highlights on Friday will be a tour of the huge linear accelerator at Stanford University during the day with sessions and opening ceremonies in the evening. Saturday will have sessions and exhibits from 9 AM-5 PM. Sunday will have sessions and exhibits from 9 AM-1 PM. Major sessions are public service, emergency operation, DX forum, youth in Amateur Radio, women in Amateur Radio, ACSSB, OSCAR meeting, AMSAT sessions, plus others. Banquet will be Saturday night at 8. Wouff Hong at 12 PM. Group breakfast Saturday and Sunday mornings at 7 AM. Lenore Jensen, W6NAZ will be banquet speaker. Registration $12 until September 20, $15 after. Banquet $20, tour $8 for bus. License sessions to be held, no preregistration. License session info, call hotline 408-984-8353 after September 1. Other info, call 408-243-8349. Hotel call 408-288-9200. Be sure to mention convention. QST

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.

Arizona (Sierra Vista)—Sep 27: The Cochise ARA will hold its 1986 Flea Market at the CARA training facility on Moson Rd. No charge for tailgaters. Free overnight RV camping for club members. Talk-in on 16/76. For more info, write CARA, PO Box 1855, Sierra Vista, AZ 85636.

Arkansas (near Mena)—Sep 5-7: The 17th Annual Queen Wilhelmina Hamfest will be held at Queen Wilhelmina State Park on Talihima Dr, Hwy 88, in western Arkansas, for a weekend of ragchewing, socializing, swapping, buying, eating and all the other things that go along with a hamfest. New dealer. Free admission. No registration fee. Talk-in 19/79. For more info, SASE to Bill Glassco, WA5PNT, Rt 1, Box 116, Prattsville, AR 72129-0116.

†**California (Sebastopol)—Sep 20:** Sonoma County Radio Amateurs, Inc, will hold their fourth annual ham radio flea market 8 AM-2 PM at the Sebastopol Community Center, 290 Morris St, 5 miles west of Santa Rosa, just off Hwy 12. The largest ham flea market on the North Coast. Admission and parking free. Tables $7 at the door, $5 in advance. (Advance registration gets best indoor spaces.) Vendor setup starts at 7 AM. Talk-in on 13/73. VEC exams, radio clinic, exhibits, refreshments, auction around noon. For tickets and information, write SCRA, Box 116, Santa Rosa, CA 95402.

California (West Covina)—Oct 4: Scatcon 86. The hours are 9 AM-3 PM at Cortez Park, 2441 Cortez Ave, West Covina. Technical sessions, hands on, packet, satellite, swaps, vendors and more. Talk-in on 765/165. Donation $2. For more info, call Bob Discount, N6NGN, 818-917-6470.

†**Connecticut (Danbury)—Sep 14:** The Candlewood ARA will hold its annual ham radio flea market at the Elks Lodge, 346 Main St, 9 AM-3 PM (dealers 8 AM). Admission $2, tables $8, tailgating $5. Talk-in on 72/12. For table reservations, send check or money order to CARA, c/o Gene Marino, W1IDH, 27 Valley View Rd, Newtown, CT 06470, tel 203-426-8852.

Connecticut (Waterbury)—Sep 28: The Waterbury ARC will sponsor a flea market 10 AM-3 PM at the Waterbury State Technical College off I-84. Light refreshments available. Admission at the door $2. Indoor spaces $10. Table and tailgating spaces $5. Dealers and sellers set up at 9 AM. Contact Gary Firtick, K1EB, 589 Hamilton Ave, Watertown, CT 06795.

†**Connecticut (Willimantic)—Sep 21:** The 4th Annual Natchaug ARA giant flea market will be held at the Elks Home, 198 Pleasant St, at 9 AM. Dealers at 8 AM. Free parking. Admission $2, under 16 free. Advance inside reserved tables $5 each, at the door $7 each. Tailgaters welcome. Outside space $5 and up. Food and drinks available. ARRL/VEC exams for all license classes. Talk-in on 90/30 and 52. For info, contact Ed Sadeski, KA1HR, 49 Circle Dr, Mansfield Ctr, CT, 06250, tel 203-456-7029 after 4 PM.

Florida (Melbourne)—Sep 6-7: The 21st Annual Melbourne Hamfest sponsored by the Platinum Coast ARS will be held at the Melbourne Auditorium just off US 1, with meetings and rooms available at the Melbourne Ramada Inn. Talk-in on 25/85. Hours Sat 9-5 and Sun 9-4. Featured will be FCC exams, commercial exhibits, swap tables, ARRL Forum, QCWA, technical, MARS and net meetings, and a 2-m transmitter hunt. For tickets ($3 advance, $4 door), contact PCARS, PO Box 1004, Melbourne, FL 32901. For swap table reservations, (limited to 2 adjacent tables per request), write to same address, mark the envelope "Tables." For exam information, send SASE marked "Exams" also to same address.

Georgia (Augusta)—Sep 21: The ARC of Augusta will hold its annual hamfest at Julian Smith Casino. Tickets $1, 6 for $5, 13 for $10. Food and drink available. Inside dealer tables furnished at $10. Ample room for tailgaters, buy 3 tickets. Talk-in on 34/94. ARRL/VEC exams at 8 AM in Red Cross Bldg, 12th St (ask for directions). For additional information, send SASE to Charles Pennington, K4FRM, 4542 Glenda La, Evans, GA 30809, or call 404-868-8842 after 6 PM.

†**Georgia (Gainesville)—Sep 28:** The Lanierland ARC is sponsoring their hamfest, 8:30 AM-3 PM. Free admission. Activities include DX forum, left foot CW, flea market, FCC VE tests (walk-ins okay). Talk-in on 07/67. For more info, call George Floyd, 404-534-8423.

†**Illinois (Carterville)—Sep 14:** The Shawnee ARA is sponsoring their SARA Hamfest at the John A. Logan College, 7 AM-2:30 PM. The largest hamfest south of Peoria, north of Memphis. Admission $3, supports $500 scholarship each year at the John A. Logan College for ham or electronics students. This hamfest will occur rain or shine in the air-conditioned gym; lunch at the college cafeteria run by SARA. Alternative activities, crafts, computers, FCC exam (walk-in okay). Talk-in on 25/85, 52, 3925 kHz, 8 AM-9 AM. For more info, contact Bill Johnson, W9ERI, 502 W Kennicott, Carbondale, IL 62901, tel 618-457-7586.

Illinois (Glen Ellyn)—Sep 13: The Northern Illinois DX Assn will sponsor the 24th Annual W9DXCC Convention at the Glen Ellyn Holiday Inn, 1250 Roosevelt Rd (near Chicago). Advance registration recommended. DXers worldwide are welcome. A DX program and evening banquet are planned. Further information from Howard Huntington, K9KM, 65 South Burr Oak Dr, Lake Zurich, IL 60047.

Illinois (Grayslake)—Sep 27-28: Radio Expo 86 will be held at the Lake County Fairgrounds, Rts 120 and 45. Flea market opens at 6 AM, exhibits at 9 AM. Displays by major manufacturers and distributors. Reserved indoor flea-market tables are $7.50 per day, electricity at a nominal charge. Limited number reserved by Sep 10. Activities include seminars, technical talks, women's programs. Novice through General exams given by DeVry. Tickets good both days, $4 in advance

†ARRL Hamfest

(before Sep 10), $5 at gate. Talk-in on 16/76. Send SASE to Radio Expo 86, Box 1532, Evanston, IL 60204, tel 312-582-6923.

†**Illinois (Peoria)—Sep 20-21:** The Peoria Area ARC is sponsoring the Peoria Superfest 86 at the Exposition Gardens on W Northmoor Rd. Gate opens at 6 AM, Commercial Building at 9 AM. Admission $3 advance, $4 at the gate, under 16 free. Activities include Amateur Radio and computer displays, huge flea market, FCC exams for all classes Sat and Sun, free bus to Northwoods Mall on Sun. Services include full camping facilities on the grounds. Talk-in on 16/76. For more info, SASE to Superfest86, PO Box 3461, Peoria, IL 61614.

†**Illinois (Willow Springs)—Sep 14:** Sponsored by the Boling ARS. Gates open 6 AM-3 PM. Admission $2 in advance, $3 at the door. Activities include commercial exhibits and a large flea market. Talk-in on 33/93 or 52. For more info, contact Ed Weinstein, WD9AYR, 7511 Walnut Ave, Woodridge, IL 60517, tel 312-985-0527. For advance tickets, SASE to John Dinnella, WA9DIP, 108 Shady La, Boling Brook, IL 60439.

†**Iowa (West Liberty)—Oct 5:** Sponsored by the Muscatine ARC and the Iowa City ARC. Admission $3 advance, $4 at the door. For more info, contact Allen D. Kiddoo, KAØSTA, 1410 Lucas St, Muscatine, IA 52761.

†**Maryland (Howard County)—Oct 5:** The Columbia ARA will hold its 10th Annual Hamfest at the Howard County Fairgrounds (15 miles west of Baltimore just off I-70 on Rt 144, 1 mile west of Rt 32), 8 AM-3:30 PM. Admission $3, XYLs and children free. Tables $7 additional if payment is received by Sep 30, $8 after Sep 30. Outdoor tailgating $3 additional. Food available. Talk-in on 735/135, 52. For table reservations and info, write to Mike Vore, W3CCV, 9098 Lambskin La, Columbia, MD 21045, tel 301-992-4953.

Massachusetts (Wellesley)—Sep 28: The Wellesley ARS will hold its annual outdoor flea market at the Wellesley Senior High School parking lot, 9 AM-2 PM with ample parking for all. Admission $1 for buyers, $2 for sellers with car. Offerings of Amateur Radio, computer and associated electronic equipment are welcome. Take Rice or State St, off Rt 16. Light refreshments available. Talk-in on 63/03. For more info, contact Wellesley ARS, 211 Washington St, Wellesley Hills, MA 02181.

Michigan (Adrian)—Sep 21: The Adrian ARC is sponsoring their 14th Annual Hamfest held at the Lenawee Fairgrounds, 8 AM-3 PM. Table sales $6 full, $4 half. Trunk sales $2. Advanced tickets $2, $3 at the gate. Talk-in on 31/91. For more info, write to Adrian ARC, PO Box 26, Adrian, MI 49221.

Michigan (Grand Rapids)—Sep 20: The Grand Rapids ARA will hold their annual Swap and Shop at the Hudsonville Fairgrounds. Follow I-196 west from Grand Rapids to Hudsonville exit. Talk-in on 16/76. Gates open 8 AM. Tickets $3 at the gate. Tables $4 each. Vendors, please reserve tables. Trunk sales a specialty. For more info and reservations, contact Larry Kozal, K8PUJ, 864 Coldbrook NE, Grand Rapids, MI 49503, tel 616-459-8722.

†**Michigan (Mt Clemens)—Sep 14:** The L'Anse Creuse ARC is sponsoring their 14th Annual Swap and Shop at the L'Anse Creuse High School, 8 AM-3 PM. Admission $1 in advance, $3 at the door. Inside tables $8, trunk sales $4 per space. Plenty of food and parking available. Talk-in on 69/09 and 52. For more info, SASE to Maurice L. Schietecatte, N8CEO, 15835 Touraine Ct, Mt Clemens, MI 48044, tel 313-286-1843.

†**Mississippi (Biloxi)—Oct 4-5:** The Mississippi Coast ARA will hold their hamfest at the Point Cadet Plaza, 8 AM-5 PM Sat and 8 AM-2 PM Sun. Free admission. Activities include forums, women's activities, Sat night shrimp boil (tickets for shrimp boil available 8 AM Sat, no advance tickets). Services include RV parking, first come first served. Water and electricity also available. Cost per night is $10. Other activities include ARRL/VEC testing Sat 1 PM, preregistration 30 days in advance. Limited walk-ins available at 12 PM. Talk-in on 13/73. For more info, contact Jan Carlson at 601-392-5331. For dealer info, contact Joyce Anderson at 601-388-2824.

New Jersey (Maple Shade)—Sep 20: The Maple Shade ARC will be hosting their 1st Annual Hamfest at the Maple Shade High School on Coles Ave, 8 AM-2 PM. Talk-in on 52 and 223.02/224.62. Refreshments will be available. Technical programs conducted throughout the day. Donation $5 per carload, which includes one tailgating spot. Additional spaces $5. For information, contact Howard Weinstein, K3HW, 15 Lakeside Dr, Marlton, NJ 08053, tel 609-596-3304.

New Jersey (Norwood)—Oct 4: The Orange County ARC will be holding its hamfest and auction at John S. Burke Catholic High School, 9 AM-3 PM. Tailgating available. Setup at 8 AM. License exams as available, starting 9 AM. Talk-in on 16/76 and 52. Admission $3, tables $7, tailgating $3. For more info, call Bob, WB2ENA, at 201-767-6698.

Hamfest Calendar Rules and Regs

☐ *QST* will list your hamfest in its monthly Hamfest Calendar, free of charge. Here are some guidelines:

Hamfests will be listed only once. When you send in your announcement, feel free to specify the issue you'd like it to appear in. Normally, the event will be listed in the issue of the month of the event (Nov *QST* for an event scheduled for Nov 8, for example).

Information must arrive *by the 5th of the second month before the issue date.* For example, the material on a Nov 8 hamfest must arrive at ARRL HQ by Sep 5 if it is to appear in Nov *QST*.

We will acknowledge all information received at HQ for Hamfest Calendar with a postcard stating the date of publication. If you don't receive an acknowledgment within a couple of weeks or so, your letter may not have arrived, so please send us a duplicate copy.

Oh, yes. Hamfest Calendar is separate from the Ham Ads. See the first page of the Ham Ads section in this issue for information on how to advertise your event there.—*Bernice Dunn, KA1KXQ, Hamfest Calendar Coordinator*

†**New Jersey (Pennsauken)—Sep 14:** The South Jersey Radio Assn will hold their 38th Annual SJRA hamfest at the Pennsauken High School parking lot, 8 AM-4 PM. Admission $2.50 advance, $3 at the door. Activities include VE testing. Food and refreshments served in school cafeteria. Talk-in on 144.69/5.29. Table and tailgate sales $5 per space (bring your own table). Plenty of free parking. For more info, contact J.W. Sammis, W2YRW, 300 Woodstock Dr, Cherry Hill, NJ 08034, tel 609-429-0103.

New Mexico (Santa Fe)—Sep 27-28: The Northern New Mexico ARC is sponsoring their 3rd Annual Hamfest at Camp Stoney, 8 miles east of Santa Fe. Featured will be ARRL/VEC exams and a tour of the beautiful fall colors of the aspen trees at an elevation of 9500 feet. Free camping with restrooms available, Sat night only (no hookups). Sunday will feature tailgate flea market, programs on ham-related items. Registration $5 for adults, $2 under 12. Lunch served on Sun with BBQ chicken or hot dogs. Talk-in on 22/82 or 52. For further info, send SASE to Alan Hill, N5BGC, 2020 Calle Perdiz, Santa Fe, NM 87505.

New York (Corona)—Sep 14: The Hall of Science ARC is sponsoring their hamfest at the Hall of Science Bldg, 111th St and 48th Ave, 8 AM (for sellers) and 9 AM (for buyers). Admission $3 for buyers, $5 for sellers. Featured will be general hamfest activities. Snack bar available. Talk-in on 445.225, 223.600 or 144.300. For more info, call John Powers, KA2AHJ, 718-847-8007, or Arnie Schiffman, WB2YXB, 718-343-0172.

New York (Horseheads)—Sep 27: The Elmira ARA is sponsoring their 11th Annual Elmira International Hamfest at the Chemung County Fairgrounds. The features will include a variety of attractions: an outdoor flea market, indoor dealer displays of new equipment, and breakfast and lunch served on premises. The gates will be open 6 AM-5 PM. The public is invited to attend, whether licensed in Amateur Radio or planning to be. Tickets are available at the gate or in advance from Steve Zolkosky, 118 East 8th St, Elmira Heights, NY 14903.

†**New York (Old Westbury)—Sep 21:** The Long Island Mobile ARC is sponsoring their Outdoor Hamfair at the New York Institute of Technology, Northern Blvd, 9 AM-3 PM. Activities include computers, dealers, Hi Fi Stereo, ARRL information, CB equipment, TV, satellite communications and VHF tune-up clinic (get your rig checked). Admission $3 to all buyers. Wives, children and sweethearts free. Exhibitors car space $5 (admits driver), enter at 8 AM. Free parking, food and refreshments available. Directions: Long Island Expressway (495) to exit 39 north, 2 miles on Glen Cove Rd, right turn onto 25A Northern Blvd, 1 mile east on the right. From the East: exit 41, north on 107, left on 25A, 1 mile on the left.

New York (Yonkers)—Oct 5: The Yonkers ARC is sponsoring their hamfest at the municipal parking garage, 9 AM-4 PM. Admission $3. Activities include a frequency clinic, mini-theatre, satellite TV, etc. Refreshments and plenty of free parking. Free coffee served all day. Talk-in on 265/865 and 445.15/440.15. For more info, contact YARC, 53 Hayward St, Yonkers, NY 10704, tel 914-969-1053.

Ohio (Berea)—Sep 21-22: The Cleveland Hamfest Assn will hold their hamfest at the Cuyahoga County Fairgrounds, 8 AM-4 PM. Indoor tables $10 for first 8 ft (includes 2 chairs), $8 for each additional table. Flea market $4 for each space, provide your own tables and chairs (no extra charge for shelter in case of rain). Overnight parking available. Indoor setups on Sat 12 PM-5 PM, showday 6 AM. Flea market 6 AM on Sun. Guards will be on duty for duration (fenced area). Power available on prior request (indoors only). Ample parking. For more info, write to Cleveland Hamfest Assn, PO Box 93077, Cleveland, OH 44101.

Ohio (Springfield)—Oct 5: The Independent Radio Assn will be holding the 4th Annual Springfield Hamfest and Computer Expo at the Clark County Fairgrounds, ¼ mile west of the intersection of I-70 and Rt 41 (exit 59). Doors open 8 AM-4 PM. All vendor and swap-meet activities are indoors. Admission $2 advance, $3 at door, under 12 free. Tables $7 ($6 in advance). Talk-in on 144.85/5.45. For advanced reservations, write to the Independent Radio Assn, PO Box 523, Springfield, OH 45501, or call Steve, KA8QCS, at 513-882-6521.

Ohio (Youngstown)—Sep 13: The 2nd Annual Hamfest of the Twenty Over Nine Radio Club will be held at the Mahoning County Joint Vocational School in Canfield. Doors open 9 AM-4 PM, setup at 6:30 AM. Indoor dealer sales with table rentals and large paved flea-market area. Admission $3. Talk-in on 144.67/5.27, 915/315, and 52. For more info, contact John Tarr, N8GUB, 3452 Lenox Ave, Youngstown, OH 44502, tel 216-782-0673.

†**Pennsylvania (Butler)—Sep 7:** The Butler County ARA will hold their hamfest at the Roe Airport, 9 AM-4 PM. Admission $1, under 12 free. Activities include mobile check-in, fly-in, overnight camping, free outside and inside flea market, vendors space ($5 per 8-ft table), ARRL booth, food and refreshments. Talk-in on 96/36 check-in and 84/24 for directions. Free parking, handicap parking available. Overnight accommodations available. For more info, contact K3HJH, 174 Oak Hills Hts, Butler, PA 16001, tel 412-283-9403.

Pennsylvania (New Kensington)—Sep 21: The Skyview Radio Society will hold its 1986 Swap and Shop Hamfest at the club grounds on Turkey Ridge Rd. Setup begins at 8 AM. Tickets $3 each, 2 for $5. Food and drinks available. Talk-in on 04/64. For further info, call Scott Rupert, N3DDZ, 412-478-3488.

Pennsylvania (York)—Sep 20: The York ARC, Keystone VHF Club, Pennmar RC and Hilltop Transmitting Assn will hold their Hamfest at the York Fairgrounds on State Rt 74, NW corner of the city. Activities begin at 8 AM both days, with specialized communications seminars, vendor's displays, tailgating, FCC exams (Saturday only), XYL activities and general-interest seminars (Sunday only). Admission $3 each day, or $5 both days; XYLs and under 12 free. Banquet (ham or chicken) on Sat at 6:30 PM, $10 per person, preregistration please. Entertainment. Services include special motel rates, free FCC exams and overnight camping. Talk-in on 37/97 and 93/33. For more info, write to York Hamfest, Box W, Dover, PA 17315, or call 717-528-8412.

Virginia (Suffolk)—Oct 4: The Tidewater Tailgaters Hamfest and Packet Radio Meeting will take place at the Bennetts Creek Park, off Shoulders Hill Rd. (Note: Rain date Oct 18.) Take US 17 to Shoulders Hill Rd, south to signs. Scheduled events at Shelter 2. Parking in reserved areas. Gates open 8 AM-4 PM. Packet Radio Meeting at 12 PM. Activities include eyeballing, tailgating (no dealers please, casual sales only). Admission $1 each, tailgate $1 each vehicle, spouses and children free. Talk-in on 52 or 146.40/7.00. Bring your own picnic lunch, chairs, tables, tents, etc. Cold drinks on sale. Only day camping permitted, and boat landing on Bennetts Creek available. For more info, call Jim, WA4MAV, 804-483-4359 or Lloyd, WA4HMT, 804-539-7674 (both between 6 PM-8 PM).

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contraction for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Affiliated Clubs in Action

Conducted By Leo D. Kluger, WB2TRN
Club Program Manager, ARRL

Introducing prospective radio amateurs to our Service should be an ongoing activity of any club. The Radio Association of Western New York, Inc, has devised an interesting method for this introduction, one that has a side benefit of honoring the club's Silent Keys.

Carmen A. Queeno, WB2OWS, came up with the idea to present prospective radio amateurs with a copy of the ARRL *Tune in the World* book. Each copy is dedicated to the memory of one of the club's Silent Keys. Carmen's proposal also included donating copies of *Tune In the World* to local junior and middle high schools' libraries.

Club members provided Carmen with the names and addresses of the Silent Keys, so he could contact the family to explain his intentions. Carmen next called the Superintendent's Office for the names and address of the local high schools and their principals. He found that some explanation was necessary before the school information was given to him. A polite request to speak to the principal or his/her assistant at their convenience regarding the donation was always met with success.

An appointment was made for delivery of the *Tune in the World* kit, at which time Carmen showed the principal the dedication page emblazoned with the official RAWNY seal. Not only did this give Carmen the opportunity to answer questions about the gift and Amateur Radio, but it also gave him the opportunity to present a copy of the letter sent to the Silent Key's family. Carmen also distributed copies of the ARRL brochure, *Amateur Radio: The World at Your Fingertips*, to the schools' guidance counselors.

The family was sent a letter about the club's gift to the school. The letter ends with the phrase: "The RAWNY Board of Directors decided that this would be the best way to continue the memory of _____ and instill in our future generation his/her great interest in Amateur Radio." Also sent to the family was a copy of the dedication certificate with the club's seal.

The response to RAWNY's generosity has been gratifying. A number of the schools have sent letters of appreciation to the club. As the club learns of other Silent Keys, they too will be honored. The living memorial program is an excellent way to help increase the number of Amateur Radio operators.

New Special Service Clubs

Becoming a Special Service Club (SSC) is not for every Amateur Radio group. It takes commitment, planning and, mostly, a membership that sets the highest standards for itself. A number of your fellow clubs have recently undertaken the commitment and become SSCs. Here's a rundown of these special groups, their city, state and number of members:

ARC of El Cajon, El Cajon, CA (150)
Big Island ARC, Hilo, HI (84)
Frontier ARS, Las Vegas, NV (9)
Pacific Radio Amateur Transmitting Society, Kane'Ohe, HI (13)
Palomar ARC, Vista, CA (321)
Raleigh ARS, Inc; Raleigh, NC (126)

Renewing Special Service Clubs

After completing a year of Special Service, SSCs go through a review process with their respective Affiliated Club Coordinators (ACCs). With successful programs behind them, they plan their next 12 months of activities. Recently renewing SSCs are presented here, followed by their city, state and number of members:

ARC of Augusta, W4DV, Augusta, GA (31)
Fort Wayne Radio Club, Inc, W9TE, Fort Wayne, IN (192)
Ogden ARC, Ogden, UT (51)
Portage ARC, Inc, Mantua, OH (85)
Triple States Radio Amateur Club, Adena, OH (700)
Wabash Valley ARA, Inc, W9UUU, Terre Haute, IN (90)

Volunteer Examiner Information

from the ARRL/VEC, 225 Main St, Newington, CT 06111

Locating A Test Session: Sessions are advertised publicly via local Amateur Radio club newsletters and repeaters. A printout of sessions in any state and some overseas locations is available from ARRL HQ for an SASE. We list ARRL/VEC sessions plus those of other VECs who inform us of their testing schedules.

Registering to Take an ARRL-Coordinated Test: A completed FCC Form 610 application and a check or money order for the test fee, payable to the "ARRL/VEC," should be sent to the local VE Team where you intend to be tested. "Walk-in" candidates may be allowed at some sessions, but registering in advance helps. If you write to a VE Team, send an SASE to cover postage and handling.

Test Fee: For ARRL-coordinated sessions held during calendar 1986, the test fee is $4.25, payable to "ARRL/VEC." A check or money order is preferred.

What to Bring to the Session: Bring the *original* plus a photocopy of your current FCC-issued Amateur Radio license, and the *original* plus a copy of any temporary upgrade certificate issued by a VE Team less than 1 year prior to the test date. (Duplicates of lost licenses are available through the FCC's Gettysburg office.) Also bring two forms of positive identification (including a photo ID, if possible) and at least two pencils and a pen. Scratch paper and answer sheets are provided.

Calculators: Nonprogrammable and "scientific" calculators are welcome. Pocket computers that store words are not allowed. Programmable calculators will be allowed only at the discretion of the VE Teams; be prepared to demonstrate that the memories have been cleared.

Exam Format: Written element exams are four-choice multiple-answer tests. A score of 74% or more is required to pass a written element exam. Most VECs assemble tests based on the ARRL-issued multiple-choice question pool. Code test transmissions are played from an audio tape prepared by the ARRL/VEC with message contents similar in format to an Amateur Radio QSO. The code test is "fill-in-the-blank" style and may be passed by answering at least 7 out of 10 comprehension questions correctly *or* by copying on paper at least one continuous minute of perfect copy from the code test transmission. The ARRL/VEC does not require a code sending test, based on the FCC's recommendation. Code tests may be copied on typewriters, but prior arrangement with the VE Team is required so that other candidates are not disturbed.

Which Question Pool(s) to Use: FCC revises the four written element question pools on a staggered basis, with one of the four pools revised every three months. The 1986 scheduling calendar that the ARRL/VEC will be using for putting into use the question pools revised by FCC is as follows:

Question Pool	*Revised by FCC*	*ARRL/VEC Tests Will Change*	*ARRL/VEC Tests Good Through*
Element 2 (Novice)	Jul 1985	Jan 1, 1986	Dec 31, 1986
Element 3 (Tech/Gen)	Oct 1985	Apr 1, 1986	Mar 31, 1987
Element 4A (Advanced)	Jan 1986	Jul 1, 1986	Jun 30, 1987
Element 4B (Extra)	Apr 1986	Oct 1, 1986	Sep 30, 1987

ARRL/VEC Retest Policy: A candidate who fails a written element and who has exhausted all code test possibilities at a session may not be retested during that same session. If a convention or hamfest test session schedules multiple sittings, a failed candidate may request that the VE Team retest him or her at a subsequent sitting. Retesting is allowed *if* the VE Team has a *different* test version available and the VE Team determines that it has the time and resources available to accommodate the retest. A candidate for retest is required to pay another test fee, and may be required to complete a fresh application Form 610 at the Team's request.

Special Tests: Candidates who require special assistance, materials or equipment because of physical disability must attach to the application a signed and dated physician's statement certifying the nature of the disability, plus a letter explaining what special assistance, materials and/or equipment must be used to conduct the examination. (See Section 97.26[g] of the FCC Rules.) Be sure to notify the VE Team well in advance so that special arrangements can be made. If Braille or tape-recorded written tests or special-pitch code tapes are needed, contact the ARRL/VEC at least one month in advance to ensure materials will be available. Further questions about testing persons with disabilities should be addressed to the ARRL Program for the Disabled at HQ.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

THE FUN OF FIELD DAY

☐ Field Day sure was fun time this year! It's great to see the number of hams in this country take such a serious attitude in joining together to prove their determination and "potential to survive under the most impossible conditions" just as all of ham radio has done since its start. I had no idea 40 meters could have so many people in one spot at the same time!

I truly feel Field Day brings us all a lot closer together. It's the best contest of the year! I'd like to commend the ARRL for the incredible job it's done now and in the years past.—*Tom Legault, WA1DAF, Pittsfield, Massachuetts*

MORE ON NOVICE ENHANCEMENT

☐ The articles that have been in *QST* lately about enhancement of Novice privileges to improve the rate of upgrades to higher class licenses have been very interesting. At least someone has discovered that a lot of Novices don't upgrade and possibly never even get on the air, and has acted on an attempt to do something about it. With about 15 years experience behind me in various forms of skills training, including Navy air controller, flight instructor and nuclear power plant operator training, it appears to me that the FCC is treating symptoms, not the problem.

It is a good idea to have something to offer the new Novice which in a broad sense might compete with CB radio, or other communications hobbies like computer bulletin boards. But that is not the answer to why there is high attrition of Novices. From my experience in training, the very worst thing you can do to a new student is put him in a standby status, like being put "on hold" on the telephone, for a long period of time right after the student achieves a new qualification. When you can't use newly acquired skills, such as the newly learned code skills and technical information a Novice must master to pass that first test, proficiency goes down and with it the student's confidence in his own abilities. Many probably just give up, thinking they never will be able to properly operate on the air.

As for my personal forced inactivity waiting for my license, I am spending this time getting ready for upgrade to General class, hopefully this summer—so I will be on the air on phone, too, in November, in time for some of the big service activities with my club. I feel sorry for those who pass the Novice test and are waiting like me but don't have the support of a good Elmer (mine is KA4ZIP) and the helpful support of a club (mine's Rappahannock Amateur Radio Association, or RARA). I had a great time with our Field Day effort, learned a lot about antennas, tuning up, and communicating. I also enjoy sitting in with my Elmer on the local repeater net and learning about traffic handling from listening to everything. But there is no substitute for the real live QSO, especially in code, for improving your skills. The delay in issuing earned licenses I feel does a great disservice to the hobby.

By now, the ARRL probably has a growing pile of correspondence about the proposed rule and all it could do. I thought you might like to hear about it from someone just coming into ham radio with another idea for a solution to the problem. Hope you'll hear me on the air soon.—*William E. Pheris IV, Weems, Virginia*

☐ I feel PR Docket 86-161 should be approved. I am involved in teaching classes for unlicensed individuals wishing to enter Amateur Radio and feel the addition of voice, data, and image privileges can do nothing but help attract and encourage new amateurs.

The new privileges will also permit new amateurs to participate in public service and emergency communications immediately, an important function of Amateur Radio here on Florida's space coast. In this regard, I feel the enhancement should include privileges on 220 MHz. This will be necessary to provide local voice and data communications with existing, inexpensive equipment.

I agree that the Novice examination (Element 2) written test be expanded to include additional material covering the added emissions and operating practices. Additionally, the test should include a requirement for two examiners, with the same qualifications as now (General or higher licensee, 18 years or older, unrelated to the applicant), or incorporated into the VEC systems to control fraud.

Providing an entry level license that allows access to all the diversity Amateur Radio has to offer has been a long time coming. I see no reason why we wouldn't have 20,000 hams (about 1% of the population and 10 times what there is now) on the Space Coast by 1990 with an enhanced license like this.—*William E. Newkirk, WB9IVR, Melbourne, Florida*

☐ I am in complete support of PR Docket 86-161. It may not be the best proposal, but it is the best I've heard of so far. The question is "How do we get the hobby going again?" Being against this proposal will not answer this question. If you don't like this proposal, propose something of your own. The main argument I hear against this proposal is that if Novices have phone privileges, there is no incentive to upgrade. If so, where is the incentive to upgrade from General to Advanced, or Advanced to Extra? It is time to put our own selfish, self-serving interests aside and do something to help the hobby.—*John Mullis, N0GRN, Green Ridge, Missouri*

☐ As an Extra class amateur operator who has taught Novice classes for the past three years, I wish to express my desire to see PR Docket 86-161 adopted.

I remember the eight months I spent as a Novice, and at times I was so discouraged that I was ready to give up. These additional privileges will be that incentive to keep Novices interested in perfecting their skills and knowledge until they are ready to upgrade.

Being involved in packet radio also makes me glad that Novices will be given digital privileges. It is an aspect of Amateur Radio which has much to offer.—*Tom Smith, KI4IG, Dalton, Georgia*

HR 3378—WHAT DOES IT MEAN?

☐ Regarding HR 3378 "The Electronics Communication Privacy Act of 1985": One cannot help but draw a parallel between the proposed HR 3378 and a man who builds a home with floor-to-ceiling windows, but for which he chooses not to buy curtains or shades, but still becomes upset when passers-by tend to look in. So he goes to the village fathers in an attempt to convince them to pass an ordinance that any passersby may not look in his home, because this violates his privacy. Illogical? Of course, but the village fathers actually consider his request.

I urge all citizens, hams or not, to take another look at HR 3378 (July 1986 *QST*, page 53) and think about this little story. —*Dave Miller, K9POX, Niles, Illinois*

[HR 3378, now designated HR 4952, passed the House of Representatives and is now being considered in a Senate Subcommittee—Ed.]

PORKY PIG, PLEASE QSL!

☐ The letter from G3DOJ (May 1986 *QST*) regarding CW in old cartoons brought back an incident of nearly 50 years ago.

My college roommate, W5FYZ, and I (then W5GWO) in 1938 went to a movie in our college town of Lubbock, Texas. I don't recall the movie, but the cartoon starred Porky Pig.

There was a runaway train, and Porky was the telegrapher who signalled for help, only instead of telegraphic clicks, perfect CW came out at a brisk rate. We were both so surprised that we had to sit through the entire movie again to get the complete message.

After a call for help, the message ended with, "QSL Leon Schlesinger, Hollywood, California." With just this meager QTH (long before Zip codes) I dashed off a QSL.

Several months later I got a lovely Christmas card-QSL card from W6KX, "confirming your Porky Pig QSO." Ever since, I've wondered how many other hams responded to the message. The call sign may provide a clue as to how CW sneaked into many cartoons.—*Jim Kennedy, W7ID, Phoenix, Arizona*

WISCONSIN IS IN GOOD HANDS

☐ I've read The First Hundred Feet (Strays, June 1986 *QST*) several times. Each time, K9GDF's love for people speaks loud and clear to me, leading me to believe that the Wisconsin Section is in excellent hands.

I wonder if we would have to be so desperately looking for ways to increase the ham population if more of us were like Richard Regent.—*Jim Wilcox, K4JAP, Falls Church, Virginia*

Silent Keys

Administered By Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

N1ADQ, Lyndon N. Connary, Rockport, ME
KA1GYL, Dexter Bowden, Marblehead, MA
W1JDF, Sumner R. Herrick, Lawrence, MA
W1SZQ, Cornelius J. Harrington, Manchester, MA
W2CUZ, Donald B. Whittemore, Bronxville, NY
*W2DEZ, Douglas B. Fields, Wappingers Falls, NY
KE2F, Wallace R. Austin, Barryville, NY
KA2FXM, Edwin V. Faulhaber, Towaco, NJ
W2GEE, John F. Robertson, Huntington, NY
WB2MTL, Howard F. Bowker, Port Norris, NJ
W2NBZ, Peter A. Swolak, Short Hills, NJ
W2NI, Walter G. Rodin, East Hills, NY
NG2Q, Silas F. Mack, Middlesex, NJ
K2RPZ, Stuart Goodman, Rocky Point, NY
WB2SJF, Ercil D. Miller, Neptune, NJ
KC2YQ, Elmer Hemingway, Woodbine, NJ
W3EDY, Frank J. Pauer, Bear, DE
W3EZI, Albert R. Foster, Hot Springs, AR
WB3GZR, Richard F. Mikesell, Butler, PA
KA3HBF, Orris R. Perry, Cambridge Springs, PA
K3UEB, William T. Doyle, El Cajon, CA
W4AFK, Henry L. Ruhlander, Lawrenceburg, TN
N4BA, John R. True, Great Falls, VA
KB4DMV, Charles A. Williamson, West Melbourne, FL
KP4EDH, Gabriel Fuentes, Santurce, PR
WA4FSK, George P. Firmin, Marietta, GA
W4GMK, Robert E. Hansell, Dania, FL
WA4IEG, Theodore C. Hegstrom, Monticello, IN
K4INA, Albert Q. Zellefrow, Ridge Manor, FL
W4IRA, Herb C. Tuell, Clearwater, FL
N4IUB, James Faller, Bayonet Point, FL
KB4KB, Marie Denning, Naples, FL
N4LLP, Rodney Z. Lommler, Port Richey, FL
WA4MJB, R. H. Flack, Huntsville, AL
KA4RJM, James P. Wheeler, Houma, LA
WA4UCV, John K. Steel, Miami, FL
KB4WU, Robert Garlough, Huntsville, AL
*K4ZA, Lyman M. Rundlett, Lake Placid, FL
W5DX, Philip H. Bloom, Brownsville, TX
WB5INV, Byron W. Farnsworth, Bella Vista, AR
W5LPW, Stanton C. Agnew, Albuquerque, NM
W5LUP, Marion B. Beam, Odessa, TX
W5LVB, Robert G. King, Sr, Hot Springs, AR
WB5MQH, Leonard E. Henson, Harrison, AR
W5MQV, Donald G. McConnell, Bartlesville, OK
W5QHZ, Jim J. Brown, Gatesville, TX
WA5RGI, Michael L. Gomez, Las Cruces, NM
N6AM, Charles O. Heilman, Kingsburg, CA
N6AMF, Herb Sullivan, San Bernardino, CA
N6BAB, Charles V. Andersen, Los Altos Hills, CA
*KD6C, Julian Perry Masterson, Pasadena, CA
W6CMZ, William K. McKay, Oakland, CA
W6DTY, Keith S. Williams, Oxnard, CA
N6HLO, William S. Watson, San Diego, CA
W6ID, Vaughn I. Parry, Escondido, CA
W6IIR, Howard W. Parker, Hayward, CA
KB6KF, William R. Heifner, Lakewood, CA
*KI6L, Sid Balkman, Los Angeles, CA
WB6NCF, Robert P. Clymer, Santa Monica, CA
KA6QYD, Richard Carter, Santa Maria, CA
WA6RNP, Alfred E. Wendehl, San Juan Capistrano, CA
WA6SIX, Bert E. Newkirk, Jr, San Jose, CA
KA6SVS, Elmer L. Campbell, Roseburg, OR
K6UC, Doyle D. Andrews, Petaluma, CA
KG6WZ, L. E. Cranfill, Chula Vista, CA
W6YFR, Nelson E. Collett, Arcadia, CA
K7EHP, William "Frank" F. Lord, Bremerton, WA
W7GOH, A. Foy Pickett, Black Canyon City, AZ
W7IBF, Clarence R. Stefens, Glendale, AZ
W7IOW, Fan Liebman, Tucson, AZ
W7RDU, Eugene E. Taft, Ocean Park, WA
W7SBM, Ernest J. Schenk, Seattle, WA
W7UOJ, Henry M. Cruse, Spokane, WA
KB7VC, Henry C. Gepke, Jr, Federal Way, WA
W7ZG, Charles M. Christian, Ridgefield, WA
*WD8BDY, William R. Smedley, Follansbee, WV
WD8DQN, Vernon E. Landry, Grosse Pointe, MI
W8EY, L. Morse Weimer, Dayton, OH
W8GSD, Joseph Stefanko, Euclid, OH
WA8PGO, Paul E. Speer, Columbus, OH
*K8WFI, Galen E. Toms, Dunedin, FL
K9AOA, Marion J. Wilcox, Hazelcrest, IL
W9DAX, Irv C. Pratke, Madison, WI
W9ENU, Chesteen Chapple, Silver Lake, IN
WD9EPR, Robert L. Bonnell, Belmont, CA
K9ESN, Warren G. Jenkins, Stevens Point, WI
WD9HUR, Noel B. Burroughs, Mount Vernon, IN
WD9JEN, Russel W. Norris, Waycross, GA
WB9MVB, Wilbur H. Klett, Lombard, IL
WB9PLH, Ralph T. Brocker, Indianapolis, IN
KAØBOD, Patrick J. Barry, Seward, NE
KØBTJ, Lester E. Dierking, Washington, MO
WBØGLH, James J. Bush, Topeka, KS
WØJPJ, Frank N. Stephenson, Waterloo, IA
WØKD, Palmer A. Lien, Northwood, IA
WBØKIP, Arlington M. Reynolds, South St Paul, MN
WØNJV, Charles G. Ough, Davenport, IA
WØNYI, Orville Braaten, Morris, MN
WØQZ, Ross F. Waterbury, Excelsior, MN
WØROB, Paul G. Sandels, Belleville, KS
WAØSGS, William E. Peters, Ottumwa, IA
VE7AJF, Thomas H. Martin, Ganges, BC
VE7AX, Donald Vaughan-Smith, Surrey BC
VE7CEQ, Thomas W. Cisar, Burnaby, BC
VE7PS, Robert E. Shaw, Surrey, BC
*VE7YW, Victor Mandryk, Victoria, BC
DL7SU, Goetz Linke, Berlin, Fed Rep of Germany
VP9BN, William E. Jones, Paget, Bermuda

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are 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*.

50 Years Ago

September 1936

☐ Propagation anomalies, evident currently on 5 meters, make us wonder just what is this Kennelley-Heaviside thing anyway—what causes it and its various layers? Physics professor K4DDH gives us some answers, including discussions of critical frequencies, magnetic storms, sporadic ionization and the pitfalls in attempting to predict future propagation performance.

☐ A few manufacturers have commenced sponsoring operating contests for amateurs, offering substantial prizes to winners. *QST* takes a strong stand against the practice, announcing it will not accept advertising of such contests. "Let's keep amateur operating *amateur*!"

☐ W3EHE has been experimenting with some unorthodox crystal circuits, seeking multiple-band output. A "doubling tank" in the ground lead from the rotor of a split stator condenser tuning the plate circuit apparently uses the "push-push" principle to achieve a desired harmonic signal.

☐ The League's request to widen the 3.5- and 7-Mc. bands has been turned down by the U.S. preparatory committee for the 1938 Cairo international conference. Every country will want more frequencies, especially for h.f. broadcasting, and our government, though sympathetic, feels that *any* change in the 1932 Madrid allocations table will prompt wholesale chaos in the spectrum and losses for amateurs, not gains.

☐ Getting any practical output above 100 Mc. or so with present tubes is nigh impossible. But Ross Hull finds the new Western Electric 316-A, with low capacitance and low lead inductance, can put us on 224 Mc. with comparative ease.

☐ Though the 6L6 was designed as an audio beam-power output tube, W1JPE finds it highly useful as a doubler and straight r.f. amplifier. Ease of neutralization is a plus.

☐ The code exam for an amateur license is now standard—an applicant must copy 65 consecutive characters correctly anywhere in the 4-minute run. The 13-w.p.m. rate is a practical figure for the 12-1/2 speed recommended by the League's Board, which was split between the old 10 and a proposed 15, and compromised.

☐ XE2N was top dog in the 1936 DX contest, making 1370 contacts with all 14 W/VE districts. W4DHZ, W3SI, W2UK and VE2EE were high domestic scorers. Ninety hours of operating time was the maximum allowed this year during the 9-day fray.

☐ I.A.R.U. News highlights amateur regulations of some other countries, making us Ws and VEs feel rather fortunate. E.g., only small portions of 3500-4000 kc. are available to most European hams. Other bands often have substantial "buffer" restrictions at each end, apparently to protect government operations.

☐ After attending the extensive F.C.C. hearings as an observer, Washington communications attorney W3FMC complimented the League staff: "Without the slightest doubt, the amateurs had the best prepared case, and the engineering information presented was the most comprehensive."

25 Years Ago

September 1961

☐ The Project OSCAR crew no longer says "if" but only "when" its ham satellite goes up, hopefully later this year. As prompt amateur reception reports will be of great value, W6ZRJ provides details on reporting procedures and use of existing traffic networks for rapid relay.

☐ F.C.C. Chairman Minow is publicly pushing the concept of charging fees for all radio licenses. The League will be opposed to any such move, arguing that we supervise a majority of all amateur exams (Novice, Technician, Conditional), are largely self-policing through the OO system, and our TVI committees relieve the Commission of extensive investigative work.

☐ One kilowatt p.e.p. input in grounded-grid operation without neutralization is made possible with the new Eimac 3-400Z zero bias triode. W6GQK and W6UOV show a neat linear amplifier using the tube.

☐ Ed Tilton completes his design of a complete two-band station for the v.h.f. beginner, covering the modulator, power supply and standing-wave bridge.

☐ W8GRY's system for achieving 2- through 160-meter coverage in a "portable" station is to have separate plug-in subassemblies in a large carrying case. Crystal-control converters into surplus "command" receivers adequately bring in the desired signals.

☐ The Collins KWM2 produces only s.s.b. signals, but W2LNP added a simple switch to bypass the balanced modulator and reinsert the carrier for the occasional times he wants to use a.m.

☐ Conditions were tops for the June V.H.F. Party, sending all records tumbling. Entries were received from all sections except Alaska, Hawaii and the Canal Zone.

☐ If your ham-band receiver has no provision for tuning to WWV standard frequency and allied services, build the simple one-tube converter W1DF has designed.

☐ The Commission is swamped with amateur applications, many being for renewals—a situation that recurs every five years, starting with the 1946 postwar relicensing surge.

☐ Not yet out of ideas for using old TV receiver parts, W1ICP this month constructs a basic power supply from the cannibalization.

☐ Omnidirectional coverage on 144 Mc. with horizontal polarization features the "big wheel" antenna design by W1IJD and W1FVY.

☐ A good weekend project is a simple one-tube electronic key described by K2POO, who kept the unit small for use with a portable transceiver.

☐ *QST* takes sad note of the passing of Dr. Lee DeForest, inventor best known for his three-element audion tube, which opened the way to modern communications and achieved for him the name, "The Father of Radio."—*W1RW*

Strays

PLEASE QSL . . . CORRECTLY

☐ Thousands of QSLs come through the ARRL DXCC and Awards Desks each day. Most pass inspection and are used to qualify for an award, but some don't make it.

The most common cause for rejection is the altered card, the QSL that has letters in the call sign either crossed out or written over (see Fig 1). Even if the alteration is made with the best of intentions, the card won't make the grade. Imagine if this were a card for a WAS or WAC application. Worse, what if it's the card that could knock your DXCC count to 99. If your call appears correctly in another place (say in the address area), the card is still unacceptable. Your call (unaltered) must appear accurately in the QSO report. A good rule of thumb is, when you accidentally make a writing error while filling out a QSL, destroy the card and start over.

Believe it or not, the second most common mistake occurs when the QSLer puts his or her call in place of yours in the QSO report. This confirms a self QSO! In this case, if your call appears correctly somewhere else on the card, it's okay.

Sometimes, the QSLer may write your call sign wrong, even if he's worked you under the right call. This is common with 2 × 1 calls. For example, suppose while on a DX-pedition to Peter I island, you work KR1R, but you mistakenly make out the card to K1RR. KR1R now has a card made out to K1RR. Even if you send the card to KR1R's address, it still doesn't count for KR1R. We don't even want to think what would happen if K1RR should get hold of the card!

Once in a great while the QSLer forgets to put your call in the QSO report. In this case, if your call is somewhere else on the card, the card is good. If not, no credit.

Occasionally, a QSL will come through without the band or mode indicated. Is this the end of the world? Only if that card is part of a Five-Band DXCC, Five-Band WAC or Five-Band WAS, or a specialty-mode WAC, WAS or DXCC that requires that information. For example, all cards submitted for a CW endorsement must confirm a code contact. If the card lacks any mode indication but an RST report is provided, this information is acceptable to show that it was a CW contact, if all else fails.

Sometimes, the date is important. For 5BWAS, cards must be dated on or after January 1, 1970. For CW DXCC, cards must be dated on or after January 1, 1975. So before submitting for these special awards, check the date!

Okay, so you've checked over your cards and found some with one or two of these errors. What now? You've got two choices: You can send the card(s) back to the station(s) worked and ask for a replacement, or you can get on the air and work that country or state again (of course, getting a replacement card for, say, FØØXX or 3CØA is much easier than waiting to work the next DXpedition!). If you decide to obtain a replacement card, do so as quickly as possible. Sometimes logs get tossed out and the QSO information is lost forever. Obtaining a valid replacement card first and having your application pass with flying colors is much better than having your application hang in limbo because one or more of your cards was obviously not acceptable. Finally, if someone asks you for a replacement card, return the new card promptly.

STATION	DATE	UTC
K1XA	4 JUL. 86	ØØ15

STATION	DATE	UTC
K1XA	25 APR. 86	Ø11Ø

Fig 1—Two examples of call-sign alterations. Who changed the call isn't important. Neither card is acceptable for awards credit.

QSLing is the final courtesy of the QSO and, no doubt, for most of us it's fun to exchange cards. If we all take the time to check over our cards before we send them out, we can avoid the hassles mentioned above. This makes QSLing and award collecting that much more enjoyable!—*Frank Vesci, WB1CRI, ARRL Awards Assistant*

NEWSLETTER CONTEST: HAS YOUR CLUB ENTERED?

☐ Does your club's newsletter have the write stuff? Why not enter it in the 1986 Amateur Radio News Service Publications Contest. The contest is open to all Amateur Radio organizations worldwide; your club need not be a member of ARNS. General-circulation magazines and professional journals are not eligible. Judging will be based on several things, including layout and design, coverage of club and technical material, and overall interest. Entries must be received no later than September 30, 1986. More information can be obtained from Lee Knirko, W9MOL, President, ARNS, 11 S LaSalle St, Suite 2100, Chicago, IL 60603.

MOVING? UPGRADED YOUR CALL?

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

WRITING TO HQ?

☐ Each year, ARRL HQ receives over a quarter of a million pieces of correspondence. That translates into a lot of cards and letters to be sorted, routed to the proper department and answered. To help us continue to provide prompt, efficient service to our members, we ask that you follow these guidelines when writing to HQ.

1) Use a separate piece of paper for each request.

2) Type your letter (if possible), or print or write clearly.

3) Include your name, address, call sign and membership number from your *QST* label.

4) Enclose a business-sized SASE, if a reply is required.

5) Address your request to a particular individual or department, if possible, especially when responding to correspondence received from HQ.

6) Send a check or money order (IRCs for foreign requests) when applicable. Do *not* send cash.

SAFETY FIRST

☐ There are reasons for accidents involving radio gear, but never *good* reasons. Take no chances with electricity. Even a low-voltage shock can be serious—sometimes fatal.

Heed the ARRL safety code: While there's no reason for you to be involved in a ham-related accident, that possibility always exists if you are not thinking safety. Following the ARRL safety code will make your ham experience more enjoyable. Read it and practice it.

1) Kill all power circuits completely before touching anything behind the panel or inside the chassis or the enclosure.

2) Never allow anyone else to switch the power on and off for you while you're working on equipment.

3) Don't troubleshoot in a transmitter when you're tired or sleepy.

4) Never adjust internal components by hand. Use special care when checking energized circuits.

5) Avoid bodily contact with grounded metal (racks, radiators) or damp floors when working on the transmitter.

6) Never wear headphones while working on gear.

7) Follow the rule of keeping one hand in your pocket.

8) Instruct members of your household how to turn the power off and how to apply artificial respiration. (Instruction sheets on the latest approved method can be obtained from your local Red Cross office.)

9) If you must climb a tower to adjust an antenna, use a safety harness. Never work alone.

10) Do not install antennas at levels that permit humans or animals to come in contact with them. Not only might the victim sustain a severe RF burn, he or she could run into the antenna and be injured.

11) Do not operate high-power UHF or microwave gear that has inadequate shielding against radiation. Similarly, do not look into or stand near microwave antennas when transmitter power is being fed to them.

12) Do not install antennas near electrical power lines.

13) Don't drink alcoholic beverages when working on equipment or installing antennas.

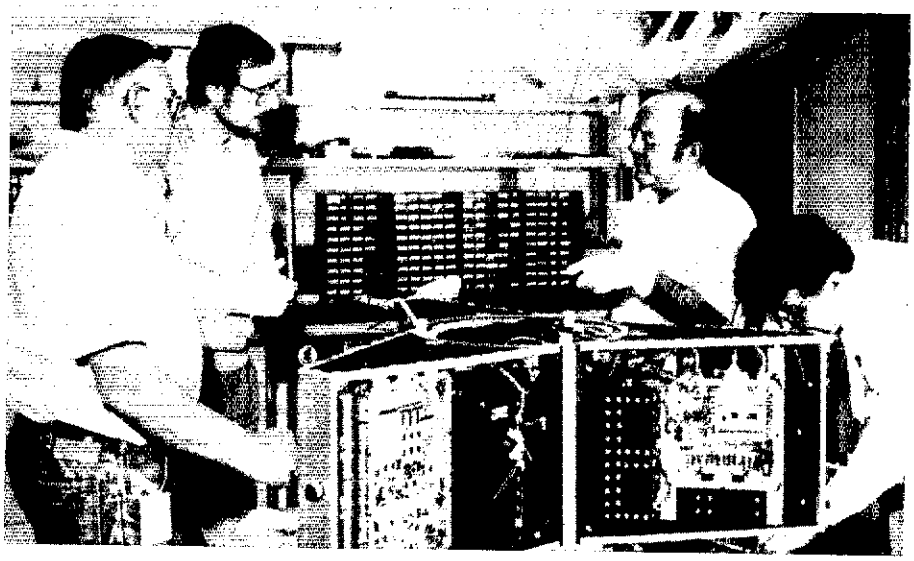
Take time to be careful. Death is permanent.

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

The Digital Satellite World

Next year, AMSAT's Phase 3C spacecraft will carry four transponders, one of which is the so-called RUDAK digital transponder. High in its eliptical orbit, Phase 3C and RUDAK may serve as a digital trunk for terrestrial networks. The following description of RUDAK comes from our German colleagues at AMSAT DL. In particular, a team in Munich under Hanspeter Kuhlen, DK1YQ, has built RUDAK. Read now what it's all about.



Part of the AMSAT-DL team during the Phase 3C integration in Golden, Colorado recently. Shown (l-r) are Konnie Mueller, RUDAK Project Manager DK1YQ, DJ4ZC and DJ5KQ.

RUDAK Status Report of the RUDAK Group of AMSAT-DL

By Peter Guelzow, DB2OS
Deputy RUDAK Project Leader
(Translated by Don Moe, KE6MN/DJ0HC)

"RUDAK" stands for "Regenerative Umsetzer fuer Digitale Amateur Kommunikation" (in English: Regenerating Transponder for Digital Amateur Communications). It is comparable to a so-called digipeater (digital repeater). Digipeaters are terrestrial relay stations for packet radio. They relay digital information between two stations in case there is no direct path between them.

Similarly to analog transponders, it seems desirable to install such a digipeater at the highest possible location with a large coverage area, eg, aboard a satellite in earth orbit. Thanks to the highly elliptical orbit of Phase 3C, RUDAK should eventually enable the interconnection of several local area nets in addition to point-to-point contacts between radio amateurs across the entire world. Naturally, a relay station with such a large coverage area has to contend with a series of difficulties. For example, the problem of multiple uncoordinated access or the selection of optimal modulation techniques are only two of among many that could be mentioned. These and other problems are to be researched primarily with the help of RUDAK with the goal of developing suitable techniques and protocols which will benefit future projects.

The initial designs of the RUDAK experiment were determined at a working meeting at AMSAT-DL in Marburg, West Germany in February 1985. In July 1985, in Marburg, the entire hardware design, the IHU interface as well as the satellite interface were presented. After certain modifications were agreed, the first functional wire-wrap prototype, RUDAK 1, was unveiled September 6-7. At this meeting in Marburg the primary task was to integrate the programming language IPS, previously developed by Dr Karl Meinzer, DJ4ZC, into the RUDAK processor. After several software errors were eliminated, IPS-CR was at last successfully loaded into RUDAK. The successful implementation of the IPS system brought the RUDAK experiment a giant step closer to completion.

The first printed circuit version, RUDAK 2, supplemented the original wire-wrap version a short time later. In all, the plan calls for four double-sided circuit boards with plated-through holes with the dimensions of 290 × 180 mm. Two boards will be built as identical flight versions, with one serving as a reference model on the ground. The other flight version will be mounted together with the demodulator and the power supply in a two-section housing with the dimensions of 300 × 200 × 20 mm and 300 × 200 × 17 mm. This will be subsequently integrated into the Phase 3C satellite. The remaining circuit boards are reserved for software development and various tests such as radiation testing. The boards were laid out using a CAD/CAM system.

The hardware development of the RUDAK processor is completed. The main work now involves the completion of the flight version as well as the implementation of the AX.25 protocol.

On January 24-25, 1986, the RUDAK group met once again in Marburg to clarify remaining details regarding integration into the satellite. A further high point was the demonstration of RUDAK's capabilities. For the first time, four TNC1s were linked together via the RUDAK processor, simulating on hard-wire connections how the operation will later take place. TAPR TNC1s were used exclusively, though only one had the original TAPR software; the other three used the multi-connect firmware from WA8DED. A lively data exchange took place, and DJ4ZC made his first packet-radio QSO. Additionally, RUDAK transmitted some general information in beacons. As was to be expected, numerous collisions occurred. Even so, RUDAK demonstrated that it already was working correctly. The next milestone is May 10, when the RUDAK flight version has to be ready for integration into the Phase 3C satellite.

The RUDAK hardware consists of 25 integrated circuits and only two discrete transistors. The entire circuitry was realized using CMOS technology, so power consumption is only 300 milliwatts. The heart of the RUDAK processor is the CMOS version of the 6502 CPU, which is clocked at 800 kHz. For storage of the RAM-resident system software and data, 56 kbyte of static CMOS RAM chips are provided. This concept itself gives RUDAK greater flexibility in case, for example, the entire RUDAK software has to be updated due to changes in the protocol, as has already been practiced with OSCAR-10's IHU. A single 2-kbyte fusible link CMOS PROM is used to load the IPS system via the command link after power-on. Additionally, the boot PROM contains various programs that will perform tests of the entire hardware in the RUDAK processor while in orbit.

To communicate with the outside world, the RUDAK processor has various parallel and serial input/output ports. One serial line and one 8-bit parallel port with the appropriate control lines are used for communication with the IHU. In the start-up phase, these paths are used to transfer diverse command and diagnosis instructions. Later, using this same path, RUDAK can receive current telemetry data which can be processed further. The IHU can also use a portion of the RUDAK memory as virtual memory in which to store larger quantities of data, eg, RTTY/PSK bulletins. The capacity of the 16 kbyte of RAM in the IHU is already totally used.

Normal operation with ground stations is handled by the RUDAK packet port. One send and one receive channel are available. The heart of this port is the CMOS version of the Z80-SIO, a universal chip that supports the AX.25 protocol in addition to asyn-

chronous and synchronous operation.

An independent receiver in the Mode-L transponder is provided for the RUDAK uplink on 1269.675 MHz. The demodulator converts the 2400-bit/s biphase PSK signal into a clean digital signal for the RUDAK processor. Thanks to the sweep circuit in the demodulator, the uplink signals only have to be in the capture window within plus/minus 7.5 kHz of the center frequency.

On the downlink side, the output data modulates the RUDAK beacon transmitter in the L-transponder on 435.675 MHz using BPSK at a data rate of 400 bit/s; the same as for the general beacon of OSCAR 10. Experimentally, the rate can be increased to 1200 bit/s using NRZI modulation.

The 2400-bit/s uplink and the 400-bit/s downlink signals are generated using the AMSAT standard, just the same as for the general beacon of AO-10. In the AMSAT standard, the data bits are transmitted differentially, ie, a logical "0" is sent when there is no change in two successive bits, whereas a logical "1" is sent for a change between bits. Additionally, the clock signal is combined with this data stream. Due to this trick and the differential encoding, the design of the decoder is significantly simplified.

Unfortunately, another standard has established itself internationally in which the assignment of the logical levels is exactly reversed. In the NRZI standard, a logical "1" is transmitted when there is no change between bits. If the bit clock is also combined with the data, the signal is then called "NRZIC." In order to reduce the confusion as much as possible, it was decided to adopt the previous AMSAT standard for RUDAK. In the case of the 1200-bit/s downlink option, the NRZI standard was chosen, and, in contrast to the AMSAT technique, the clock signal is not combined with the data, since to do so would exceed the bandwidth of the SSB receiver.

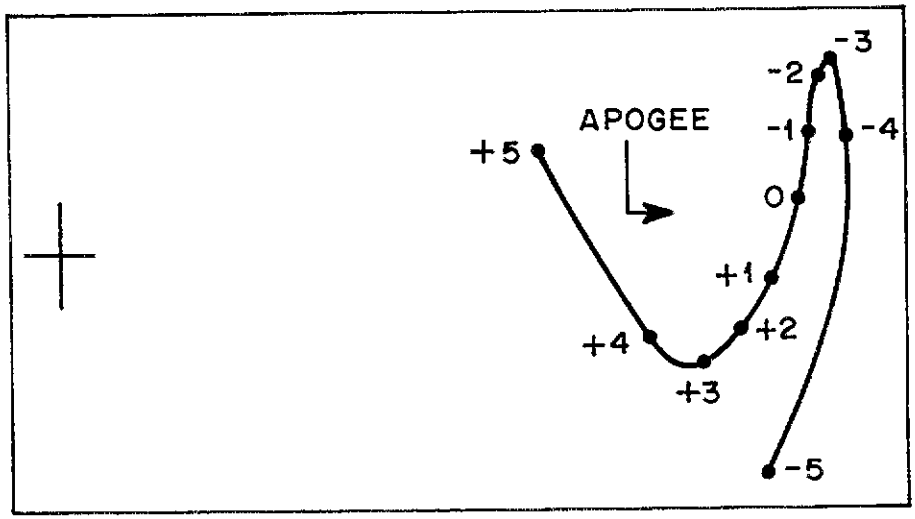
In the initial stages, RUDAK will emulate the existing digipeater functions as they are defined the AX.25 protocol version 2. No mailbox operation is planned presently, although various other messages, such as bulletins, orbital data, telemetry values and user instructions, can be cyclically transmitted when no uplink signals are being digipeated. New ground stations can take their time in adjusting their receiving equipment.

Additionally, a robot-type operation is planned in which the ground stations "connect" to the satellite and are assigned a consecutive number. In a fashion similar to the RS satellites, a RUDAK command station could later download the list and send out QSL cards. It is also hoped that an overview of packet-radio activity worldwide could be thereby obtained. Should a suitable link-layer level 3 protocol subsequently become available, it could possibly be implemented.

For the majority of the terminal node controllers, eg, TAPR TNC1, AEA PKT-1 or Heath HD-4040, the only software modification required is an updated EPROM to handle a hardware bug in the WD1933/35 HDLC controller. Otherwise, only a PSK modem for 400/2400 bit/s has to be connected to the external modem jack in the TNC. Other TNCs, such as the Kantronics "Packet Communicator" or various software solutions, are unfortunately not suitable due to the software and/or hardware restrictions. The TNC must be capable of operating full-duplex at different transmit/receive baud rates and support the connection of an external modem.

Besides the normal equipment, a so-called "RUDAK User Interface" is required. This is under development by the RUDAK group and AMSAT-DL. The RUDAK User Interface consists of a converter that translates a 2-m signal to 24 cm and modulates the carrier with 2400-bit/s BPSK, and the "AMSAT-AFREG," which is the BPSK demodulator for the 400-bit/s downlink. Additionally, various buffers and controls for switching the different signal paths and a power supply are needed. The various schematics, especially for the AMSAT-AFREG and the converter, will be published by AMSAT- DL after the design is completed.

On the RF side of the ground stations, the 400-bit/s downlink signal on 435.675 MHz should provide a signal strength of 12-dB Eb/No to an antenna with 10-dBi gain. For the uplink on 1296.675 MHz, 12 watts (11 dBW) into a 15-dBi antenna should be sufficient. QST



AMSAT-OSCAR 10 ground-track cursor for the OSCARLOCATOR. Reference data are for August 15.

Strays

KEITH WILLIAMS, W6DTY

We're saddened to learn of the recent death of Keith Williams, W6DTY, of Oxnard, California. Although most readers probably won't recognize the name and call, many will recall his legacy: the classic November 1956 *QST* article, "Your Novice Accent." Its operating advice, expressed simply and clearly, has served as a benchmark for two generations of newcomers to Amateur Radio.

HAM BATS ZERO AGAINST NATURE

Ham radio operators in warm climates have quickly found out that Old Sol will very rapidly dispense with antenna and tower materials. Thanks to the sun, many times I have found the remains of "perfectly good" plastic cable ties lying in the grass around my tower.

Now it comes that we need to put some active electronics (preamps) and relays up on the tower near the antennas. Some of us think that we have fooled her by covering the electronics with a simple rain cover. But, you had better make it aluminum. Old Sol up there will fix those plastics real good. The rain doesn't get on the electronics, and they don't seem to mind being out of doors even though the bottom of the cover is open to the fresh air.

Not long ago I noticed something strange hanging out of the open bottom of the equipment cover. It sort of looked like a huge ball of loose yarn. Odd, I don't recall any of those wires looking like that. Cranking down the tower I found the box filled with one of the unique Southern plants, Spanish moss. All trees in the area are infested with this parasite, but that sure was a strange place for it to grow!

Recently, some of the electronics in the box failed to work. Gad, did I blow another GaAs-FET? There hadn't been any thunderstorms lately. Another laborious cranking over of the tower held some more surprises. A number of the no. 22 AWG control wires (not the larger power wires!) had considerable mechanical damage. It looked like a very young child with innocent perversity had been let loose on the scene with a dull pair of wire cutters. A number of the wires were completely cut and many others badly damaged. This was quite a puzzle as neither rain nor sun nor Spanish moss could cause this kind of problem.

Casting about for an answer, I gazed around the yard at the numerous oak trees. Then the dawning! We have a copious population of squirrels. I'd never seen any of these furry demons anywhere near the tower top, but we got lots of 'em. They are very rambunctious in their chewing habits and had now taken to vinyl-covered no. 22 AWG wiring. Ma Nature had struck again!—*Dick Jansson, WD4FAB*

Public Service

Conducted By Michael R Riley, KX1B
Public Service Manager, ARRL

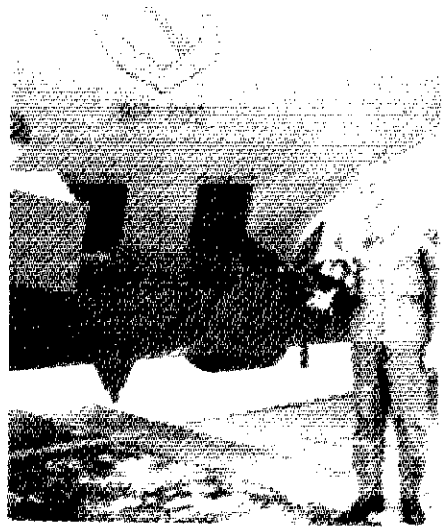
Amateur Radio Comes Through in Survival Training Emergency

Buck Allen's Amateur Radio knowledge came in handy during a medical emergency last June. When a member of his 14-man Air Force Reserve aircrew was hurt during a survival exercise on a remote island on Canada's west coast, his attempt to make contact with the outside world on military frequencies was unsuccessful. Only after resorting to the Amateur Radio bands, was he able to get help for his injured crew member.

Each time Buck, N4FDG, leaves his civilian civil engineering job at Eglin Air Force Base, Florida to become Captain Allen, US Air Force Reserve, he knows he is in for an exciting, challenging, rewarding job; but this mission to the great Northwest turned out to be more than he expected.

On Saturday, June 14, he reported to his Reserve unit, the 919th Special Operations Group, at Eglin's Auxiliary Field 3 to assume his duties as pilot in command of an AC-130 aircraft. Those people who have come in contact with this unique aircraft may know it as "Spectre," the gunship, a highly modified Hercules transport fitted with guns, sensors to see in the dark and a sophisticated fire control system. Captain Allen and his crew flew their gunship to Canadian Forces Base Comox, British Columbia as part of a four aircraft deployment for a week of tactical training and rescue exercises with the California Air National Guard's 129th Aerospace Rescue and Recovery Group. In addition to their flight activities, the air crews were scheduled for one day of survival training on beautiful but isolated Nootka Island on the west coast of British Columbia's Vancouver Island.

Captain Allen's turn at survival training came on Monday, June 16. A helicopter dropped off his crew at their camp site on the north shore of Nootka's Crawfish Lake, accessible only by helicopter or float plane. Although his team landed during a drenching rain, it didn't take long to set up camp. While cutting pine boughs, one of his aerial gunners was accidentally cut while swinging a machete. The cut was deep, requiring quick medical attention. Captain Allen immediately began operating the portable military shortwave transceiver provided for emergency communications.



Air Force Captain Buck Allen alongside the AC-130 aircraft. *(photo courtesy K3NN)*

In past years, the military often defined portable as anything you can weld two handles on. Weighing just 33 pounds (15 kilograms) including backpack and battery, Captain Allen's radio was a triumph of solid-state technology over the traditional image. It was a high-frequency, single-sideband transceiver with 9-foot whip antenna and built-in automatic antenna tuner. Power output was selectable at 2 watts or 50 watts.

After getting no response on his assigned frequency, Captain Allen tried emergency and air-traffic-control frequencies. Failing in this attempt, he called on his previous experience as a B-52 pilot and tried all the Strategic Air Command frequencies he could remember. Although he could hear operators handling traffic, he was unable to make contact. He then tried the long-wire antenna packed with the radio. All he heard was a tone from the speaker, indicating the antenna tuner didn't like the new antenna. He switched back to the whip and, as a last resort, tuned in the 20-meter band.

Starting at 14.313 MHz, he worked his way up the band, calling all stations heard until he made contact with Don Strom, WAØLKL, in Bloomington, Minnesota on 14.336. This frequency is monitored by the County Hunters Net, a group of amateurs trying to contact all US counties. Because dozens of operators are generally listening on this frequency, the net often gets emergency calls. Although Buck's signal was weak and Don's beam was pointed toward the East Coast, Don was one of the few stations to hear Buck's emergency call. After Don realized that the call was from Vancouver Island and rotated his antenna in a westerly direction, the S meter on his transceiver read S3 peaking to S5.

After hearing of the condition of the injured Air Force crew member, Don phoned the Canadian rescue squadron at Comox. A half hour later, Buck's crew saw a white DeHavilland Otter float plane swing into a tight turn over the lake. They watched the spray from its pontoons as the Otter settled on the water and taxied to the shore near their camp site. Its pilot, Ed Williams, worked for Air Nootka, a flying service mostly for loggers and vacationers. Because deteriorating weather prevented helicopter transit of the mountains between Comox and Nootka, rescue service had alerted him at his headquarters office in the lumber town of Tahsis, 19 air miles (30 kilometers) northeast of Buck's camp. The injured man and Captain Allen wasted no time getting aboard and were soon airborne.

The area's only physician, Dr John Wheeldon, lived in the small village of Tahsis, which is accessible only by air, water and primitive logging roads. Soon after the plane touched down, Dr Wheeldon attended to the machete wound.

Amateur Radio has a proud tradition of public service through emergency and disaster communications. This is but another example of its exceptional value. Because of Amateur Radio, Buck Allen may have averted a serious medical emergency on a remote island. —*William Bosley, K3NN*

SPOTLIGHT ON SERVICE...

Help Via Hattiesburg

The Missouri "bootheel's" disastrous May tornadoes proved again that one does not have to be in the midst of an emergency in order to be of service. Hundreds of miles from the destruction, the Hattiesburg (Mississippi) Amateur Radio Club (HARC) found itself in the thick of the action.

In the early hours of May 16, shortly after word of the deadly storms began to spread, HARC was asked by the local American Red Cross, which houses the club's headquarters and station, to handle two health-and-welfare messages into Sikeston, Missouri. Normal communications in and out of that area had been disrupted because one tornado had dropped a major telephone microwave tower. This traffic was cleared in a matter of minutes through KØDQV in St Louis.

Later in the morning, when additional health-and-welfare inquiries were received by the Red Cross, HARC was asked to activate the club station, W5CJR. Chris Baskind, KA5YFE, took on the task, having no idea that he would spend the rest of the day and much of the evening passing traffic in and out of the Missouri bootheel.

Baskind quickly located Lavern Wilson, NQØB, who was operating from one of the hardest-hit areas in southeast Missouri. Although he had no commercial power and was working virtually alone, Wilson was handling hundreds of health-and-welfare messages throughout the county.

As the day wore on, it became obvious that Wilson would not be able to continue at the grueling pace, and he asked the HARC station to assume control of the rapidly growing ad hoc traffic net. Over the next five hours, Baskind, still at the helm of his club's station, handled more than 150 messages into and out of Missouri, allowing Wilson a periodic break and permitting him to maintain a 2-meter link into nearby storm areas. By 10 PM, other Missouri amateurs had mobilized and established a net on 75 meters and, with propagation rapidly declining, the 40-meter net was closed.

This emergency effort stretched the Hattiesburg club's capabilities, especially since many of its members were providing communications for the State Special Olympics competition across town.

However, Baskind and relief operator Larry Morgan, AG5Z, proved that every amateur can provide a vitally needed service, even hundreds of miles from the scene.—*Hank Downey, K5QNE, Assistant Section Manager, Mississippi*

YOUR CONDUCTOR'S CABOOSE

Following is the second installment of a series on preparing for disaster communications written by D-CAT (a Disaster and Communications Action Team) of Houston, Texas. The first installment can be found on page 78 of July 1986 *QST*.

The Liaison Station

The liaison station and its operators are put into service when an extensive disaster, or perhaps an emergency of long duration, takes place. Even the best organized groups providing communications need assistance when a major disaster lasts more than 72 hours, or the emergency lasts more than 24 hours.

The liaison station is a necessary element in helping fill a communication need between Amateur Radio groups, between various public and private agencies, and between state and community officials. Also, different amateur organizations may work to serve specific needs in a particular area, city or community. Liaison services are necessary when information is to be exchanged between two or more of the different groups since, during disasters, these different organizations should have the ability to communicate reliably with each other.

There are some easy ways of handling the needed information between participating groups. A person who is Emergency Coordinator, net control or a liaison operator for a particular group, should obtain prior permission to contact and communicate with different groups during the emergency or the disaster. This coordination and permission should be obtained [in writing, if possible—Ed.] from the liaison officer or the Emergency Coordinator of the other amateur group or the agency or organization to be served.

Explain to those you've contacted that members of your group should be familiar with the services and/or communications provided by their group. Along with information on the capabilities of their group, you'll need names, titles, addresses and telephone numbers, call signs and net frequencies. A good rule of thumb is "the more you know about your served agency or organization, the better!" Lastly, don't forget to share similar information about your own group!

Although it is best not to rule out absolutely any type of traffic [within the law—Ed.] that needs to be sent from one group to another, standardization of format could be a lifesaver. It is extremely important that traffic format be discussed by groups which may respond during an emergency prior to the disaster. If one of the participants does not agree on standardization, it's best to know this before you're up to your elbows in traffic! If you get into a discussion concerning standardization of traffic format, remember that flexibility is one of our Service's greatest strengths.

All organizations should agree to meet on a frequency other than their primary operating or tactical communications frequencies. This may require that a special net be established to handle all liaison work. In fact, many outstanding ARES groups operate in this fashion. Remember that each individual group will be passing intra-organizational traffic on their own frequencies and nets. So, if possible, utilize a specific preplanned frequency [with a back-up available—Ed.] for liaison traffic.

In summary, you may wish to remember a few items when establishing or operating a liaison station:

First, prior to the emergency, exchange basic information about your amateur group with other amateur organizations, public and private agencies, and, if needed, state and local officials. If at all possible, get and disseminate similar information from the served agency/organization to members of your group. This mutual flow of information will help all concerned.

Second, be flexible. Do not rule out any reasonable amateur frequency, method or mode, including single sideband, CW, radioteletype, all types of VHF communications, and some really great methods of message handling such as packet communications, and who knows, maybe even amateur television. Use what you have in the most efficient manner possible to get the job done.

Third, have net-control stations keep, at the main site of operation, the names, call signs and frequencies of other participating amateur groups. Use prearranged methods of contacting the other groups.

Fourth, be willing to provide assistance when requested.

Fifth, don't be afraid to ask for help when necessary.

Sixth, radio amateurs belonging to ARES provide a communications service to the public—functioning as crowd control or security guards is not a desired role of ARES members.

By following these pointers, your group can be ready to interact professionally and efficiently with other organizations during emergencies.

People, Plans and Practice

So far in this discussion we have talked about the agencies served, we have talked about the role of a specific person, or group of persons, the emergency coordinator and the assistant emergency coordinators, and we have talked about several communications requirements to get messages from one group of people to another group of people. Throughout this entire discussion there is a common, a very common, link that binds all the plans and operations, all the success or failure, of disaster communications. That link is the individual amateur radio operator. Remember, in an emergency or a disaster, radios and plans don't communicate, people communicate. You, as a radio amateur, are those people.

It doesn' matter how elaborate a plan may be, or how much equipment you have or the sophistication of that equipment. If you don't have people to do the job of communicating, the job won't get done. And of all the tasks of preparing for disaster communications, the hardest task is getting the people.

Let's talk about the people who may be out there, willing to help you prepare for emergency or disaster communications. And in the same discussion we can talk about you, out there, who should be willing to help and organization in preparing for disaster communications.

First, remember that this person is a volunteer. The laws and regulations supporting the existence of the Amateur Radio Service justify amateur radio as a noncommercial service whose value, in part, is to provide emergency communications. But this doesn't mean that everyone will pay their dues and help. So the burden falls on a relatively few amateurs who do care enough to prepare themselves, then volunteer their time and their stations to the community when situations dictate the use of disaster communications. A primary task, in getting and keeping volunteers, is to discover and meet their needs while using their best abilities to achieve significant accomplishments in disaster communications. That's not an easy task, but remember, it is a most important task, if you want to get and keep communicators.

Second, remember that most volunteers have agreed to help because they want to satisfy a personal need, and although they may have volunteered their services out of this need, they also know that they can serve the community the best way they know how, as communicators. You can keep these volunteers by remembering that they are volunteers, and have a right to be treated with courtesy and consideration. Also, volunteers don't, generally speaking, like to be underutilized. Keep the volunteers interested and busy, and you'll keep them on the active participant list. And don't keep them busy with make work projects, you do have to satisfy their wants by giving them meaningful tasks to accomplish. This, in the long run, will help you and your communications efforts. If you are an individual, don't sit back and wait for someone to ask you to do something. Even if it's not in your psychological makeup, find something constructive to do towards the disaster communications efforts.

Third, how do these volunteers find you, or how do you find them? Advertise. Let people know that you are working in organized disaster communications. Don't sit back and dream about people coming to help, get out and let people know what is being done. This tactic is the same for an individual as it is for a group, a club. Let people know that you are interested, and you will have volunteers coming to you asking to help.

Let's say that you have the volunteer communicators for your disaster communications effort. What are you going to do with them? If you have some ideas on what you, and the other communicators can do to help the community, you could write those ideas down. When there is a particular agency that you are working for, those ideas and guidelines may be a bit more specific. If you have a plan, you and your volunteers will know what is expected—from the group, the agencies served, and yourselves. When developing a plan, remember that it should be flexible and understandable. When conditions warrant change, your communications group must be able to change.

Knowing the restraints of your particular group, and of yourself, you will be able to develop a guideline, a plan, that is reasonable and acceptable to everyone. And above all, write the guidelines down. No one can be expected to remember all there is about applying techniques of disaster communications, for a specific agency. Besides, with a written plan, there exists a way to practice disaster communications, so you will be prepared for the actual disaster.

Before we go any further, let's get to an understanding on a subject that often causes grief in disaster communications groups, especially during training. We are not talking about the training required to make someone a communicator. You know how to communicate, no matter what your class of license or how long you have been an amateur. What you may not know is how to communicate in a specific manner, dictated by the communications group or the agency served. It's those specifics that you train for. Learning how the group or the agency wants messages passed, how they want you to conduct yourself, etc.

The major link between the people and the plan is practice, this training we are talking about. Local conditions and the people help to dictate how much training and when this training is required. There are no hard rules or guidelines that I can give you; this is something that you and the group will have to determine for yourselves. I will tell you this much, it is my personal experience that if you practice, you will generally succeed. And when you don't practice, or fool yourself into thinking that your practices are realistic, when in truth they are not, the chances of failure are greatly increased.

Let's summarize what I've presented. For successful disaster communications you need people, you need a plan, and you need practice. People are the most precious commodity that you have, for without the people, the best plan in the world won't work. You need a reasonable plan, a written plan, to direct the efforts of your people. Without a plan, neither you, your volunteers, or

the agencies served will know what is expected to be done, by whom, when, and where. If you have people and a plan, then use the two of them together to practice, to conduct realistic training excersises preparing them, and the group, for the real disaster.

And finally, remember, that in an emergency or disaster situation, radios don't communicate, people do.

Field Organization Reports June 1986

ARRL Section Emergency Coordinator Reports

Thirty-three SEC reports were received, denoting a total ARES membership of 18,526. Sections reporting were: AB, CO, EPA, ENY, GA, IA, KS, MDC, ME, MI, MN, NFL, NLI, NNJ, NV, OH, OK, ONT, ORG, PAC, SC, SCV, SD, SDG, SFL, SK, VA, WA, WI, WMA, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	99	82.50	398	828
TCC Central	83	92.00	283	580
TCC Pacific	106	83.33	396	719
Summary	288	85.94	1077	2127
Cycle Four				
TCC Eastern*	234	96.69	695	1395
TCC Central	50	83.30	229	507
TCC Pacific	108	95.00	503	1006
Summary	392	91.66	1427	2908

*TCC Eastern operates both cycles 3 and 4.
TCC certificates issued this month: KA7MUL, KB2HM.

TCC Roster

KA1AE N1BHH W1CE W1EFW K1EIC K1EIR WA1FCD K1GRP WB1GXZ W1ISO KN1K KT1Q W1QYY KA1T KW1U AK1W W2AET N2DC WB2EAG WA2FJJ W2FR W2GKZ NN2H KB2HM N2IC W2MTA W2RQ N2XJ W3ATQ N3COY KK3F WB3GZU W3PQ KB3UD KQ3T AA4AT WA4CCK W4CKS N4EXQ WD4FTK N4GHI WA4JDH W4JL WA4JTE WN4KKN WB4PNY WB4UHC W4UQ K4WJR K4ZK N5AMK N5BB N5BT WB5CIC W5CTZ N5DFO N5DT W5GHP K5GM AE5I W5JOV AJ5K W5KLV KD5KO K5OAF K5OU KD5RC KA5SPT ND5T N5TC W5TFB KT5L W5TNT W5VMP KB5W NQ5W KV5X KU6D W6INH K6LL W6RDY WF6O K6UYK W6VZT W7EP KD7EY KB7FE NN7K KR7L KA7MUL KE7NN K7OVK KF7R W7VSE KA8CPS WD8LDY W8PMJ KZ8Q W8QBH N8XX WB8YDZ W9EHS W9FC W9JUJ KA9RII WB9UYU KA0CPT KC0D KA0EPY KJ0G N0IA WA0OYI VE3AWE VE3FAS VE3GSQ VE6CHK VE7BLY.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	30	713	26.30	.552	87.2	
CAN	30	554	18.50	.424	100.0	
PAN*	60	612	10.55	.549	96.6	
Region Nets						
1RN	60	554	9.20	.400	93.0	100.0
2RN	46	121	2.60	.193	56.3	86.6
3RN	30	248	8.30	.500	95.0	100.0
4RN	60	513	8.55	.369	75.7	93.3
RN5	60	647	10.76	.447	86.0	100.0
RN6	57	169	2.96	.278	100.0	96.6
RN7	60	447	7.45	.402	91.4	96.6
8RN	59	156	2.64	.200	89.0	90.0
9RN						100.0
ECN						86.6
TEN	60	266	4.40	.264	81.1	100.0
TWN	53	222	9.65	.354	65.0	96.6
TCC						
TCC Eastern	99	828				
TCC Central	83	580				
TCC Pacific	106	719				
Cycle Three						
Area Net						
EAN	30	266	8.87	.490	74.4	
Region Net						
1RN	28	71	2.54	.220	69.0	86.6
2RN	28	172	6.10	.344	91.4	70.0
3RN	15	6	0.40	.071	57.8	86.6
4RN						80.0
8RN						43.3
ECN						80.0
Cycle Four						
Area Nets						
EAN	30	1256	41.87	1.250	95.5	
CAN	30	692	23.00	.770	100.0	
PAN	30	778	25.90	.713	97.2	
Region Nets						
1RN	48	430	9.00	.540	93.4	93.3
2RN	59	221	3.80	.331	85.4	90.0
3RN	57	198	3.47	.316	91.2	93.3
4RN	60	506	8.43	.350	100.0	100.0
RN5	60	490	8.17	.478	100.0	100.0
RN6	60	501	8.30	.673	98.0	93.3
RN7	60	397	6.60	.760	87.5	98.3
8RN	51	310	6.08	.348	79.0	100.0
9RN	30	390	13.00	.449	90.4	100.0
TEN	60	290	4.80	.345	73.3	100.0
ECN	60	178	2.97	.340	60.6	96.6
TWN	57	188	3.29	.253	79.0	100.0
TCC						
TCC Eastern	234	1395				
TCC Central	50	507				
TCC Pacific	108	1006				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CT, DE, EMA, GA, IN, MDC, ME, MI, MN, MO, NC, NFL, NH, NNJ, NTX, OH, OK, ONT, OR, ORG, RI, SC, SCV, SD, SFL, SJV, SNJ, STX, TN, VA, VT, WA, WI, WMA, WNY, WPA, WV

Public Service Honor Roll

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 SM). 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; (9) Participating in a public-service event, 5 points, no max.

This listing is available to Novices and Technicians who achieve a total of 40 points or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

408
KC9CJ
210
KE8BE
165
K5CXP
148
W7LRB
147
K4NLK
N8EFB
132
WX4H
131
N4GHI
127
W2MTA
KW1U
126
KA8TIK
125
WA4QXT
124
KA3DLY
119
WB7WOW
KD7ME
KA9FFO
WB2OWO
118
WB1HIH
116
WF6O
N2JX
115
W2PKY
KB4WT
N1DDC
114
N6AWH
NN2H
113
WB2VUK
KA2SPH
112
VE4AJE
111
KA2MYJ
110
N9BDL
W9EHS
109
N7BHL
W8FPA
108
WA4PFK
K4SCL
N4EXQ
WB1GXZ
W0IKT
107
KK3F
K6UYK
WD5GKH
106
WB6DOB
W7VSE
105
W3FA
WB1CMQ
104
AA4MP
VE4IX
WA1FCD
N1CPX
103
WD8LDY
KA9RII
W9JUJ
WA2FJJ
WA4JDH
102
K8LIQY
W9YCV
K4JST
N7FXJ
NC9T
W4ANK
101
AG9G
WB8RFB
N8EVC
WB8JGW
100
KA4TLC
W2RRX
N3AZW
99
KC3Y
K2ZVI
98
K4ZK
N6CVF
97
N4KFU
W4PIM
AJ5K
96
KA1GWE
N1AKS
W9NXG
W4CKS
WB8KWC
95
W6VOM
AA4GL
KB1AF
WD8KQC
WB8SIW
N3COY
94
N3EGF
KB4OGR
93
K4VWK
W9HBI
W5VMP
92
NO0A
WB1CBP
91
NG2T
VE3DPO
W9CBE
K0GP
W0OYH
WB2MCO
N0BKE
W8JMD
90
N3EMD
KA2UBD
89
AA4HT
WA6ZUD
W9DM
K2ZM
88
WB2UVB
W0KK
VE4RO
87
WB4ADL
K0ERM
N7GGJ
WA0TFC
ND2S
WD2AFI
86
WB4WII
KV5X
KA8SPT
85
W5CTZ
W7GHT
NJ8R
WD8OUO
84
W7LG
KT9I
WB5SRX
W1TN
K0SI
W0OTF
AI0O
KA8CPS
AE5I
83
K4JHF
WD4ALY
K3RXK
82
KC4VK
KJ3E
KE7MO
81
KN1K
N1DMU
80
KC2TF
K2TWZ
KB1TA
WA1TBY
79
KJ9J
AC5Z
K2VX
78
N7BGW
KA4YEA
77
VE3WM
WA1YNZ
K2YAI
NF8B
K8JDI
76
WA4RUE
K4MOG
WD0GUF
WB2NLU/T
KA1ON
KA8KHS
WB8TNT
75
N0CLS
KA1KTH
WB2QMP
N1NH
74
WD6BZQ
WB4HRR
WB2IDS
73
KQ3T
W3YVQ
KB7E
NN4I
72
W3DKX
N2FKA
KC3DW
NT4S
WA2VJL
KA7AID
K0PCK
WD8RHU
71
KF4U
WD4KBW
N6HYM
W2ZQJ
ND0N
WA8HGH
KF8J
W4FMZ
K5EVI
70
AD7U
VE2EDO
NK8B
KC8UZ
69
N4PL
W6INH
K1LCQ
KA1LIH
WB8SYA
N8FWA
68
WA6WJZ
N1EDD
N1DNA
N2DXP
W2FR
67
VE3POJ
NJ4L
WB5YDD
W5KLV
WA4RNP
66
W4TAH
KD7G
N0GCC
KU2N
KB1PA
WB7WVD
65
KB4LB
NS7C
K9ZBM
WA4CCK
VE2FMQ
KK1E
WF4Y
64
KB9LT
WA3UNX
K0ZBJ
KA0BCB
KI4YV
W4JLS
WA6QCA
KA1MDM
WB5EPA
WA0PJV
W1PEX
W7JMH
KD8KU
KF7R
63
WB4TZR
VE3GSQ
N4JOA
WA3GYW
K4SWN
WB6QBZ
K8ND
62
VE3GT
KA4YHS
KA4GUS
W4HON
WA7VTD
W1RWG
N1CVE
N8AHA
WA8DHB
N8AEH
KB4BZA
K4ZN
61
WB0WNJ
WB9PFZ
N4KSO
K6UXO
60
N8GJO
WD0CRD
W0OUD
WA8DYS
59
KA1HPO/T
58
KA5QYV/T
57
N2EVG/T
53
KA2COX/T
52
KA7RFD/T
51
N4MMM/T
49
WA2MGV/T
47
KA2SJG/N

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM 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 the standard ARRL form.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	837	871	1252	71	3031
KW1U	19	945	885	26	1875
WB9YPY	0	755	82	505	1342
W3VR	261	303	397	21	982
WA4JDH	1	460	417	2	880
N4GHI	75	352	372	30	829
WA1TBY	6	330	363	7	706
W9JUJ	0	353	318	2	673
KK3F	19	308	283	25	635
WF6O	5	303	289	15	612
KB1AF	2	276	251	21	550
N1BGW	29	288	153	74	544
K6UYK	74	258	203	6	541
N4EXQ	31	231	235	39	536
WX4H	3	260	255	11	529
N4PL	105	148	255	10	518
N0GCC	3	218	287	2	510
W7VSE	1	262	237	5	505

BPL for 100 or more originations plus deliveries.

KA1BBU	213
KE8BE	151
N1DDC	150
WA4QXT	100

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Central Gulf Coast Hurricane Net	30	103	2453
Clearing House Net	30	348	441
Early Bird Net	30	509	309
Empire Slow Speed Net	29	56	302
Golden Bear Amateur Radio Net	30	182	1666
Hit and Bounce Net	29	238	555
IMRA	24	782	1592
Midwest RTTY Net	29	6	144
Mission Trail Net	30	130	829
New England Novice Net	26	24	89
NYSPTEN	30	57	550
Southwest Traffic Net	30	215	1217
West Coast Slow Speed Net	30	84	405
20ISSBN	25	276	688
75 Meter Interstate SB Net	30	187	942
7290 Traffic Net	46	355	2566

Results, 1986 June VHF QSO Party

"This was my first VHF contest in 5 years. The activity is more now than ever before."—NB2T

By Mike Kaczynski, W1OD
Contest Manager, ARRL HQ

and Billy Lunt, KR1R
Assistant Contest Manager, ARRL HQ

"June is Busting Out All Over" was the title of a popular show tune during the era of "Gooneyboxes" and "Lunchboxes." This June, it should have been named "Six Meters is Busting Out All Over," in this year's version of the annual ARRL VHF summer shoot-out.

These selected comments tell the 6-meter story from all compass directions: "Six meters was absolutely wild! Love it!"—WB4NNY. "Six meters opened up and we got our best score from our mountaintop."—N2WM. "I like old home week on 6."—NW5E. "Conditions on 6 meters were simply great. My biggest surprise was to receive a reply to my CQ from OX3LX!"—W3EP/4. "The contest came to life on Sunday when 6 meters opened up to all call areas except 6 and 7. Best DX was W6JKV/J8 and N4HSM/J8 in St. Vincent."—WØETT/7.

The Far West did not fare as well, as indicated by the NØKV/6 group operating from central California's renowned Mt Pinos: "Unfortunately, we weren't favored with very good 6-meter E_s, as were many areas of the country." Sometimes poor conditions are man-made, however, as WB6WLE discovered: "I was sure wondering what happened to six, figuring the band can't be *that* dead, until we found the coax was not hooked up to the antenna on Sunday morning!"

The intense 6-meter activity brought about call for reform on the botton end: "US stations covered up Caribbean DX by utilizing 50.110... there has got to be a better way."—KA3B op at AC3T. "50.1 to 50.110 should be limited during a contest for DX Watch."—WB4NMA. "With YV, XE and OX3 near 50.110, certain multi-op stations refused to QSY because they could not hear the DX stations. Please, keep the DX window open and spread activity higher in the band."—WA1OUB. Do we need a rules change?

That June is a 6-meter contest has been a long-standing axiom for VHF enthusiasts. That is not to say that the higher frequencies go neglected. The many mountaintop multiops typically dedicate a full-time operator on each band through 1296 MHz, some with capability all the way from smoke signals to light. Your serious single op knows he cannot neglect any band without serious degradation of score. Add in your single-banders, and you have quite a menu of signals to work on the band of your choice. Further, the activity hours are a big boon to concentrating the ether glow on bands like 220 and 1296 MHz.

The West Coast had some real 2-meter excitement. KH6HME, operating from the slopes of Mauna Loa, appeared in nine lucky California station logs.

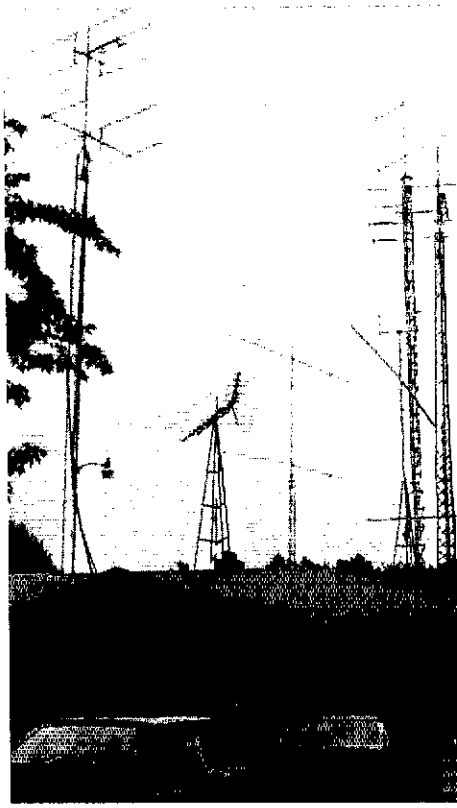
Division Leaders

Single Operator		*Division*	*Multioperator*	
Call	*Score*		*Call*	*Score*
K2SMN	151,704	Atlantic	K3YTL	609,637
VE3ASO	64,125	Canadian	VE3LNX	152,862
WB9MSV	74,725	Central	K9HMB	394,689
WØXG	46,110	Dakota	KCØP	86,366
K5UR	113,022	Delta	N5DL	118,320
W8ULC	43,920	Great Lakes	WD8ISK	326,239
K2CBA	107,706	Hudson	W1XX/2	326,400
NØLL	102,060	Midwest	WBØDRL	328,520
W1VD	367,443	New England	W2SZ/1	750,046
W7HAH	24,080	Northwestern	K7ND	28,336
W6RXQ	16,218	Pacific	N6AMG	100,806
W3IY/4	145,754	Roanoke	W3CCX/8	415,200
KAØNNO	88,023	Rocky Mountain	WØKEA	101,568
W5HUQ	59,724	Southeastern	WA4NJP	122,584
K4CKS	41,595	Southwestern	NØKV/6	145,680
KE5EP	84,656	West Gulf	K5CM	294,640

Top Ten

Single Operator		*Multioperator*	
W1VD	367,443	W2SZ/1	750,046
WA1STO	153,642	K3YTL	609,637
K2SMN	151,704	W1TKZ	415,384
KB3QM	151,495	W3CCX/8	415,200
W3IY/4	145,754	K9HMB	394,689
AA2Z	128,535	AB4L	340,316
WA2OMY	122,244	WBØDRL	328,520
W9IP/2	113,661	W1XX/2	326,400
K5UR	113,022	WD8ISK	326,239
K2CBA	107,706	W8VP	307,835

The QRP portable category, now official for the September contest, attracted more than passing interest: "This was our first attempt at hilltopping and the first attempt by any group from this part of southeast Alabama. Our 10-watt station was plenty competitive and we surely did enjoy ourselves."—AA4LE. "No one ever told me I could have a 20-over-9 signal while running less than 10 watts! Next time I'll be on the tallest hill on the island (312') with 10 watts."—KB1QL, Martha's Vineyard, Massachusetts. "I ran a 2-meter transceiver and amp off a battery on a hilltop just north of my home QTH. In one hour, I heard more grid squares than I had heard in the past year. Will be back in September."—KC2KK. Meanwhile, KA2IVS makes this observant comparison of mountaintopping to the comforts of operating from the home QTH, as he did: "Love to hear the inquiries from mountaintoppers sweating in tents above the background noise of the 5000-BTU air conditioner in my shack. Ah, the



WD8ISK, dubbed "Radio Free Mainville" by his neighbors, placed number 9 in the multiop category.

Top Single Band Scores

50 MHz		144 MHz		220 MHz		432 MHz		902 MHz		1296 MHz	
KAØNNO	88,023	K2TXB	27,775	W1VD	3,348	K1FO	17,600	W1JR	210	K2SMN	3,021
W1VD	74,382	W1VD	17,415	N2EOC	2,546	W1VD	8,432	AA2Z	180	K8WW	2,520
NØLL	60,160	K1RZ	17,108	WB2IEY	2,208	K2SMN	5,880	W1QXX	162	W2VC	2,160
N2CEI	59,345	K4MSK	16,491	KB3QM	2,100	NI8O	5,148	WA1JOF	84	W1RIL	1,617
WA1OUB	53,768	K2SMN	15,532	K2GK	1,722	W3IY/4	4,524	WB1FKF	54	WA1JOF	1,548
WØETT/7	48,552	WB2QOQ	15,000	K4LHB	1,560	K8WW	4,410	W1RIL	54	K2TXB	1,521
WØOZL	44,980	WA1VTA	14,615	WA2OMY	1,520	WA2OMY	3,796	W3HQT/1	45	NI8O	1,296
WA7KYM	40,176	K2GAL	14,194	AA2Z	1,496	W2VC	3,650	WB5RFH	18	W3IY/4	1,218
KAØCSI	39,396	AA4KP	14,160	W3IY/4	1,404	K9WZB	3,584	K9MK/5	18	W1VD	1,152
WB4NMA	39,100	AF9Y	13,860	K1PXE	1,368	K2BJG	3,486	NR6E/6		WA2OMY	825
*K5CM	103,558	*W2SZ/1	35,250	*K3YTL	9,916	*W2SZ/1	18,312	(CN90)	3	*K3YTL	4,071
*WBØDRL	93,972	*AB4L	32,175	*W2SZ/1	7,688	*W3CXX/8	17,150	*K3YTL	798	*W2SZ/1	3,477
*K5JL	86,688	*K3YTL	29,736	*NØKV/6	7,410	*W1TKZ	11,340	*WA7JTM	162	*W3CXX/8	3,036
								*W1TKZ	144		

*denotes multioperator station

Multiplier Leaders—Single Operator

50 MHz		144 MHz		220 MHz		432 MHz		902 MHz		1296 MHz	
KAØNNO	183	N3EAX	84	W1VD	27	K1FO	44	W1JR	7	K8WW	24
W1VD	161	K4MSK	69	WB2IEY	24	K8WW	35	AA2Z	6	K2SMN	19
NØLL	160	AF9Y	63	K2GK	21	W1VD	34	W1QXX	6	NI8O	18
KAØCSI	147	PE1AHX/W4	60	W9IP/2	21	K5UR	34	WA1JOF	4	W2VC	16
KE5EP	144	K2TXB	55	VE3ASO	21	NI8O	33	WB1FKF	3	W3IY/4	14
N2CEI	143	K1RZ	52	KB3QM	21	W3IY/4	29	W3HQT/1	3	K2TXB	13
WA1OUB	143	K4CKS	52	WA2OMY	20	K2SMN	28	W1RIL	3	W1VD	12
W9IP/2	139	VE3DDW	52	K4LHB	20	K9WZB	28	K9MK/5	2	WA1JOF	12
WØETT/7	136	K3LNZ/8	52	N2EOC	19	WØRAP	27	WB5RFH	2	K1RZ	12
WØXG	131	VE3FGU	49	K1PXE	19	K5YY	26	WA5VJB	1	WA2OMY	11
WØOZL	130	AA4FQ	49	W3IY/4	18	WA2OMY	26	NR6E/6		W1RIL	11
		K5UR	48	K2SMN	18	WB4NXY	25	(CM88)	1	K6CH	11
		AA4KP	48	WB3LJK	18	WB3LJK	25	NR6E/6		W3IP	11
		K2GAL	47	K2CBA	18	W2VC	25	(CM97)	1	K4QIF	9
		WB9MSV	46	AA2Z	17	WA4HHG	25	NR6E/6		AA2Z	9
				KB8ZW	16	WB9MSV	24	(CM87)	1	K1PXE	9
				WB2YEH	15	VE3ASO	24	NR6E/6		W3WFM	9
				AC3T	15	WD9IIX	24	(CN90)	1	KE5EP	9
				W2EIF	15	WØVD	24	NR6E/6		K6UQH	9
				W3IP	15	KB3QM	24	(CM98)	1	WB2YEH	8
				N2BFJ	15			NR6E/6			
				WA1STO	14			(CM89)	1		
				WA3DJG	14			NR6E/6			
								(CM99)	1		
								VE3ASO	1		

Multiplier Leaders—Multiop

50 MHz		144 MHz		220 MHz		432 MHz		902 MHz		1296 MHz	
WBØDRL	191	W8VP	82	W8VP	38	W8VP	50	K3YTL	14	K3YTL	23
K5JL	184	WBØDRL	79	K3YTL	37	AA9D	49	N6AMG	7	W3CXX/8	22
K5CM	182	AB4L	75	W3CXX/8	34	W3CXX/8	49	WA7JTM	6	W3KWH	20
K9HMB	173	WD8ISK	74	W2SZ/1	31	AB4L	45	W1TKZ	6	W2SZ/1	19
W9UD	170	W2DRZ	73	WD8ISK	29	K5JL	45	K1WHS	5	WBØDRL	17
WD8ISK	163	K9HMB	71	W1TKZ	27	W2SZ/1	42	W1XX/2	4	W1TKZ	15
WØUC/9	161	N8DKL	67	AF2K	26	W3KWH	41	VE3LNX	3	NØKV/6	15
WBØZKG	161	W9UD	64	VE3LNX	26	K9HMB	41	W3CXX/8	3	N6AMG	15
AA9D	157	W3CXX/8	60	K9HMB	25	W9UD	40	K1DS	2	WB8BKC	15
WØKEA	155	AA9D	60	W3KWH	25	WBØDRL	38	K9HMB	2	W8VP	14
W2SZ/1	154	K3YTL	59	KF6AJ	22	K3YTL	38	W2RCX	2	K9HMB	13
				W1XX/2	22	W1TKZ	35	WD8ISK	1	K2BWR	12
				AB4L	21	VE3LNX	35			WD8ISK	12
				W9UD	21	WB8BKC	31			AA9D	11
						W2DRZ	30			K5JL	11
						WD8ISK	30			W1XX/2	11

joys of operating from the home QTH with steady line voltage, a stocked fridge, and indoor plumbing. The cost? Only 20 grid squares, thanks to the 'XYL building code' that keeps the beam up only 30 feet." Who wants to get him first, guys? W3CCX/8, K2AA, et al, line forms to the rear.

With 902 gaining in popularity, the W2SZ gang could have used a tape loop to indicate "no 902" to the many inquiries. The "Yellow Traffic Light," K3YTL, was loaded for bear on this band however, with 19 QSOs in 14 (count 'em!) squares. Nice going! Everyone at the K1DS station "got a charge out of the 902 rig, a true breadboard with a clip lead as keyer, and manual coax changeover to boot."

In our regular "rare square" feature, we had several qualified entrants, so these three are the rarest of the rare: "I tried something different and operated from 10 different grid squares on six bands from Oregon to central California. Climate varied from snow and ice on mountaintops to 90 degree heat in the valley. Highlight was a 1296 contact from Oregon to San Francisco Bay area. "Lowlight" was a rattlesnake that added new meaning to the term QRT."—NR6E. "Sixteen states from a 30-foot boat on VHF from FM39. Please let everyone know that there are three squares in water which are three miles or less off the East Coast."—WA2GEZ/MM. "As far as we know, DM16 has never been put on the air. Through the cooperation of the National Park Service at Death Valley, KF6NX operated from Dantes View at an elevation of 5700 feet above the valley floor which is 280 feet *below* sea level. Many amateurs in southern and northern California were happy with the results"—KF6NX.

In the regulations department, Rule 7I (no telephones) took a beating. All your comments have been bundled up in a crate and forwarded to the Contest Advisory Committee. Incidentally, some misread the rule, thinking that schedules before the contest were *verboten*. Not so. It's your contest, so let the CAC know how you feel. A single copy to the CAC via HQ will be forwarded to all members of the Committee.

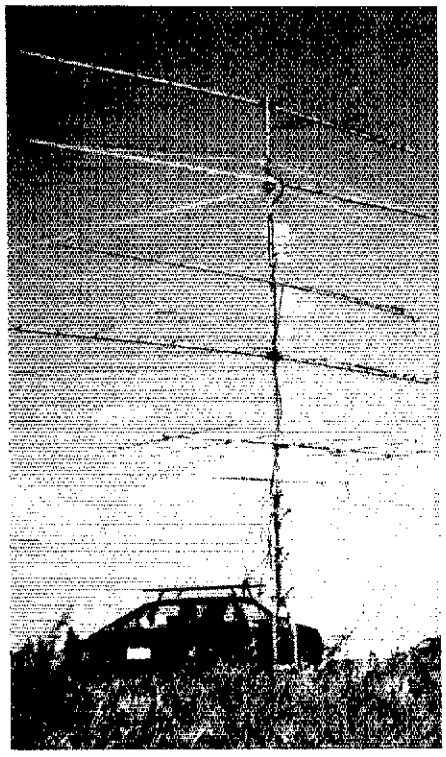
Space does not permit recounting all the neat experiences that you all had in this year's June VHF QSO Party. Competition is regional and section-wide, so that story is told best by the scores and boxes which follow.

The fun and games start all over again in the September Party, set for the 13th-15th. Before which, please find a solution for NJØX who "needs some suggestions on how to get my wife and family to speak to me again after these contests."

Special thanks to the extra effort of Mark R. Burke, KA1MIS, for his work in the preparation of this report.—*W1XX*

SOAPBOX

We had to have one person man a sledge hammer and a portable radio to track down line noise (WD8ISK). The amp popped, the six-meter beam wouldn't turn all the way, the generator died for an hour on Saturday and the beer ran out too soon, otherwise things were fine (K1WHS). Never have we experienced mobile VHF operations as enjoyable as on this weekend (ND2X). VHF quite a diversion from chasing "rare DX" on 20/40 meters (KAØGGI). I worked enough grids in two days to qualify for VUCC (WB2DNE). A real barnburner, signals from all directions (K8TGC). Stations should spread out and use these spacious bands (KC2MI). Packet rekindled my interest in ham radio (WA1OBI). Hours of monitoring and CQs pulled little out of the air. Strange? (KB1WR). One can get a complex yelling to the backs of the beams that are pointed west looking for that rare grid square (WA1VCU). Sure wish more stations in Kilowatt Alley would point their antennas this way. Believe it or not there *is* life in FN55! (N1BUG). Hi Murphy, nice to see you take out three coax relays and two front ends on 220! (K1DS). Two-meter activity took a backburner, as I knew that 6 meters would be the equalizing force (WB2ELB). This was more fun than chasing DX on 20! (NR2E). Poor propagation prevailed on two meters this year, that tropo opening just never happened (AA4FQ). I couldn't find many stations on two meters and up because they were all on six (W4ODW). It's good the contest was on Father's Day or my wife would have killed me! (AA4FL). All the band openings seem to occur while I'm taking a break (KB4GBS). Conditions on 144 were rotten for most of the contest. Next year please arrange to have a wild E opening on two! (K5MAT). We are just back on six meters after almost 35 years and the same fine operators are on as before. Gentlemen, all of them! (W5OZI). From now on out I'll only operate two meters as I can't operate six living 90 miles from channel 2 (KS6A). Six meters dead, next time I'll use 144 and 432 (KB6QC). Sure thought a contest would bring out all sorts of people on 220. Just the opposite (K6BPC). One of the worst contests I've been in for six-meter propagation. Too bad since we were in a rare grid square: DN05 (N7DB). Location is all important! (N7CWU). Saturday I thought six would never open, Sunday I thought it would never close! I wish two was better (WA7KYM). Good grief, am I bushed! What a contest!! (KB8JI). What took 12 hours on Saturday to set up, check out and debug took only 2 hours to remove. Including the temporary 30-foot tower. (WB8KAY). Biggest thrill of the contest was breaking the pile up to J8 and WP4 on six with 10 watts on CW. My hat is off to those ops! (KA9LDS). Couldn't think of a better way to spend Father's Day weekend—participating in my favorite hobby (N9EOM). My first VHF contest in five years. Enjoyed operating from a picnic table at 9000 feet (KDØSU). N8FGV was watching "60 Minutes" when a Canadian TV station overwhelmed our local CBS affiliate. We decided to check out two meters and stumbled onto the contest (KAØUBF).



The FN15 QTH used by VE3ASO netted him top score in the competitive Ontario Section.

Scores

Scores are listed by ARRL Section. Within each Section, single-operator scores are listed first, followed by multioperator scores. From left to right, each line score lists: call, score, QSOs, multipliers, bands operated (A—50 MHz; B—144 MHz; C—220 MHz; D—432 MHz; 9—902 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). Among the single-operator stations, the single-band winner is indicated by boldface type for the letter(s) denoting the band won. For example, in Connecticut, W1VD is the single-operator Section award winner, and he also had the highest scores on 50 MHz, 144 MHz, 220 MHz, and 1296 MHz. K1FO had the highest score on 432 MHz, while AA2Z had the highest score on 902 MHz. KF6AJ is the highest-scoring Connecticut multiop. *Denotes QRP portable entry.

W

1

Connecticut

W1VD 357,443-1067-279-ABCDE
WA1STO 153,642- 762-174-ABCDE
AA2Z 128,535- 583-165-ABCD9E
K1PXE 54,035- 347-107-ABCDE
AB1U 37,558- 296- 89-ABCDE
KA1BXB 37,080- 328- 90-ABCDE
W1GRW 25,714- 226- 86-ABCDE
W1VRH 21,238- 259- 82-AB
K1FO 17,600- 200- 44-D
NE1A 8,894- 207- 42-AB
W1WHL 5,678- 129- 44-A
WA1GTP 5,488- 112- 49-AB
W1AW (KJ4KB,opr) 4,992- 96- 52-A
K1OQG 885- 59- 15-B
WA1OBI 208- 26- 8-B
KB1WR 45- 15- 3-B
KA1KQJ 24- 6- 4-B
KF6AJ (+W1QK,WA1WXV,K1EFI, N1A8Y,KA1ECL,WB1CVW) 150,388- 747-184-ABCDE
K1GX (+WA1NLD) 28,080- 278- 90-ABCDE
WA1KGR (KA1AHR,KA1MDA,KB1TH, KB1XD,N3BAO,N1EAU,oprs) 18,480- 314- 55-ABCD

Eastern Massachusetts

W1QXX 59,024- 409-112-ABCD9EF
K1KG 49,028- 371-119-ABCDE
WA4PFN/1 48,204- 403-103-ABCD
WA1JQF 43,320- 287- 95-ABCD9E
W1JR 27,200- 193- 85-ABCD9EF
KA1DHO 21,760- 220- 85-ABCDE
K1SRZ 20,922- 255- 86-ABCD
W1GXT 19,951- 197- 71-ABCDE
WB1FKF 19,389- 173- 89-ABCD9EF
K1DAT 19,125- 225- 85-AB
K1TO 16,692- 179- 78-ABCD
KA1SU 14,552- 204- 68-ABD
K5MA/1 10,848- 339- 32-B
K1VZI 9,548- 139- 44-ABCDE
WA1AYS 8,604- 127- 52-AB
WA1NQV 5,472- 96- 57-A
W1YN 4,668- 113- 29-BD
WA1VCU 3,498- 132- 22-BD
KB1QL 3,375- 75- 45-A
W1JOT 1,776- 70- 16-BCDE
KA1AMR 1,363- 47- 29-A
W1HNZ 276- 39- 7-B
W1XM (N1s CPK,DAM,DFM,DMM,DPU, W1GSL,N0GSZ,oprs) 36,900- 299- 90-ABCDEI

Maine

W3HQT/1 42,804- 295-116-ABCD9E
K1TOL 34,320- 286-120-A
WA1TRE 16,808- 174- 88-ABCD
K1RSA 8,775- 135- 85-AB
W1PLX 700- 50- 14-B
WA1YXL 480- 60- 8-B
N1BUG 440- 40- 11-B
K1WHS (+K1MNS,AF1T,WA1s NIE, OAQ, KA1LMR) 165,798- 729-181-ABCD9EI

New Hampshire

WA1QUB 99,893- 583-171-AB
AC1J 27,534- 301- 78-ABCD
WA1UPB 11,134- 239- 38-BD
KA1CDZ 5,922- 117- 47-ABCD
KA1BJ 4,834- 147- 24-BD
W1FJH 4,488- 187- 24-B
W1JSM 1,440- 87- 16-BD
W1IUN 1,360- 79- 16-BD
VE3BFM/W1 490- 27- 14-ABE
N1DNC 308- 31- 9-BD
KA1YQ (+K1IO,N1s OJB,DVC,OGF,KA1KN, WA1QHQ,VE3BFM) 130,666- 717-158-ABCDEFJ
KA1BLF (+KA1s MPT,MTM,MXH,N1BAC, WA1YZN,WB8BTH) 30,184- 305- 88-ABD

Rhode Island

AI1K 2,394- 133- 18-B
K1DS (+KM1X,K1HGC,WA3EEC,W1RVO, KA1KWE,KA1KIL,WA1TAQ,W1EYH,N1BBM) 86,043- 533-128-ABCD9EI

Vermont

W1AIM 19,260- 195- 90-ABCD
WB1GQR 11,760- 200- 49-ABD
K1IK 5,260- 140- 59-AB
KB7IX 1,800- 90- 20-B
WA1ZOJ 1,072- 67- 16-B
WA1TBV 704- 32- 22-A
W1TKZ (W1GCI,ND1Z,G3VVH,N2BJ, WB1BUM,WA2s TIF,TEQ,N1CPE, K1TK,oprs) 415,384-1189-274-ABCD9EI

Western Massachusetts

W1RIL 42,496- 436- 84-BCD9E
K9ES 36,789- 391- 83-ABD
K1ISW 22,287- 264- 69-ABCD
WA1VTA 14,615- 395- 37-B
NA1W 4,582- 133- 29-BD
KA1KRJ 4,580- 228- 20-B
WA2ALV 4,578- 100- 42-ABD
W1NMQ 1,464- 57- 24-ABC
WA3EEC 209- 19- 11-AB
K1JG 16- 4- 4-AB
W2SZ/1 (AG1M,K1OH,NC1J,KY1H,N1DJE, KA1DZV,WA1UGE,WB1EYL,KJ2B,NF2B, NJ2L,N2s BNY,CJJ,W2ARQ,WA2s AAU, SCA,SPL,WB2s KMY,QCJ,KA2s TOC,WRG, KM3T,AK4L,WA8USA) 750,046-1679-331-ABCDEFGHIJ
K1TR (+K1EA,N1BEM,N1AFQ, WA1s PBU,RAJ,VFJ) 369,844-1107-199-ABCDEGHI
W1NY (AC1T,N1DPM,NC1B,W1KK,KA1ZE, WA1EYF,WA1UQC,KA1HTK,oprs) 209,312- 830-211-ABCD

2

Eastern New York

K2CBA (WB2DNE,opr) 107,706- 545-174-ABCDE
WA3ZPX 16,478- 214- 77-AB
WA2BAH 12,768- 156- 76-ABCD
N2FPB 4,316- 83- 52-A
KA3NQD 2,170- 62- 35-A
KD2IX 1,740- 116- 15-B
KA2JUV 1,722- 82- 21-B
KG2H 1,216- 64- 19-B
W2KHQ 1,104- 69- 16-B
KA2Q 630- 40- 14-BD
WA2RUW 552- 23- 12-C
W1XX/2 (+KB9NM,W1OD) 325,400-1058-256-ABCD9E
AB2I (+WB2DVV) 540- 45- 12-B
KC2KK (+KW2D) 384- 24- 16-B

NYC & Long Island

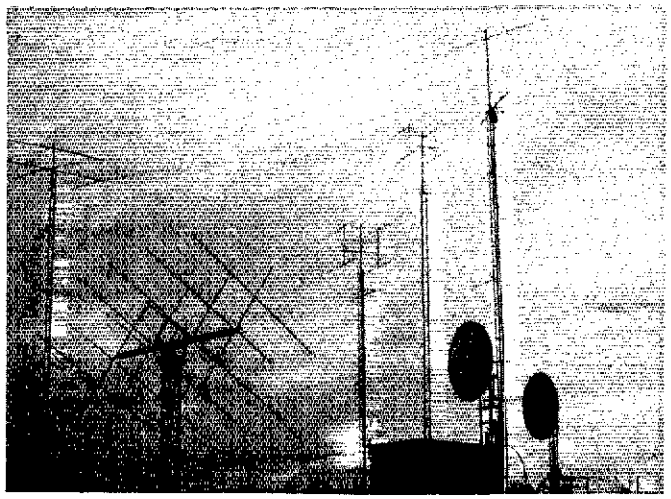
N2BFJ 66,555- 393-135-ABCD
WB2CMI 32,340- 291- 98-ABD
K2IJL 13,288- 233- 44-BD
WA2SLY 9,894- 194- 51-AB
NB2T 6,075- 225- 27-B
K2OVS 5,000- 100- 50-ABD
KA2VKD 5,282- 139- 38-AB
WB2ALW 304- 29- 14-ABCD
WA2EUS 150- 10- 5-E

Northern New Jersey

N2CEI 59,345- 415-143-A
WB2QOQ 15,000- 375- 40-B
K4BNG 14,960- 187- 80-AB
W2VC 11,521- 118- 41-DE
WB2BPY 10,458- 166- 63-AB
WA2SPO 9,966- 129- 54-AB
N3AHF 5,456- 178- 31-B
WB2TIX 4,428- 108- 41-ABD
K2BJG 3,486- 83- 21-D
KA2IVS 2,960- 148- 20-B
N2EOC 2,545- 67- 19-C
N2FGZ 2,016- 72- 25-AB
WA2ALM 1,155- 77- 15-B
N2CG 600- 25- 24-A
WB2WIK (+KT2B,KC2PX,W2HWG,WA2VUN, K3QM,NV6O) 174,921- 739-199-ABCDE
N2WM (+N2s EWV,CJS,WA2GZN,WA3WUD) 105,104- 599-146-ABCD
WA2GEZ/M (+WB2DGM) 9,992- 88- 34-AB

Southern New Jersey

K2SMN 151,704- 660-168-ABCDE
N2AHN 66,978- 490-157-ABD
W2HRW 57,340- 437-122-ABD
WB2YEH 50,022- 279-128-ABCDE
K2TXB 42,296- 544- 88 BE
W2EIF 33,864- 252-102-ABCDE
K2GAL 14,194- 302- 47-B
W2PAU 12,444- 161- 88-ABD
KA2WKA 6,642- 246- 27-B
WB2JHG 1,656- 40- 23-BD
K2JF 1,611- 118- 25-BCD



The antennas and operators of number 7 WBØDRL. From left to right, WAØTKJ, WBØPJB, NOØY, KXØO and station owner WBØDRL.

WB2YHA 885- 59- 15-B
W2CFY 380- 22- 10-BD
KA2KFO 18- 6- 3-B
K2BWR (+K2ZRJ)
85,204- 361-178-ABCDE

Western New York
W9IP/2 113,661- 446-219-ABCDE
WA2BPE 46,512- 299-144-ABD
K2GK 34,917- 233-113-ABCDE
WA2TPU 31,625- 253-125-A
WB2ELB 25,424- 209-112-ABC
WB2MKN 23,370- 205-114-A
KA2DQA 20,615- 200- 95-ABD
NA2A 3,636- 83- 36-BCD
W2WGL 2,484- 88- 28-B
KU2A 2,358- 48- 38-ABCD
WB2SZY 2,214- 82- 27-B
WB2IEY 2,208- 46- 24-C
N2BKS 2,001- 69- 29-B
KA2VYW 672- 42- 16-B
NR2E 408- 29- 14-B
W2DRZ (+KA2GOJ,N3EYD,KA3LRR)
179,031- 719-249-ABCD
AF2K (+K2SPO,KA2HSK,KG2F,KS2Z,N2sTW, WK,NQ2O,WA2LAQ)
151,656- 593-213-ABCDEFL
WB2RRK (+N2HR,NE2W,NN2K,WA2YFB)
29,150- 244-110-ABCD
KC2MI* (+N2CZL,KA2HYY,NM2P)
8,526- 154- 49-ABD
W2RCX (KW2T,WA2YTM,WB3JSU,NA2O,oprs)
2,790- 41- 31-CD9GI

3

Delaware
AC3T (KA3B,opr)
88,637- 502-151-**ABCD**
KA3KHZ 3,744- 144- 26-B
K3SXA 2,184- 55- 26-BCD
KA3IJO 2,112- 96- 22-B

Eastern Pennsylvania
WA2OMY 122,244- 507-183-ABCDE
N3EAX 38,808- 287-127-ABD
K3ACR 27,270- 260-101-ABC
K3IWK 19,035- 225- 81-ABD
W3CL 14,170- 170- 65-ABCD
WB3IGR 10,595- 122- 65-ABCD
KQ3D 8,120- 180- 34-B
K3KEL 4,284- 104- 41-AB
W3CWG 1,624- 56- 29-B
WA2IUU/3 180- 18- 10-B
K3YTL (K3s MKZ,IK,KA3EEO,KB3QI,N3CXB, WA3s JWP,YON,WB3s FAA,FKQ,CAI,oprs)
609,637-1348-329-ABCD9EFIJ
K2AA (W2EA,N2FY,WA2ABF,WA2VYA,N2DYC, KA2MSM,KA2QMP,oprs)
147,966- 731-182-ABCD
W3HZU (K3GDI,KA3s NAM,NUB,OBW,KB3YS, W3s FLD,SST,VQJ,WB3AWJ,oprs)
28,112- 225-102-ABD
K3NYX (+W3TI,K3BS,WA3JQJ,N3ECZ)
4,884- 148- 33-B

Maryland-DC
KB3QM 151,495- 609-205-ABCDE
W3WFM 85,500- 425-171-ABDE
W3IP 77,308- 383-154-ABCDE
K3ZO 72,520- 490-148-AB
K3NXH 48,556- 384-113-ABD
WB3LJK 44,310- 308-105-ABCDE
W3XO 41,762- 292-133-ABCD
K1RZ 24,704- 348- 64-BE
K3AKR 24,200- 203-100-ABCD
WA3UJE 22,542- 245- 78-ABCD
W3IFM 16,471- 181- 91-A
W3OTC 6,283- 103- 61-A
K3TC 5,790- 193- 30-B
W3MR 3,240- 135- 24-B
KB3HH 2,300- 73- 25-BD
KA3NTX 2,037- 97- 21-B
W3GN 1,824- 65- 24-ABD
W3MSN 325- 25- 13-AB
KA3CXG 44- 11- 4-B
W3EAX (KA1GD,KC3WD,N3AKO,NA3J,oprs)
38,552- 308-103-ABCD
K3IVO (W1DGA,K3YDX,N3s CBJ,DCI,W3IP, WA3TID,WB3ICL,WP4J,NP8Q,oprs)
16,985- 200- 79-ABD
W3PGA (W3JDF,W3VRD,WA3LAW,K3PHH, WA3HZJ,KB3EL,WA3VIF,oprs)
5,130- 114- 45-AB

Western Pennsylvania
WA3DJG 47,328- 280-138-ABCDE
W3HDH 8,610- 115- 74-AB
KA3KZF 1,664- 64- 26-B
W3KWH (+W3s ANX,HH,SVJ,SYT,WA3s FYJ,TTS,WB3EML,K3QFU,KT3L,N3EQP)
194,340- 598-246-ABCDE

4

Alabama
WB4GFO 24,795- 233- 95-ABD
KA4VEY 15,525- 207- 75-A
W4CNQ 1,485- 54- 27-ABD
WA4VUG 55- 11- 5-B
AA4LE (+KB4PTA,WA4ZOF)
32,232- 293-102-ABD
WA4AUX/4 (+WB4NIX)
8,967- 147- 61-AB

Georgia
N4JK 52,890- 392-129-ABC
K4CKS 41,595- 257-141-ABCD
WB4SLM 38,500- 335-110-ABCD
WS4F 36,424- 275-116-ABCDE
KX4R 4,935- 105- 47-AB
W4ISS 2,560- 56- 32-BD
WB4RUA 330- 15- 11-D
WA4NJP (+WA4IZI,KJ4s EV,LY, WB4s GQX,OSD,KB4s ODC,OBG,RWK, KI4PD,N4s FCL,BYX)
122,584- 560-199-ABCDE

Kentucky
AA4FQ 29,869- 251-119-**AB**
WB4NXY 28,956- 184-127-ABDEF
WA4QQV 3,096- 86- 36-B
KB4GEJ 840- 35- 24-B

North Carolina
WB4NMA 38,100- 340-115-A
K4MSK 16,491- 239- 69-B
N2CJP 15,834- 169- 91-ABD
K54S 9,086- 118- 77-A
WD4ODS 3,795- 69- 55-A
KA4RVS 1,104- 46- 24-B
KJ4HF 720- 38- 18-BD
WA4CAK 255- 17- 15-A
W4SFB (AA4ZZ,K4s JQU,PDY, WA4UMZ,WB2HNQ,WB4s PCS,QCS,TLX, WD4ABZ,oprs)
74,163- 375-117-ABCD

Northern Florida
W5HUQ 59,724- 368-158-ABD
W4ODW 43,758- 318-117-**ABCDE**
W4WHK 22,908- 249- 92-A
AA4FL 17,739- 219- 81-A
W4HJW 13,132- 196- 67-A
WA4JNE 12,165- 158- 77-AB
KL7JGI 6,300- 95- 45-ABDE
KI4CI 3,822- 70- 42-BD
AA4JI 105- 15- 7-B

South Carolina
WQ4V 47,422- 313-131-ABCDE
W3EP/4 28,680- 239-120-AB
PE1AHX/W4
12,540- 209- 60-B
W2CUK 5,800- 100- 58-A
WD4JQV 5,014- 79- 46-ABDE
WB4NNY 4,602- 73- 59-ABD
K4ADI 4,578- 109- 42-AB
WA5DJJ 2,046- 66- 31-AB
N4LTA 1,891- 61- 31-A
WQ4V 1,350- 50- 27-B
WB4TBF 920- 46- 20-B
NB4S 432- 18- 12-D
WA4LDU 187- 17- 11-D

Southern Florida
WD4MGB 32,736- 341- 96-AB
W4OO 24,138- 298- 81-A
K4DZP 21,182- 224- 89-ABD
K1FJM/4 10,792- 142- 76-AB
WD4AHZ 1,334- 43- 23-BD
W1WLE/4 975- 39- 25-AB
KB4GBS 300- 25- 12-B
N4EJW (+N4EJV)
58,320- 426-128-ABD

Tennessee
N4VC 28,224- 238-112-ABCD
WB4CTW 20,303- 219- 79-ABCD
N4MW 16,016- 160- 88-ABDF
WA4QYK 15,744- 177- 82-ABCDE
WA4GBE 15,386- 171- 78-ABD
KF4FL 9,152- 143- 64-AB
K4RWP 6,195- 98- 59-ABD
KI4JU 5,520- 120- 46-A
WA4TZG 4,214- 95- 43-ABD
N5AYD 2,052- 76- 27-B
W4HHK 1,300- 44- 26-ABF
AD4F 684- 36- 19-A

Virginia
W3IY/4 145,754- 543-203-ABCDE
K4LHB 43,625- 285-125-ABCD
N4MM 38,052- 302-126-AB
WD4GXN 28,080- 240-117-AB
KA2JMM/4 27,768- 253-104-ABD
WA4HHG 15,972- 193- 66-BD
W4DO 14,553- 181- 77-ABD
AA4KP 14,160- 295- 48-B
K4QIF 12,880- 148- 58-BDE
K4FTO 12,670- 170- 70-ABD
KB4OLM (FM07)
8,736- 156- 56-AB
WA4SBC 5,977- 97- 43-ABCD
W4LMJ 2,208- 69- 32-AB
K3ZJ 2,014- 106- 19-B
KB4EUZ 1,925- 66- 25-BD
NQ4K 1,450- 50- 29-A
N4MQX 1,008- 63- 16-B
WA4MMP 703- 31- 19-ABD
WY4D 234- 18- 13-B
KB4OLM (FM08)
204- 17- 12-AB
AB4L (+KA4NZO,KB4XK,N4JED,W4AAH,WA4s IVF,KCO,PGI,WB4WTC,WB9AHM)
340,316- 940-298-ABCDEI
N4HS (+WB4BVY)
67,350- 399-150-ABD
WA2VPH (+KF4KI)
4,292- 116- 37-AB

West Indies
WP4G 5,656- 101- 56-A
KP4EKG 4,747- 93- 47-ABD

5

Arkansas
K5UR 113,022- 482-207-**ABCD**
WB5JAR 37,680- 297-120-ABD
K5YY 11,375- 137- 65-BD
N5DL (+WD5s CAN,CAP,WA5OOE,N5DZQ, KA5NNT,K5LG)
118,320- 533-204-ABCDE
N4FAC/5 (+WB4LHD,KB4s GGD,GGE,KA5YAI)
59,760- 399-160-ABCDE

Louisiana
WA5UFH 20,240- 160-110-ABD
N5HWJ 15,095- 193- 74-ABD
N5HYV 5,994- 101- 54-ABD
W5FYZ 2,842- 98- 29-B
NW5K 275- 25- 11-B
WB5TPW (+KF5BF)
2,320- 80- 29-B

Mississippi
W5RCI 28,180- 200-110-**ABCDEF**
WJ5P 6,708- 129- 52-A

New Mexico
W5FF 39,593- 281-137-**ABD**
KI3L/5 19,900- 199-100-AB
W5IXR 11,325- 141- 75-ABCD
KB5GY 9,144- 127- 72-A
N5BFM 5,356- 101- 52-ABC
K5MAT 2,013- 50- 33-ABCD
W5RKS 252- 17- 12-ABD
KA5EBL (+W8RJM)
11,060- 135- 79-ABD
NG4C (+KD5HP,N5JHV)
2,312- 63- 34-ABD

Northern Texas
KE5EP 94,656- 385-176-**ABCDE**
NW5E 58,356- 375-154-ABC
WA5VJB 32,079- 199-111-ABCD9**EFGIJL**
WA5TKU 21,338- 171- 94-ABCDE
KB7IJ/5 11,011- 143- 77-A
WI5O 2,485- 48- 35-BDE
AA5C 1,972- 58- 34-A
K5EI 1,560- 64- 20-BD
K7CW (DM82) 900- 26- 25-ABDE
WA5ZKO 168- 21- 8-B
K7CW (DM91) 21- 4- 3-BDE
WB5RFH 18- 3- 2-B
K7CW (DM81) 18- 3- 3-BDE
K9MK/5 18- 3- 2-B
K7CW (DM92) 18- 3- 3-BDE
K7CW (DM83) 8- 2- 2-BE
K7CW (DM93) 8- 2- 2-BE

Oklahoma
K5SW 34,056- 215-132-**ABCD**
W5NZS 23,205- 170-105-ABCDEF
K5WE 4,698- 73- 58-ABD
AB5T 3,478- 80- 37-BD
KA5PUB 2,025- 75- 27-B
KA5ZKF 1,725- 69- 25-B
KB5OB 396- 33- 12-B
K5CM (+N5KW,N5CG,KF5KR)
294,640- 891-290-ABCDEI
K5JL (+W8RRY,WD5AGO,WB5DSH,K5CBL, N5DDB,WA5s ETV,WCP)
240,948- 698-291-ABCDEFHIL

Southern Texas
N5HHS 28,448- 232-112-**ABD**
W5QZI 21,658- 221- 98-A
W5SXD 6,720- 103- 60-ABD
WA5IYX 3,735- 85- 45-A
WB5RUS (+K5LZO,KE5IV,N5IUF)
17,472- 182- 96-AB
W5UWB (+WA5TBE)
14,028- 157- 84-ABD

6

East Bay
WA6LHD 4,454- 117- 34-**BC**
KN6S 2,619- 97- 27-AB
WE6G 88- 22- 4-B
NR6E/6 (CM88)
21- 3- 3-CD9
NR6E/6 (CM87)
10- 2- 2-D9
NR6E/6 (CM97)
10- 2- 2-D9
N6AMG (+N6IG,KA6OLK,N6s FJE,ICW,FRI,NE)
100,806- 852-106-ABCD9EI

Los Angeles
W6CPL 33,594- 326- 68-ABCDE
WB6FCS 9,275- 208- 35-ABD
KB6XG 8,264- 150- 38-ABCDE
W6PFE 4,576- 137- 28-ABCD
N6HEK 3,382- 135- 19-BCD
N6KN 2,980- 105- 20-BD
N6NJI 1,786- 69- 19-ABD
WI6I 732- 61- 12-A
W6TRW (K6AWO,KB6LSE,N6CIZ,WA2KDL, WA6RAY,oprs)
48,256- 551- 64-ABCD
KF6NX (+N6MUK,W6HDO)
2,048- 73- 22-BD

Orange
K6CH 20,100- 228- 60-ABDE
WD8AUP 15,800- 316- 50-ABDE
K6PVS 15,087- 166- 63-ABCDE
KA6PYA 8,534- 195- 34-ABD
K6IBY 5,848- 117- 34-ABCD
NN6W 4,914- 145- 25-BEF
K6PFW 4,321- 119- 29-ABCD
WB9AJZ/6 4,080- 136- 24-BD
K6UIY 1,782- 81- 22-AB
K6PHE 1,280- 80- 16-AB
N6FSL 1,040- 65- 16-AB
KA6VVD 189- 21- 9-B

Pacific
KH6HME 105- 21- 5-B

Santa Barbara
WD6BCN 2,552- 79- 26-ABD
K6SV 1,849- 74- 17-BD
N6KV/6 (+AJ6F,W6YLZ,WA6TMJ,K6LMN, WB6QPO,N6DBS,K6KSY,W6OXX,N4EPY, W6OSM,N6MUL,WA6AJX,KA6WVO)
145,680- 798-120-ABCDE
WA6IJZ (+WA6FPX)
12,816- 209- 48-ABCDEI

Santa Clara Valley
W6RXQ 16,218- 213- 51-ABCDEFI
K6KLY 13,728- 223- 44-ABCDE
K6HCP 13,393- 157- 59-ABCDE
KA6ING 2,826- 134- 18-ABD
KK6C 1,248- 78- 16-B
K6UQH 1,144- 33- 11-EFI
WB6STU 732- 61- 12-BD
KG6AO 360- 45- 8-B
KI6CG (W6QHS,KA6HSM,KA6IRT,WA6AZP, NU6S,oprs)
88,900- 524-127-ABCDE
KU6U (+KG6MW,W6YLL)
17,832- 205- 58-ABCDE

San Diego
WA6BNH 14,445- 208- 45-ABCDE
KS6A 3,300- 112- 25-BD
WA6BDC/6 3,256- 83- 35-ABD
W6OYJ 2,740- 107- 20-BCDI
KB6QC 2,329- 137- 17-AB
K1CT/6 931- 42- 19-ABC
N3EEG 136- 12- 8-BCD
N6CW (+K1LL,N6ND,WB9LDD)
69,181- 525- 97-ABCDE
W6XJ (+K6JYO,KD6R,WB6OKK)
56,112- 396-112-ABCDE
WB6DTA (+K6DYD)
8,908- 112- 66-ABCDE
WB6AXW (+WA6AXO)
2,247- 107- 20-AB

San Francisco
N6GLI 4,368- 115- 24-ABCDEF
WA6LLY 952- 48- 17-ABD

San Joaquin Valley
WB4AYE/6 8,901- 159- 43-ABCD
NA6J 286- 22- 13-AB
KA6AMD 119- 17- 7-B
W6YKM (WB6YIY,W6KZN,W6UZR,N7EIJ, KE8NS,KF6GY,oprs)
49,725- 429- 85-ABCDE
K6BPC (KA6ZVP,N6MI,WA6HXD,WB6YVP,oprs)
26,386- 252- 79-ABCDE
WB6WLE (+N6FF,WB6PGN)
8,619- 138- 51-ABCDE

Sacramento Valley
KI6O 2,214- 73- 27-ABD
WA6OSX 1,440- 80- 18-A
NR6E/6 (CN98)
1,386- 40- 21-BCD9E
WF6J 1,232- 77- 16-B
NR6E/6 (CN81)
160- 11- 10-BCDE
NR6E/6 (CM98)
55- 5- 5-CD9
NR6E/6 (CM89)
40- 4- 4-CD9E
NR6E/6 (CN86)
21- 3- 3-DE
NR6E/6 (CM99)
12- 2- 2-9E
WA6KOD (+N6DPP,KB6JPZ,N6MYH)
3,864- 101- 28-ABCD

7

Arizona
K2DNR 9,128- 121- 56-ABDEI
WA7KLK 1,107- 41- 27-A
W7ZMD 688- 43- 16-AB
WB7OHF 627- 33- 19-A
WA7BBM (KC0W,opr)
200- 19- 8-BDE
WB5FFA 55- 11- 5-B
WA7JTM (+WA7s LYI,CJO,ZWO,ULD,W7CI, W7OX,K7PRS,K6LZL,K7OO)
85,575- 461-163-ABDE

Idaho
WA0DYU 16,107- 177- 91-A
W7CVJ 11,826- 144- 81-ABC
KD7IY 8,976- 133- 66-ABD

Montana
W7HAH 24,080- 212-112-ABD
KZ7N 230- 23- 20-A
WA7PDC 58- 8- 7-B

Nevada
K7ICW 14,525- 147- 83-ABD
WA4GPM 9,178- 137- 67-AB
W7LQV 2,905- 75- 35-ABD
W7KYT 2,240- 58- 32-ABD
WA0YPL/7 1,014- 39- 26-AB
N7ALX/7 (+WA7JUO)
6,076- 91- 62-ABD

Oregon
AE3T 8,200- 178- 40-BD
N7BLS 3,780- 90- 42-AB
K7HSJ 3,108- 102- 21-ABCDE
WA7TDU 2,784- 84- 29-ABCDE
W7UDM 1,786- 74- 19-ABCD
WA3RMX 1,400- 51- 14-ABCDEFGHIJ
WB7UNU 1,328- 49- 18-ABCDEFGHIJ
NR6E/7 (CN82)
1,159- 47- 19-ABCDE
K6VIZ 350- 26- 10-BD
W7VOK 344- 35- 8-ABCD
NR7U 104- 26- 4-B
KI7N 84- 21- 4-B
N7DB/7 (+WA7ECY)
90- 15- 6-AB

Utah
KC7UB 21,504- 224- 96-A
W4WD 4,756- 76- 58-ABD
WA7TUX 506- 23- 22-A
KE7NS 264- 22- 12-B

Washington
WB7UUP 6,766- 152- 34-ABCDEF
W7FI 5,069- 138- 37-AB
KE7HR 3,204- 145- 18-BC
WA7VHW 1,380- 46- 30-AB
W7IDZ 945- 34- 27-ABD
KA7YQU* 602- 86- 7-B
KT7G 342- 38- 9-AB
W7YOZ/7 80- 5- 5-EF
K7ND (+NF7X)
28,336- 285- 77-ABCDEF
KA7ICT (+N7COU)
1,479- 87- 17-ABCDE
W7WKR (+KA7VVH,NN7N)
1,044- 87- 13-AB
N7CWU (+K7NTW)
490- 49- 10-AB

Wyoming
W0ETT/7 59,823- 386-153-ABD
KA7DHE 27,392- 240-107-ABDE
KT7V 12,384- 144- 86-A
WA7KYM (+W0KJY)
65,565- 386-155-ABCDE

8

Michigan
KB8JI 25,560- 199-120-ABCD
N8DEJ 21,507- 201-107-AB
NQ8A 14,904- 162- 92-A
K8NWD 9,855- 219- 45-B
WA8WOQ 8,775- 128- 65-ABD
WA8MIL 8,624- 131- 56-BD
K8NTK 4,251- 109- 39-B
KV8J 3,914- 103- 38-B
N8BWG 3,880- 97- 40-AB
WB8CPW 2,728- 88- 31-B
W8QOI 2,464- 56- 44-A
WB8AAX 2,294- 74- 31-B
N8CGY 1,320- 55- 24-B
KD8YL 1,053- 39- 27-A
W8VPD 1,050- 50- 21-B
K8CV 448- 32- 14-B
WB8BKC (+NE8I,WB8TGY)
174,000- 609-232-ABCDE
N8CKH (+WB8KAY)
142,065- 606-205-ABCD

Ohio
W8ULC 43,920- 279-144-ABCD
WB8PAT 27,489- 181-119-ABCDE
WD8CTX 18,414- 181- 99-ABD
K8WW 18,031- 113- 73-ABCDE
KB8ZW 14,007- 149- 69-BCD
NI8O 11,628- 102- 51-DE
WA8TTE 10,336- 122- 76-ABD
N8CCC 8,239- 104- 77-ABD
K8TGC 4,408- 76- 58-A
KA8QKY 840- 40- 21-B
K8LMN 480- 24- 20-B
WD8IFC 493- 26- 17-BD
WD8ISK (+WA3OJX,K4JBV,N8s BPB,ECH, WB8s GEX,IGY,LUA,ZCC,WA8s NJR,OGS, ONQ,W9VNE)
326,239- 894-311-ABCD9EGL
W8VP (K8s AL,IOX,KNL,YY,ZWF,KC3CL, N8s COX,FXL,GUV,GUW,W5UA,W8PR, WA8FHF,WB8s DQE,ERB,WB9YCZ,oprs)
307,835- 785-319-ABCDE
K3DMG (+K8FU)
14,931- 195- 63-BD

West Virginia
K3LNZ/8 (WA3EOQ,opr)
9,936- 182- 54-BCD
K8UC 9,280- 130- 58-BD
W8LSC 6,283- 80- 61-ABD
WB8DRR 5,852- 133- 44-B
N8HGW 4,320- 120- 36-B
KA8UIE 2,077- 67- 31-B
W3CCX/8 (N2SB,K2EVW,WB2s NPE,RVX, AK3O,N3s ACG,CX,WA3s AXV,JUF,NUF,YUE, WB3s JYO,KOZ,KA8VTN)
415,200-1022-300-ABCD9EFI
N8DKL (+N8BZS,N8FWL,KC8OQ,KC8IT, WB8CNN)
75,818- 417-162-ABCD

9

Illinois
WB9MSV 74,725- 352-175-ABCD
WD9IIX 60,520- 382-136-ABDE
WB9WMM 47,142- 271-162-ABD
WA8FTA/9 33,655- 240-127-ABD
KA9LDS 16,740- 178- 93-ABD
KU9L 8,557- 193- 43-BC
NG9R 8,468- 116- 73-AB
KY9Y 8,400- 112- 75-AB
KA9ORY 6,720- 112- 60-AB
AF8Z 5,757- 101- 57-AB
N9EXU 5,576- 136- 41-B
WB9QBU 5,371- 101- 41-BD
W9JGV 4,680- 120- 39-B
N9AQ 4,674- 114- 41-B
K9MBX 4,620- 99- 35-BDE
WB9PDD 2,310- 66- 35-AB
KA9CAI 1,530- 85- 18-B
KA9QIK 1,464- 61- 24-BD
KR9G 768- 24- 16-D
K9BQL 752- 47- 16-B
N9EOM 144- 18- 8-B
WD9HAK 126- 7- 6-E
K9HMB (+K9s GL,NO,RS,PW,WB9TIY,KA9CJG, WB4YVO,AH2U)
394,689-1001-327-ABCD9EF
AA9D (+N9KC,N9BD,W9XA,K9RO,WB9SNR, WB9EEA,N9EDT,KA9s CKI,JYI,K9TLM)
263,913- 703-303-ABCDEFI
K9VV (+WB8FGP)
27,360- 228-114-ABD
KA9VAC (+KA4RGW,KA9s FJZ,VAB,KD9KU, G4UTB/W9)
5,904- 184- 36-B

Indiana
KA8MRI/9 69,237- 413-157-ABCD
NE9O 17,300- 173-100-A
K9DZS 15,600- 147-100-ABD
AF9Y 13,860- 220- 63-B
KA9DZM 11,571- 133- 87-A
AG9S 8,424- 108- 78-A
WB8YFE 4,788- 76- 63-A
K9WZB 3,584- 64- 28-D
W9MBL 2,120- 53- 40-A
AF9L 1,696- 53- 32-A
KA9IVT 504- 28- 18-A
KA9HPK 288- 12- 12-C
NA9N 261- 29- 9-B
K9UNM 221- 17- 13-B
W9YB (KA9CCR,KC9RG,oprs)
10,956- 164- 66-ABC

Wisconsin
K9VGE 63,240- 372-155-ABD
WA9LZM 18,924- 181-104-AB
W9UB 17,204- 187- 92-AB
WA9KVS 15,030- 167- 90-AB
NK9O 9,920- 124- 80-AB
WA9HCZ 9,477- 113- 81-ABD
W9NAW 7,081- 97- 73-A
N9DWL 6,076- 98- 62-A
K9RRS 4,851- 90- 49-ABD
N9TD 3,648- 79- 38-BD
K1TMM 2,928- 61- 48-A
W9YCV 2,752- 79- 32-BD
WA9OKB 1,166- 53- 22-AB
W8UC/9 (+K8GJX,N8AKC)
110,220- 466-220-ABCDE

0

Colorado
KA0NNO 88,023- 481-183-A
W0OZL 66,340- 408-155-ABDE
KD0GS 59,645- 373-151-ABDE
WA8EQX 25,440- 240-106-AB
W0RTZ 23,532- 212-111-AB
W9MHL 7,345- 113- 65-AB
KD8SU 5,760- 96- 60-A
W8JF 1,551- 45- 33-ABD
N0EOQ 858- 39- 22-B
AA2L 376- 31- 8-BD
W0KEA (+N0BRI,K0CL,N8DVL)
101,568- 531-184-ABD
KB8JB (+WB8GCC,KD8S,KD0N,WA7WDJ, KA7TYU,KA0WAU,KB6QI,WD0HNP,W0LJF, KI8B,WB8WSI)
41,184- 352-117-A
NK0P (+N0CMW)
23,040- 204- 96-ABCDE
N8CG (+N8GEL,WB8ZCV)
1,207- 71- 17-B

Iowa
K9CO 53,070- 264-174-ABDE
KA8CSI 39,396- 268-147-A
WB0TEM 35,167- 216-139-ABCDE
WD0FOY 33,086- 233-142-AB
WB0USU 19,788- 176-102-ABD
WA0DCB 9,820- 122- 74-ABCD
W0RAP 4,200- 55- 35-DE
KA0FTO 2,070- 69- 30-B
KA0TLJ 1,898- 73- 26-B
K0IQA 946- 43- 22-B
W9UD (+AE9M,K9AKS,K9CHZ,WB9OPI, WD9FSA,AK0P)
282,112- 784-304-ABCDE
WB0ZKG (+WB0VYV,KE0BX)
101,850- 446-214-ABD
KA9MGR/0 (+KA0RIU,KS9Q)
12,276- 130- 93-ABC
KA0GOA (+NE0P)
320- 32- 10-B
W0IO (KA0UBF,N8FGV,oprs)
36- 9- 4-B

Kansas
N0LL 102,060- 462-210-ABD
N0FUJ 5,152- 99- 46-BD
WA0CFQ 4,784- 92- 52-AB
W0RT 2,079- 51- 33-ABD
KC0ZR 1,755- 65- 27-B
K0VUA 924- 33- 21-BD
WB0DRL (+KX0O,NO0V,WA0TKJ, WB0PJB)
328,520- 820-344-ABCDEF
KF0M (+KB0DW)
9,072- 106- 63-ABCD
N0FBS (+WA0PWE,KA0WNC)
3,450- 75- 46-AB

Minnesota
W0XG 46,110- 310-145-ABCD
NO0T 9,471- 123- 77-AB
AF0T 5,723- 97- 59-A
KC0P (+W0s OHU,VB,WA0ULE,KA0UZZ)
86,366- 382-199-ABCDE

Missouri
WA0NOK 84,224- 410-188-ABCD
W0VD 33,153- 225-129-ABD
NJ0X 25,868- 214-118-ABCD
W0URP 24,035- 202-115-ABD
N0GRS 19,656- 182-108-AB
WD0FLJ 4,680- 74- 45-BDE
KA0GGI 3,078- 81- 38-B
K0GOB 1,008- 37- 21-BCD
WB9SKE 527- 31- 17-B
AK0M 425- 25- 17-AB
KM0A (+W0FY)
37,050- 252-130-ABCD

Nebraska
KA0JGH 26,565- 231-115-A
KC0QR 17,568- 139- 96-ABCDE
WD0BCM 11,696- 125- 86-ABCD
KA0CRI 8,540- 122- 70-A
W0KAV 143- 13- 11-A

South Dakota
WB0ULX 524- 26- 24-A

VE

Maritime-Newfoundland
KA1ICR/VE1
3,498- 106- 33-A

Quebec
VE2TH 6,300- 100- 63-A
VE2YB 3,102- 66- 47-AB
VE2DUB (FN45)
1,782- 54- 33-AB
VE2DUB (FN35)
432- 24- 18-AB
VE2XL 280- 28- 10-B
VE2ASL/2 160- 14- 10-BD
VE3PFN (VE3IMT,VE3PAE,VE2DWG, PA0KKZ/VE2,oprs)
736- 26- 23-ABI

Ontario
VE3ASO 64,125- 313-171-ABCD9F
VE3FGU 34,648- 284-122-AB
VE3DDW 13,980- 219- 60-BD
VE2BTW/3 4,752- 91- 48-ABD
VE3AQG 2,730- 80- 34-B
VE3LQS 2,646- 63- 42-AB
VE3DVF 2,325- 61- 31-BD
VE3EB 713- 31- 23-A
VE3LNX (+VE3ADJ,VE3NSQ)
152,862- 561-219-ABCD9EF
VE3FHK (+VE3s FHU,NPB,OAF,OJN)
29,083- 221-127-ABD

Saskachewan
VE5LY 9,216- 127- 72-ABD

Alberta
VE6CX 2,120- 53- 40-A
VE6AFO 180- 12- 10-BD

British Columbia
VE7ASI 1,344- 58- 21-ABCD

DX

Europe
DL9KR 162- 9- 9-D

North America
VP2MO 6,328- 113- 56-A
OX3LX 176- 16- 11-A

South America
YV4UY 962- 37- 26-A

Checklogs:

KB8LQV,N2DX,KE5TZ,N5ILB,NE0M, WA3GYW,W8SII,KN8I,W5XW.

1985 Can-Am Contest Results

By Yuri Blanarovich, VE3BMV

The 1985 Can-Am contest was actually only half of the contest. For the first time in Can-Am's history, the phone portion was cancelled. Just a few hours before the contest, I received a phone call from VE3GRO. Harry reported having just received a call from a Californian amateur who suggested that the Can-Am phone weekend be cancelled because of the Mexico City earthquake. The bands were busy with emergency traffic, and activity generated by the contest might have interfered with the proceedings. VE3GRO and I quickly agreed that the contest should be cancelled.

Harry then phoned Dave Sumner, K1ZZ, who concurred with the decision. News of the cancellation was passed along to amateurs via W1AW bulletins. Contesters who were on the bands as contest time approached notified others of the cancellation. This left the bands free for emergency traffic to and from Mexico City.

Thanks to the many contesters who helped with the traffic handling and for understanding. The phone trophy this year should go to all who helped save lives and pass messages during the disaster.

For the aforementioned reason, we do not have this year's combined winners for phone and CW competition. CW winners can consider themselves overall winners.

The CW portion of the Can-Am proceeded as planned. There was still traffic handling going on, but mostly on phone. The CW portion of the bands were relatively quiet, and no interference problems were reported.

Propagation conditions were not very good. Even though, we recorded a modest increase in logs from the US over 1984's totals.

Overall winner from the USA is Jeff Bolda, WC4E, who won the American Trophy, sponsored by CRRL. Jeff managed to edge out KBØG's higher QSO total by working two more multipliers. N6OP finished third.

The overall Canadian champion, who also managed the highest score in the contest, was Doug Freestone, VE5UF, who made 579 contacts. Doug receives the Canadian Trophy, sponsored by ARRL.

The American Champion Trophy in the multioperator category, sponsored by the International Radiosport Assn, goes to the AI9X/AA5B team, who edged out WAØQIT and NN3SI.

Multioperator entries from Canada were led by the team of VE6CSE and VE6CSF. The trophy for this category was sponsored by the Albuquerque DX Assn.

We hope that publicity for Can-Am will improve with the help of CRRL and *QST*. *Radiosporting* magazine will also give the contest full coverage. Many participants like the incentive rules. Thus, we hope that Can-Am popularity will grow.

Certificates and trophies will go out shortly. The 1986 running of the Can-Am contest will be on the third weekend of September, with some minor changes (see Aug 1986 *QST*, p 84, for complete rules).

Scores

Scores are listed by place, call sign, multiplier area, category, final score, number of QSOs and multiplier. Single-operator categories: A—All Band, single band (number indicates the frequency band used) and Q—QRP. Multioperator stations are designated by the letter M. Certificate winners are marked with an asterisk.

CW

Americans

1	WC4E*	FL	A	163,380-539-140
2	KBØG*	KS	A	161,322-539-138
3	N6OP*	CA	A	152,684-533-133
4	K5NW*	TX	A	94,164-380-114
5	W5ASP*	TX	A	92,803-415-103
6	W6JTI	CA	A	71,894-323-103
7	NA9J*	IL	A	68,579-328- 97
8	N7CIX*	AZ	A	64,100-296-100
9	WA7EGA*	WA	A	63,360-307- 96
10	KN5H	TX	A	56,682-282- 94
11	W7FGT	AZ	A	49,640-269- 85
12	AI9X*	NM	M	45,936-239- 87
13	K9LJN	IL	A	44,979-239- 87
14	NØAQN	TX	A	30,879-192- 73
15	KF6A	CA	A	28,240-152- 80
16	W7TC*	OR	A	26,950-177- 70
17	WAØQIT*	MN	M	26,845-211- 59
18	K8MR*	OH	A	25,912-168- 79
19	WBØSYV*	NE	A	23,672-172- 64
20	N1CC*	CT	A	22,720-166- 84
21	W5PWG	TX	A	22,490-149- 65
22	W4WKQ	FL	A	22,445-147- 67
23	WØIZV*	CO	A	21,038-140- 67
24	NM7M*	WA	Q	19,278-143- 63
25	WB7APW*	AZ	Q	17,460-133- 60
26	WS4E	FL	A	16,005-139- 55
27	K2SX*	NY	7	14,400-147- 45
28	NØFMR	KS	A	13,098-102- 59
29	KW2J*	NY	A	11,376-110- 48
30	N7HJM*	ID	A	11,128-102- 52
31	N2CQ*	NJ	A	10,293-100- 47
32	K7FD*	OR	7	9,792-138- 34
33	NØFFZ	CO	A	9,450- 91- 45
34	KU7Y*	ID	7	9,310-125- 35
35	WA2LBT	NJ	A	9,200- 93- 46
36	W5NR	TX	A	9,000- 79- 50
37	K9ERM*	SD	A	8,820- 88- 45
38	K4BAM*	VA	A	7,144- 83- 38
39	KA7FEF	OR	A	7,056- 74- 42
40	W5EIJ*	AR	A	7,009- 70- 43
41	K6XO*	CA	Q	6,578- 76- 46
42	W9OA*	IL	Q	6,160- 70- 40
43	W4XD*	VA	Q	5,360- 59- 40
44	KD2HE	NY	A	4,964- 74- 34
45	AC8W*	MI	A	4,699- 60- 37
46	NØCLV*	KS	14	4,188- 81- 23
47	WDØGVY*	IA	A	3,999- 58- 31
48	K5DP*	OK	A	3,744- 50- 32
49	W2NRD	NY	A	3,016- 48- 29
50	WA8LKU	AZ	A	2,997- 48- 27
51	K6ZH	CA	Q	2,987- 42- 29
52	W1CNU	CT	A	2,916- 51- 27
53	W2JEK*	NJ	Q	2,652- 45- 26
54	N3CZB*	PA	A	1,640- 37- 20
55	KK7C*	UT	Q	1,600- 42- 20
56	W8EAO*	OH	Q	882- 28- 16
57	AA8EE*	CA	7	546- 20- 13
58	KB4KEM	VA	Q	407- 17- 11
59	KF4AV*	KY	14	264- 11- 11
60	NN3SI*	MD	M	105- 7- 7

Canadians

1	VE5UF*	SK	A	207,645-579-127
2	VE1ASJ*	NB	A	187,954-476-137
3	VE3KP*	ON	A	121,776-361-118
4	VE7QO*	BC	A	69,375-319- 75
5	VE3CWE*	ON	A	55,742-210- 94
6	VE3AXV	ON	A	37,133-190- 71
7	VO1OU*	NF	14	30,756-246- 44
8	VE6ADK*	AT	A	24,475-156- 55
9	VE3NBE	ON	A	18,126-112- 57
10	VE7DVV	BC	A	13,923- 95- 51
11	VE7SK*	BC	3.5	10,512-103- 36
12	VE6CSE*	AT	M	9,954- 82- 42
13	VE7AV*	BC	3.5	8,576- 96- 32
14	VE3OMU	ON	A	8,015- 81- 35
15	VE2RO*	PQ	A	6,545- 65- 35
16	VE4QST*	MB	M	3,750- 53- 25
17	VE6BND*	AT	14	2,600- 46- 20
18	VE3BMV*	ON	14	2,100- 29- 25
19	VE3NYT	ON	14	1,380- 32- 15
20	VE2AEJ/3*	ON	Q	700- 24- 10

RANDOM COMMENTS

I believe that it was a wise decision to cancel the phone portion of the contest due to the Mexico earthquake. Even the most avid contester understands that emergency communications must take priority over all other amateur activities (VE3AXV). Good contest! Very slow starting on 40 and 80 m, but busy later. Nice to work KBØG on 5 bands (VE3CWE). Suggest stations watch 160 m on the hour. If DX counted, I could have had a real big score, especially on 80 m (VE1ASJ). This was our first contest, and we had fun. All stations were worked with 50 W output and a vertical antenna (VE6CSE). Conditions were poor, but I still had fun! (VE7AV). DC is a state-level jurisdiction, and should be counted as a separate multiplier. Good contest! (W4KM, opr NN3SI). This was my first Can-Am and I had a ball. You can be sure I'll be back next year (NØFMR). Conditions weren't very good, but, as usual, I had fun. Lots of VEs this year (KF6A). Where were the big guns on 15 meters? Heard nothing but noise and DX stations. Everyone seemed to take the time to dig out the QRP stations (WB7APW). Thanks for a good contest. Nice to hear lots of activity. I didn't have as much time to participate as I would have liked, but had fun "dabbling." I'll look forward to next year's event (N7HJM). I think output power should be indicated in the results, as in Sweepstakes (W6JTI). The contest was better than last time, but still need many more participants to get back to real good parties. There are only a few very active VEs on CW (W5NR). As usual, a great contest (W7TC). It was fun knowing I wasn't 500 QSOs behind N6LL! (WC4E). Activity seemed down from '84. Interest will cease unless results are made available to contestants (W5ASP). The CD Party people are looking for a new substitute. You might want to try stirring them up, perhaps with the League's support. Good contest format, but I'd like to drop the RST. The QSO number is a real test (N6OP). It was rough going with only 100 W and a vertical. Missed many multipliers (KY5N). Nice contest! Some stations have very broad signals, but most operators very A1! Had 6 inches of snow at our QTH over the contest weekend. That's the most snow ever for this date (WBØSYV). Propagation was marginal much of the time and participation was light. We couldn't operate during the day, so we weren't able to benefit from 20-m openings (KK7C). Poor conditions, with 10 and 15 dead and static on 80 and 160 (W4WKQ). My best score yet. Too bad about the SSB portion being cancelled. I'm planning to have a beam next year (NØCLV).

Multioperator Station Operators

AI9X (+ AA5B); WAØQIT (NØEOB, opr); NN3SI (W4KM, opr); VE6CSE (+ VE6CSF); VE4QST (VE4MG, opr).

Strays

***QST* congratulates...**

☐ Atlantic Division Director Hugh Turnbull, W3ABC, on receiving the Grand Ole Man Award at the New York State/Atlantic Division Convention.

☐ Mike Wendland, K8ZRH, of Rochester Hills, Michigan, on winning a Detroit Emmy Award for news reporting for WDIV-TV.

☐ Andrew Jackson Stockton IX, N5FUS, of Miami, Florida, on being accepted into the *Who's Who Among American High School Students*.

Rules, Tenth ARRL International EME Competition

Last year's EME contest showed the outstanding popularity of that communications mode. The fall weekends proved very successful, so we will continue to hold these contests, when possible, during the fall. This year's contests will be held the weekends of Oct 25-26 and Nov 22-23.

Special thanks to WA1JXN, W5UN and K2UYH for help in picking the dates for this year's contest. Forms are available for an SASE to ARRL HQ.

Rules

1) **Object:** Two-way communications via the earth-moon-earth path on any authorized amateur frequency above 50 MHz.

2) **Contest Period:** Two full weekends, Oct 25-26 and Nov 22-23; full 48-hour period UTC each weekend.

3) **Categories:**

A) Single Operator: One person performs all operating and logging functions, equipment adjustment and antenna alignment.

(1) *Multiband.*

(2) *Single-band:* Single-band entries on 50, 144, 220, 432, 902 and 1296-and-up categories will be recognized in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also, see Rule 8, Awards.

B) Multioperator: Two or more persons participate; includes neighboring amateurs within one call area, but with EME facilities for different bands on different team members' premises, as long as no two are more than 50 km (30 miles) apart. Multioperator neighborhood groups cannot use the same call signs at each location; all calls will be listed in the results.

C) Commercial equipment: Stations using equipment that is not amateur (such as a dish antenna for lab equipment owned by an institution or government agency) will have their scores listed separately.

4) **Exchange:** For a valid contact to occur, each station must send and receive both call signs and a signal report in any mutually understood format, plus a complete acknowledgment of the calls and report. Partial or incomplete QSOs should be indicated in your log, but not counted for contest credit. Stations may be worked once per band for credit.

5) **Scoring:**

A) QSO Points: Count 100 points for each complete EME contact.

B) Multiplier: Each US and Canadian call area, plus each DXCC country (not US/Canada) worked via EME on each band.

C) Final Score: Multiply QSO points by sum of multipliers worked on each band for your final score.

6) **Miscellaneous:**

A) Fixed or portable operation is permitted. Stations operating outside traditional call areas *must* indicate so, identifying the call area of the operating site.

B) Contacts may be on CW or SSB. Only one signal per band is permitted.

C) A transmitter, receiver or antenna used to contact one or more stations under one call sign may not be used subsequently under any other call sign during the contest, except for family stations where more than one call has been issued, and then only if the second call sign is used by a different operator.

D) There is no specified minimum terrestrial distance for contacts, but all communications must be copied over the moonbounce path, regardless of how strong (or weak) a nearby station's terrestrial signal may be.

7) **Reporting:** Entries must be postmarked no later than 30 days after the contest and must include complete log data. Your summary sheet should show a band-by-band breakdown of QSOs and multipliers, and include details of your station setup and a photo.

8) **Awards:** Certificates will be issued to the top five stations worldwide in each of the entry categories: single operator, multiband; single operator, single band (separate awards for each band); and multioperator. Additional awards will be issued where significant achievement or competition is evidenced. In addition, each station that successfully completes at least one EME contact during the contest period will receive a certificate commemorating that achievement.

9) **Disqualification:** See January 1986 *QST*, page 94.

Happenings

(continued from page 69)

SPECTRUM ALLOCATED FOR MOBILE, CELLULAR RADIO AND MOBILE SATELLITE SERVICES

In an interrelated set of decisions, the Commission allocated spectrum for the mobile, cellular radio and mobile satellite services. Specifically, the actions are as follows:

- Authorized 10 MHz additional spectrum for Private Land Mobile use by making available the 896-901 and 935-940 MHz bands to accommodate entities other than safety;
- Allocated 2 MHz—901-902 and 940-941—for a General Purpose Mobile Radio Service accessible to all mobile users;
- Allocated an additional 10 MHz of spectrum for use by cellular radio systems: the 824.0-825, 845-846.5, 869-870 and 890-891.5 MHz bands for nonwireline carriers and the 846.5-849 and 891.5-894 MHz bands for wireline carriers, giving each type of carrier a total of 25 MHz.
- Allocated 27 MHz in the L-band—1545-1559 and 1646.5-1660.5 MHz—of the Aeronautical Mobile-Satellite Service to the Mobile Satellite Service, and 6 MHz in the UHF band—821-824 and 866-869 MHz—to Private Land Mobile for public safety entities.

In authorizing additional spectrum for Private Land Mobile Radio Services other than public safety, the Commission noted that the 10 MHz in the 896-901/935-940 MHz bands would be divided among three pools as follows: 5 MHz for Specialized Mobile Radio (SMR) systems, 2.5 MHz for Industrial and Land Transportation Radio Services and 2.5 MHz for the Business Radio Service. Interpool sharing among the three will start 36 months after the first radio system license is granted in this band. The FCC also adopted a 12.5-kHz channeling plan for the 896-901 and 935-940 bands.

PULSE EMISSION IN THE 902-MHz BAND

Headquarters has received several inquiries about the removal of pulse emission (PØN) from the 902-928 MHz band. It seems that pulse was originally allowed in the 902 MHz band, but seemed to be taken away when the FCC issued its Microwave Access Docket, PR 85-23, last February. In this docket, the Commission stated "PØN emissions may be used on all amateur frequencies above 2300 MHz," and made no mention of the 902-MHz band.

After discussions with its staff, the Commission has now indicated that it will shortly issue an editorial revision, again allowing pulse emission in the 902-MHz band.

KNOCHENHAUER NAMED VICE DIRECTOR

James Knochenhauer, K6ITL, was recently named Vice Director of the Pacific Division. He replaces Kip Edwards, W6SZN, who resigned recently.

BETTER TIMES

FCC, which is currently operating an annual budget of $90 million, tentatively has decided to request $104 million for fiscal 1988. Its request for $96.4 million for fiscal 1987 is still pending in Congress. Contending that FCC essentially has eliminated its current deficit, Chairman Mark Fowler has directed that freeze on promotions be lifted July 20.

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

SEPTEMBER

3

West Coast Qualifying Run, 10-35 WPM, at 0400Z Sep 4 (9 PM PDT Sep 3). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award/endorsement.

6-7

160-Meter Bulletin SSB Contest, from 0000Z Sep 6 until 2400 Sep 7. Single operator and multioperator classes. Exchange signal report and QTH. Count 10 points per QSO and multiply by the total states, VE provinces, countries and continents worked. Awards. Send logs before Oct 31 to R. Koziomkowski, KA1SR, 5 Watson Dr, Portsmouth, RI 02871.

7

LZ-DX Contest, Aug *QST*, p 83.

12

W1AW Qualifying Run, 10-35 WPM, at 0200Z Sep 13 (10 PM EDT Sep 12). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Sep 3 listing for more details.

13-14

ARRL September VHF QSO Party, Aug *QST*, p 82.

European DX Contest, phone, Jul *QST*, p 87.

Puglia Contest, sponsored by the Associazione Radioamatori Italiani, from 1300Z Sep 13 until 2200Z Sep 14. Work Italian stations. Classes: single operator mixed mode (including RTTY); single operator SSB; single operator CW; SWL mixed mode. Bands: 1.8, 3.5, 7, 14, 21, 28 MHz. Exchange RS(T) plus serial number. Italian stations will send RS(T) and two letters identifying the province. Count 1 point per QSO with Italian stations, 5 points per QSO with BA, BR, LE or TA provinces, 10 points per QSO with FG stations. Final score equals the sum of the QSO points. Awards. Send logs before Nov 15 to ARI Comitato Regionale Pugliese, c/o Awards Manager, PO Box 536, I-74100 Taranto 12, Italy.

Washington State QSO Party, sponsored by the Boeing Employees ARS, from 0100Z-0700Z Sep 13, 1300Z Sep 13 until 0700Z Sep 14 and 1300Z Sep 14 until 0100Z Sep 15. All bands and all modes. Work stations once per band and mode. CW contacts in CW subbands only. Work WA stations again as they change counties. WA to WA QSOs allowed. Exchange serial number, signal report and state/province/country (county for WA stations). Suggested frequencies: CW—1.805 3.560 7.060 14.060 21.060 28.060; phone—3.925 7.260 14.280 21.380 28.580; Novice—3.725 7.125 21.150 28.160. Count 2 points per phone QSO, 3 points per CW QSO and 5 points per mobile QSO. WA stations multiply by total states/provinces/countries. All others multiply by total WA counties worked. Mail logs by Oct 15 to BEARS, c/o David Long, N7FNG, 6738 5th Ave NW, Seattle, WA 98117.

Fernand Raoult-F9AA-Cup, sponsored by the Union des Radio-Clubs from 1200Z Sep 13 until 1200Z Sep 14. CW and SSB in equal times. The total operating time between CW and SSB may not differ more than 30 minutes. Classes: single operator, multioperator single transmitter (for clubs only). Exchange RS(T) and serial number (plus RC for club stations). The same station may be worked twice in the contest, but must be on a different band or mode and at least 30 minutes apart. Score: 1 pt per QSO on the same continent, 5 pts per QSO on a different continent, 3 pts per QSO with RC on the same continent, 10 pts per QSO with RC on a different continent, 20 pts per QSO with a French RC, 50 pts per QSO with FF6URC. Multipliers: QSO with French RC—10; QSO with non-French RC—5. Example: W1ABC works TU2ABC/RC—10 × 5 = 50; W1ABC works FF6URC—50 × 10 = 500. Points will be computed by control commission. Only detailed logs are required. Awards. Send logs (as per example) to F9AA Contest, Jean-Luc Claude, FD1JCH, 9 rue Pasteur, 94700 Maisons Alfort, France.

20

Can-Am Contest, phone, Aug *QST*, p 84.

20-21

Scandinavian Activity Contest, CW sponsored by the Eksperimenterende Danske Radioamatorer (EDR-Denmark), from 1500Z Sep 20 until 1800Z Sep 21. (Phone contest 1500Z Sep 27 until 1800Z Sep 28.) Work LA-LB-LG-LJ, JW, JX, OF-OG-OH-OI, OHØ, OHØM, OX, OY, OZ, SJ-SK-SL-SM and TF stations on 3.5, 7, 14, 21, and 28 MHz only. Work stations once per band; no crossmode QSOs. Categories: single op, all band; single op QRP (max input 10 watts); Multiop single transmitter; and SWL. Multi-single stations may have only one transmitted signal at any given time and must remain on a band at least 10 minutes after a band change. Exchange signal report and serial number starting with 001. Non-EU stations count 1 point per Scandinavian QSO on 14, 21, and 28 MHz, and 3 points on 3.5 and 7 MHz. Multiply total QSO points by the number of different Scandinavian call areas worked per band. (LA1 = LB1 = LJ1 and W1XX/OZ = OZØ, etc) for final score. Avoid contest traffic in these subbands: 3.560-3.600, 3.650-3.700, 14.060-14.125 and 14.300-14.350 except when this conflicts with national regulations. In that case, split-operation must be used. Mail entries for both modes by Oct 30 to EDR Contest Manager, Lief Ottosen, OZ1LO, Bankevejen 12, Kong, DK-4750 Lundby, Denmark.

21

Can-Am Contest, CW, Aug *QST*, p 84.

23

W1AW Qualifying Run, 10-35 WPM, at 1300Z (9 AM EDT) Sep 21. See Sep 12 listing for more details.

27-28

Scandinavia Activity Contest, phone, see Sep 20-21 listing for details.

Italian YLRC International Contest, Aug *QST*, p 83.

California QSO Party, sponsored by the Northern California Contest Club, from 1600Z Sep 27 until 2200Z Sep 28. Single ops limited to 24 hours, time off periods at least 15 minutes and noted in log. Work stations once per band and mode. California stations may be worked again if they change counties. CW QSOs must be in CW subbands. No repeater or MCW QSOs. Suggested frequencies: CW—1805 and 50 kHz up from low end; phone—1.815 3.850 7.230 14.250 21.300 28.500. Try CW on the half hour, 160 at 0500Z and 80 at 0700Z. Exchange QSO number, state (county in CA), province, or country. Scoring: phone 2 points, CW 3 points. Multiply QSO points times number of CA counties (max 58). California stations multiply by number of states, provinces, or counties. Awards. Submit entries by Nov 1 to NCCC, c/o Gary Caldwell, WA6VEF, 1830 Polk St, Concord, CA 94521.

Delaware QSO Party, sponsored by the Delaware ARC, from 1700Z Sep 27 until 2300Z Sep 28. Work stations once per band and mode. Exchange serial number, signal report and QTH (county for DE stations; ARRL section or country for others). Suggested frequencies: CW—1.805 3.570 7.070 14.070 21.070 28.070; phone—1.815 3.975 7.275 14.325 21.425 28.650; Novice—3.720 7.120 21.120 28.120. DE stations count one point per QSO. Multiplier is total ARRL Sections and DX countries worked. Others count 5 points per DE QSO. Multiplier is total DE counties worked per band and mode (36 max). Mail logs by Oct 31 to Charlie Sculley, AE3H, 103 E Van Buren Ave, New Castle, DE 19720.

28-29

Classic Radio Exchange, sponsored by the Classic Radio Newsletter from 2000Z Sep 28 until 0300Z Sep 29. Object is to restore, operate and enjoy old equipment built since 1945, but at least 10 years old. Exchange name, signal report, state/province/country, receiver and transmitter type. The same station may be worked with different equipment combinations on each band/mode. Suggested frequencies: phone—3.910 7.280 14.280 21.380 28.580; CW—60 kHz up from lower band edges; Novice—20 kHz up from lower band edges. Add the number of all the different transmitters and receivers worked plus the different states/provinces/countries worked per band. Multiply that number by total number of QSOs. Multiply that total by total years old of all your transmitters and receivers used (minimum three QSOs per unit). For transceivers, multiply years old by 2. Mail logs (include SASE for results) to Stu Stephens, K8SJ, 1407 Hollyrood Rd, Sandusky, OH 44870.

30

West Coast Qualifying Run, 10-35 WPM, at 0400Z Oct 1 (9 PM PDT Sep 30). See Sep 3 listing for more details.

OCTOBER

4-5

IRSA World Radio Championship Contest, sponsored by Radiosporting Magazine, phone from 0000Z-2400Z Oct 4; CW Contest 0000Z-2400Z Oct 5. Phone and CW are separate contests, however, the combined phone and CW scores will be listed and awards issued. Classes: single operator all band, single operator single band, multioperator single transmitter, multioperator multitransmitter. In each class there are subclasses of high power (legal limit), low power (200 W PEP) and QRP (10 W PEP). Also, club competition for combined phone and CW. Club-competition entries may claim a maximum of one station per category in selected power groups on each mode (max 18). Single operator stations may operate no more than 22 hours (they must take 2 hours rest period in one or two periods and noted in log). Multioperator stations may operate the full 24 hours. Bands: 1.8, 3.5, 7, 14, 21, 28 MHz. Work stations once per band and mode. Exchange RS(T) plus serial number starting with 001. Count: 1 point for each exchange sent; 1 point for each exchange received on phone; 2 points for each exchange received on CW (2 points for complete phone contact; 3 points for complete CW contact). Multipliers: DXCC countries; call areas in the following countries—USA (W1-Ø), Japan JA1-Ø), Australia (VK1-8), Canada (VE1-8, VO1, VO2, VY1), USSR (UA1,3,4,6,9,Ø) per band. When counting call area as multiplier, do not count country as multiplier. Also, a multiplier of one for each of the land, maritime and aeronautical mobile stations (/M, /MM, /AM). Final score equals total QSO points times total multipliers. Awards. Send logs before 30 days after the contest to IRSA WRC Contest, Box 7, Odenton, MD 21113-0007.

International DX-HC Middle of the World Contest, sponsored by the Guayaquil Radio Club, from 0000Z Oct 4 until 2400Z Oct 5. SSB only. Entry classes: single operator 7 MHz; single operator 14 MHz; single operator both bands; multioperator single transmitter both bands. No crossband QSOs. Work HC stations. Exchange RS plus 3-digit serial number. Count 10 points per QSO with HC stations and 20 points per QSO with HD stations (HD1GRC, HD7GRC, HD8GRC, HDØGRC). Multipliers are the sum of the numerals in the HC zones worked (HC1 = 1, HC2 = 2, HC3 = 3, HC4 = 4, HC5 = 5, HC6 = 6, HC7 = 7, HC8 = 8). Count zones once per band (max 36). Final score is total QSO points times multiplier points. Send logs before Dec 31 to Contest Manager, Guayaquil Radio Club, PO Box 5757, Guayaquil, Ecuador.

VK/ZL/Oceania DX Contest, phone, sponsored by the New Zealand Assn of Radio Transmitters and the Wireless Institute of Australia, from 1000Z Oct 4 until 1000Z Oct 5 (CW contest 1000Z Oct 11 until 1000Z Oct 12). Single op and SWL classes. Operate only 12 hours in even one-hour blocks (1000Z-1100Z, 1200Z-1300Z, etc; not 1035Z-1135Z, etc). Work stations once per band. No crossband QSOs. Exchange signal report and serial number starting with 001. Count 2 points per VK/ZL/O QSO. Multiply by total VK/ZL/O prefixes worked per band. Use separate log for each band and mode. Mail entries to be received by Feb 15 to NZART Contest Manager, ZL2GX, 152 Lytton Rd, Gisborne, New Zealand.

Concurso Ibero-Americano Contest, sponsored by the Seccion Territorial de URE del Valles Oriental and CQ Radio Amateur de Boixareu Editores from 2000Z Oct 4 until 2000Z Oct 5. Phone only. Classes: single operator Latin-American; single operator non-Latin-American; multioperator single transmitter Latin-American; multioperator single transmitter non-Latin-American; single operator EC (EA Novice); SWL. Bands: 1.8, 3.5, 7, 14, 21, 28 MHz. Work stations once per band. Exchange signal report and serial number starting with 001. Count 3 points per Latin-American QSO and 1 point per non-Latin-American QSO (Latin-American stations count 1 point per QSO). Multipliers are Latin-American DXCC countries (CE, CO, CP, CR, CT, CX, C3, C9, DU, EA, HC, HI, HK, HP, HR, HT, KP4, LU, OA, PY, TG, TI, XE, YS, YV, ZP, 3C and DXCC dependencies). Final score equals total QSO points times total multipliers. Awards. Send logs before Nov 30 to IX Concurso Ibero-Americano, Gran Via de les Corts Catalanes, 594, 08007 Barcelona, Spain.

5

OMISS QSO Party, sponsored by the OM International Sideband Soc, 0000Z-2400Z Oct 5. SSB, single-op only. Contact each station once per band, 160-10 meters. Exchange name, RS, state/province/country. Count 2 points for member QSOs, 1 point for non-member QSOs. Multiply total QSO points by the number of states/provinces/countries worked. Add 500 bonus

points for each 100 OMISS members worked. Submit separate logs for each band worked. Awards. Mail by Nov 16 to Ricky Martin, KA4TLC, Rte 1 Box 199J, Hope Mills, NC 28348.

11

W1AW Qualifying Run, 10-40 WPM, at 0200Z Oct 12 (10 PM EDT Oct 11). See Sep 12 listing for more details.

11-12

Pennsylvania QSO Party, Sponsored by the Nittany ARC, from 1600Z Oct 11 until 0500Z Oct 12 and from 1300Z-2200Z Oct 12. Classes of entry: single-op, mobile (multi-op is OK), multi-single, multi-multi, QRP (max 5 W output). Phone and CW. CW contacts in CW subbands only. Work stations once per band and mode. No repeater QSOs. Work mobiles again as they change counties. Exchange signal report, serial number and QTH (county for PA stations, ARRL Section for others). Suggested frequencies: CW—40 kHz up from low end and 1.810 MHz; phone—1.850 3.980 7.280 14.280 21.380 28.580; Novice—10 kHz up from low end; mobile window—5 kHz below listed frequencies. Try 160 around 0300Z Oct 12. Count one point per phone QSO, 1.5 points per CW QSO and 2 points per 80/160 meter CW QSO. PA stations multiply by total ARRL sections plus PA counties, plus max 1 DX country. Others multiply by total PA counties (max 67). Stations on county lines count for 1 QSO credit but multiple county multipliers. Mobiles add 500 bonus points for each county from which 10 or more QSOs are made. Mail entry by Nov 15 to Douglas R. Maddox, W3HDH, 1187 S Garner St, State College, PA 16801.

GARTG-RTTY Contest, part 4, sponsored by the German AR Teleprinter Group. HF portion is from 1300Z-1700Z Oct 11. VHF portion is from 0800Z-1200Z Oct 12. Score HF and VHF portions separately. Bands are 80 and 40 meters; 144, 432 and 1296 MHz for VHF. No repeater QSOs. Exchange RST, QSO number, name, QTH; VHF add grid-locator. Work each station once per band. Scoring: HF—1 point per QSO; VHF: 144—1 point per kilometer; 432—2 points per kilometer; 1296—3 points per kilometer. Total of QSO points is the final score. Classes are A—more than 200 W input, B—less than 200 W input, C—SWL, D—VHF. Logs must include all information. Mail within 20 days to Wolfgang Puenjer, DL8VX, PO Box 90 11 30, D-2100 Hamburg 90, Fed Rep of Germany.

GARTG-SSTV Contest, part 2, sponsored by the German AR Teleprinter Group, 0000Z-0800Z Oct 11, 1600Z-2400Z Oct 11 and 0800Z-1600Z Oct 12. 3.5, 7, 14, 21 and 28 MHz only. Work stations once per band. Exchange call signs, signal report and serial number. GARTG members also send membership number. Count 10 points per QSO. Multipliers: countries as defined by the WAE and DXCC lists and W/K, VE/VO, JA, PY, VK call areas. Final score = QSO points × multipliers worked per band × continents worked per band. Add 50 bonus points per GARTG member worked. Mail logs to be received within 2 months to Wolfgang Punjer, DL8VX, PO Box 90 11 30, D-2100 Hamburg 90, Fed Rep of Germany.

VK/ZL/Oceania DX Contest, CW, see Oct 4-5 listing for details.

12-13

Illinois QSO Party, sponsored by the Radio Amateur Megacycle Society, from 1800Z Oct 12 until 0100Z Oct 13. Phone and CW. No repeater QSOs. Suggested frequencies: CW—3.550 7.050 14.050; phone—14.290. Other bands may also be used. IL stations exchange RST and county; others exchange RST and state/province/country. Count 1 point per phone QSO, 2 points per CW QSO. Work stations once per band and mode, and once per band, mode, county for IL mobile stations. IL stations multiply QSO total by sum of states plus VE provinces plus a maximum of five DX country. Count additional DX for points but not multipliers. IL portables and mobiles may add 200 to final score for each country from which 10 or more contacts were made. All others multiply QSO points by the number of IL counties worked. All stations may take one bonus multiplier for each eight QSOs with the same IL county. Awards. Send logs by Nov 8 to RAMS, Joe LeKostaj, WB9GOJ, 9134 Ewing Ave, Evanston, IL 60203.

18-19

ARCI QRP Fall CW Contest, sponsored by QRP ARC International, from 1200Z Oct 18 until 2400Z Oct 19. Operate max 24 hours. CW only. Work stations once per band. Exchange signal report, state/province/country and QRP number if member. Non-members send power output. Suggested frequencies: 1.810 3.710 3.560 7.110 7.040 14.060 21.110 21.060 28.110 28.060 50.360. No 12- or 30-meter QSOs. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. Multiply QSO points by states/provinces/countries worked per band by power multiplier (4-5 W output ×2; 3-4 W output ×4; 2-3 W output ×6; 1-2 W output ×8; 0-1 W output ×10). More than 5 W output counts as checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Awards. Mail entry to be received by Nov 19 to QRP ARCI Contest Chairman, Eugene Smith, KA5NLY, PO Box 55010, Little Rock, AR 72225-0010.

Simulated Emergency Test (See Oct *QST*)
Jamboree on the Air

25-26

CQ WW Contest, phone.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by Oct 1 to make the December issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Special Events

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

Sierra Vista, Arizona: The Desert Rats DX Club will operate KB7ND **Aug 30-Sep 1** from the ghost-town location of Paradise. Suggested frequencies: 3.970 7.270 14.270 21.370 28.570. For certificate, send business-size SASE and QSL to PO Box DX, Sierra Vista, AZ 85636.

Gloucester, England: The Gloucester ARC will operate GB9DB for the month of **Sep** to celebrate the 900th anniversary of the Domesday Book, a historical document in British history. Operation will be on HF and VHF. QSL via the Radio Society of Great Britain or *Callbook* address of G4AYM.

Plymouth, Michigan: The Stu Rockafellow ARS will operate W8NJH **Sep 4-7** to celebrate their 25th anniversary in conjunction with the Plymouth Fall Festival. Operation will be 10 kHz from the lower end of the General phone bands and in the center of the Novice bands. For certificate, send QSL and SASE via W8NJH or WD8IAE *Callbook* address.

Susac Island, Yugoslavia: The RC Marjan will operate 4N9S **Sep 4-14** from Susac Island, IOTA EU-16, latitude 42° 46' 09", longitude 16° 30' 51". Operation will be CW and SSB on all HF bands. Send QSL, SAE and IRC to YU2CBM, Box 155, 58001 Split, Yugoslavia.

Elmhurst, Illinois: The York RC will operate W9PCS, 2300Z **Sep 5** until 1900Z **Sep 14,** during the Founders Week Celebration of the 150th anniversary of Elmhurst and to celebrate the 50th anniversary of the York RC. Operation will be: 10-80 General phone bands; 40 and 15 Novice bands; 147.42 FM simplex. For a commemorative certificate, send QSL and SASE (39 cents) to YRC, W9PCS, 161 W Harrison St, Elmhurst, IL 60126.

Tuscaloosa, Alabama: The West Alabama ARS will operate WD4DAT **Sep 6,** 1300Z-2300Z, in honor of college football and its greatest coach Paul "Bear" Bryant. Operation will be 25 kHz inside General phone bands 15-80 meters. For certificate, send QSL and SASE to WAARS Special Event, PO Box 1741, Tuscaloosa, AL 35403, or via WD4DAT *Callbook* address.

Valparaiso, Indiana: The Porter Co ARC will operate N9RD **Sep 6,** 1500Z-2300Z, to celebrate the annual Orville Redenbacker Popcorn Festival. Suggested frequencies: phone—7.250 14.250 21.350; satellite if available. For special QSL, send SASE to KD9BG, 757 Ransom Rd, Valparaiso, IN 46383.

Whippany, New Jersey: The AT&T Bell Labs Whippany ARC will operate W2TW **Sep 6,** 1300Z-2200Z, commemorating their 30th anniversary. Operation will be in the lower portions of the 10-80 General phone bands, 147.63/03 FM and 144.210 SSB. For QSL, send QSL and SASE via Rick Anderson, WB2QOQ, 243 Mountain Ave, Murray Hill, NJ 07974.

Gonzales, Texas: The Houston ECHO Soc will operate NZ5V **Sep 6-7** from the First Shot for Independence to commemorate the Texas sesquicentennial. Operation will be 80-10 meters phone and CW, including Novice bands. For a special QSL and original pencil sketch of the field day site, send QSL and SASE via Houston ECHO Soc Special Events, c/o WB5INB, 7800 Bissonnet No. 215, Houston, TX 77074.

Hastings, Nebraska: The Hastings ARC will operate WØWWV **Sep 6-7,** 1900Z-1900Z, from the Clay County Old Trusty Antique and Collectors Show. Operation will be 75, 40 and 20 General bands. Send QSL and no. 10 SASE to HARC, PO Box 128, Hastings, NE 68901.

Monmouth County, New Jersey: The Ocean-Monmouth ARC will operate KC2Q, 1600Z **Sep 6** until 1600Z **Sep 7,** from Twin Lights State Historical Site to celebrate the first commercial use of wireless telegraphy by Marconi in 1899. Suggested frequencies: 3.965 7.265 14.265 21.365 28.565. Certificate via OMARC, PO Box 357, Bradley Beach, NJ 07720.

Bethlehem, Connecticut: The Hen House Gang ARS will operate W1FHP **Sep 6-7,** during daylight hours, celebrating the 62nd anniversary of the Bethlehem Fair. Operation will be 40, 20 and 10 meters. Send stamp to W1FHP, Hard Hill Rd, Bethlehem, CT 06751.

Atlantic City, New Jersey: The Southern Counties ARA will operate K2BR **Sep 7-14** from the Miss America Pageant. Suggested frequencies: phone—25 kHz inside General class bands; CW—65 kHz up from lower band edges and 7.125 21.150. Send QSL and SASE via SCARA, Box 121, Linwood, NJ 08221.

Glen Ellen, California: The Valley of the Moon ARC will operate N6KM, 1500Z **Sep 13** until 0200Z **Sep 14** and 1500Z **Sep 20** until 0200Z **Sep 21,** commemorating Jack London, author of *Call of the Wild* and *Sea Wolf.* Suggested frequencies: phone—7.225 14.275 21.360. For beautiful certificate, send QSL and 9- × 12-in SASE to VOMARC, 358 Patten St, Sonoma, CA 95476.

Robinson, Illinois: The Crawford Co ARC will operate WA9ISV **Sep 13-14,** 1600Z-0200Z each day, to commemorate the centennial of Robinson. Suggested frequencies: 7.250 14.250 21.350 147.96/36. For certificate, send QSL and business-size SASE to CCARC, 310 E Magnolia St, Robinson, IL 62454.

Idaho Falls, Idaho: The Eagle Rock ARC will operate KX7C, N7GNV, N7HUG and NO7B 1800Z **Sep 17** until 0300Z **Sep 18** commemorating the 199th anniversary of the adoption of the US Constitution. Suggested frequencies: SSB—14.250; CW—7.125. Send SASE to the station contacted for commemorative QSL.

Edgeware, England: The Borehamwood and Elstree ARS will operate GB2TV, 1200Z **Sep 20** until 2000Z **Sep 21,** to celebrate the 50th anniversary of high-definition television transmission. Operation will be SSB, CW and RTTY on 10-80 and 2 meters.

Clyde, Ohio: The Clyde ARS will operate NF8E **Sep 20,** 1600Z-2400Z, and **Sep 21,** 1600Z-2200Z, from the Winesburg Fall Fair. Suggested frequencies: phone--7.250 21.375; CW—7.125 21.150. For certificate, send no. 10 SASE to NF8E, 302 Hamer St, Clyde, OH 43410.

Logan, West Virginia: The Logan Co ARC will operate KA8RFK **Sep 20,** 1400Z-2200Z, in sponsorship of a special awards day. Operation will be 7.250. For certificate, send QSL via *Callbook* address.

Chicago, Illinois: The Chicago ARC will operate a special-event station 1500Z **Sep 21** until 0100Z **Sep 22** during the open house in celebration of their club's 60th anniversary. Operation will be SSB on 40 and 20 meters. For information, send to CARC, 5631 W Irving Pk Rd, Chicago, IL 60634.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by Oct 1 to make the December issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—A/SM: VE6AMM. SEC: VE6XC. OO: VE6TY. STM/DEC: VE6ABC. Attended Board Meeting of CRRL in Toronto May 23 to 25th. Enjoyed meeting all Executives as well as ARRL President Larry Price. Hope to see many Amateur Friends at Red Deer Picnic June 20-22 and at 52nd Annual Glacier/Waterton Hamfest on July 18-20. Traffic: APSN, QNI 994, QTC 10, Informal 73. ATN, QNI 168, QTC 42. Personal totals: VE6CPE 32, VE6ABC 15, VE6CHK 13, VE6BKP 4, VE6QN 2, VE6AAB 2. Not reported in May: VE6BLY 150, VE6CHK 109.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—VE7EJU Ferdi, BCEN, we had a good month. Daily QNIs around 30 with a high 34 low 22. Thanks to all NCS station and to Tom VE7BNI Ast. NM, for his hours of work for the net. QNI is the blood of a traffic net, sure would like to find a way to increase it. VE7BVZ Wayne Skipper of MV Marabell is generating traffic from the passengers. My Son and I are on a month canoe trip, and Tom is looking after BCEN. QNI 847, QTC 307. BCPSN NM VE7DDF Ford reports High 175 Low 100 total 4002. In hospital, VE7BBV Jimmy, his wheel chair flipped. VE7WM Bill for operation. VE7AED Ernie heart problems, same for VE7AYZ Sid. VE7EG Roger is back after years with a tower beam that works. VE7GPF son of VE7GAK, grandson of VE7FHR, Bryan has been selected to represent Canada in the Mathamatics Olympics in Portland Ore. Dogwood Chapter, QCWA Annual Meeting elected for President, VE7SH Edna, Vice Tom VE7TE, Sect. VE7FB, Treas. Dave. Vancouver ARC 50th Birthday was enjoyed by many old members also they made a nice presentation to Ernie VE7FB one of the founding members also his fifty years in amateur radio. Thanks to Burnaby ARC Victoria Short Wave Club for the newsletter they are much appreciated. Traffic: VE7BNI 409, VE7EJU 135, VE7EJW 118, VE7FB 111, VE7CDF 111, VE7CCJ 44, VE7FME 30, VE7XA 21, VE7ANG 19, VE7BZI 15, VE7DJ 10, VE7SP 4, VE7AVC 4, VE7EIR 4.

MANITOBA: SM, Jack Adams, VE4AJE—Field Day over with for another year, which I am sure was a new experience for many operators. A few of our operators at VE4NUF stations were too much of gentlemen/ladies as they were shy of QRM, hi. Sad to report that Lyall, VE4PA, became a Silent Key June 9, 1986. Also George, VE4CK, on June 14, 1986. By the time this report is read, the Hamfest at the International Peace Gardens will be history and I feel quite confident of thanking the executives now as I know they will have done a FB job. Net reports: CRRL EPN, 30 sessions, 898 QNI, 23 QTC. MWX Net, 30 sessions, 762 QNI, 33 QTC. MTN CW net, no report this month will add to next month report. Individual traffic: 4RO 38, 4AJE 36, 4IX 34, 4TE 33, 4LB 32. Hope you had a good summer, and suggest that if you're not a CRRL member now, you had better join before Jan 1, 1987, as membership goes up $3.00. 73.

MARITIME-NEWFOUNDLAND: ASM, Aaron Solomon, VE1OC—Halifax- Dartmouth *Flea Market Week-end* great success & enjoyed by all. Attendance was 350 approx. Congratulations to VE1NN, VE1TT, VE1OU, VE1CES. Winner of *Sydney ARC Draw* was VE1AGU. Eight HFx.- Dart. amateurs provided communication for annual *"Run for Light"*. VE2DD has returned to VE-1 Land. *New VE-1 Call Book* available at $7.00 each from Box 663, Halifax, N.S. B3J 2T3. *RCS Sigs. Reunion* Wolfville, N.S. August 29-30. *Hospitalization:* VE1GG, VE1GL. Sincere apology to VE1BQG—the Silent Key was VE1BJQ. *Silent Keys*—VE1QH, ex. VE1UA.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. VE3FRX, a member of the Toronto Chapter of the Morse Telegraph Club, was pictured in a recent Toronto newspaper article describing the Toronto chapter's celebrations commemorating the birthday of inventor Samuel Morse. Murray has a collection of 175 telegraph keys. VE3FGJ, licensed since 1936, has received his Golden Anniversary Award from the QCWA—congratulations Fred. VE2FNU has relocated to the Ottawa area and was able to obtain his old call, VE3IVR. London's ARES participated in the city's recent emergency exercise. CARTG's 26th Annual RTTY DX Sweepstakes is set for the weekend of October 18. SAE to them for details and log sheets. VE3CCO starts another stint as the Prez of the Ontario Trilliums. VE3NSZ spoke to the Thornhill RAC about making use of the satellite. The talk included discussion of the orbit, the time window and the direction to point the antenna. VE3RQ enjoys his weekly 20 meter RTTY sked with G8LT. Both Smiths Falls ARC's and SORT's annual flea markets were huge successes. Windsor ARC is sponsoring a 30th anniversary award so start working their club members. The Minister of Communications was on hand for the official opening of the CNIB's memorial station, VE3AW/VE3NIB. The station is located in the Ontario Division Headquarters of the CNIB. VE3EVJ has his advanced while VE3PNN is newly licensed. London repeater VE3LAC is equipped with weather warning facilities. Toronto ARES members VE3EOD VE3FOB VE3KA VE3MBB VE3ORN and VE3POJ were involved in the Moore Park exercise which involved a simulated truck accident chemical spill requiring area evacuation. Traffic: VE3FAS 485, VE3GSQ 292, VE3DCX 145, VE3GT 85, VE3GNW 84, VE3CYR 83, VE3ORN 73, VE3DPO 62, VE3AWE 52, VE3AJN 43, VE3WV 42, VE3GOL 40, VE3KXB 36, VE3EAM 29, VE3KCZ 24, VE3WG 24, VE3BAJ 18, VE3EWD 12, VE3WM 11, VE3POJ 8. (May) VE3AWE 66, VE3WM 14.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2ADO. BM: VE2ALE. TC: VE2ED. NM: VE2ADO. Again this year on Field Day, Clubs and stations were on the air in great number. I hope everyone had a good summer and are ready to resume fall activities. Change of call: VE2EKC is now VE2WH. With regret I have to report the passing of these amateurs: VE2AXK and VE2LA. Traffic: VE2EDO 121, VE2BP 46, VE2WH 45, VE2JN 27.

SASKATCHEWAN: SM, W. C. Munday, VE5WM—SEC: VE5CU, EC: VE5AQ, VE5FF, VE5HG, VE5ACI, VE5WM. STM: VE5HG. NM: VE5EE, VE5EX, VE5HG, VE5AEM, VE5BAF. TC: VE5GF. ATC: VE5XZ. BM: VE5WM. OBS: VE5CU, VE5JA. Field Day is now history, and a thank you is extended to all who took part. Summer doldrums are upon us with many hams away on vacation. Best wishes and good luck is extended to VE5BAF who is being transferred to VE7 land. He will be missed on the SK traffic nets. Net reports: ARG-2 meter 28 sessions, 486 QNI. MJARC-2 meter 29 sessions, 241 QNI, PWXN 30 sessions, 667 QNI. Traffic: VE5AGM 6, VE5WM 3.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: W3DKX. SEC: K3PFW, EC: KC3JM, KC3TI, KA3LNK. PIO: WB3DPJ. SGL: AF3R. PSHR W3DKX. Very sorry to report N2RE a Silent Key. Amateurs in southern Del. furnished communications for Delmarva Chicken Festival and the Olde Fashioned 4th. AC3U of AWARE moving to Missouri, good luck. June 12 SKYWARN was activated state wide by W3DKX for 4 hours. I wish to thank all the clubs for sending the club reports in. DTN Stations 301 Traffic 45 in 22 sessions. DEPN Stations 50 Traffic 13 in 4 sessions. SEN Stations 51 Traffic 6 in 4 sessions. May late report DEPN Stations 66 traffic 21 in 5 sessions. Traffic: W3QQ 142, WB3DUG 44, WA3WIY 32, W3DKX 31, W3FEG 16, KC3FW 14, K3JL 13, KC3JM 10, KA3IXV 9, W3PVO 9, N3AXH 8, W3PCV 7, KC3TI 5.

EASTERN PENNSYLVANIA: SM, James B. Post, KA3A—ASM: KC3LM, K3ZFD. ACC: KA3A. SEC: WA3PZO. STM: KB3UD. OOC: N3CWD. PIO: W3AMQ. TC: W3FAF. Please direct SM correspondence to KC3LM. This month, salute our Section Net Managers AA3B, WA3EHD, and WB3EPU. They spearhead a crew of NCSs, liaisons, and individual message handlers working together to link our many good local nets to 3rd Region. N3DPE is now a local Net Manager, serving the STAR net on the EPA/WNY border. W3ABC and KC3LM enjoyed hamfest hospitality from Warminster; at the Murgas 'fest, W3ABC and KC3LM met Vice-Director W2BCH and SM/WNY W2MTA, plus lots of upstate EPA friends. With our clubs. Phil-Mont has a 24 hr. phone (215- 558-1139) giving club news including the VE test sked. Harrisburg RAC's VE team held a special session for a blind candidate. Many clubs, such as Delmont and Carbon, are using "printing press" software to add visual zip to their newsletters. Cumberland County ARS and Tamaqua Transmitting Soc. became Special Service Clubs in June. Please send club papers to KC3LM and KA3A so we can recognize your activities. Good to see Suburban ARC publishing again. As we aim the kids back to class, what about contacting your school district office and volunteering to present Amateur Radio to students? Also—try to blandish some popular teachers and Scout leaders into getting tickets. They're a ...k we need for reaching young people. If you can make a c...mmitment to publicizing Amateur Radio in your area, imita... KA3NKA by becoming a Public Information Assistant. In A...tes, 73 to Sullivan EC N3ERE and Northampton EC NB3L on their upgrades. Welcome aboard new EC's KB3OM in Lycoming and KA3BPN in Columbia; many thanks to KC3PO, outgoing Lycoming EC. Dist. 6 ARES Net Manager WA3CKA hosted a traffic handlers confab at the Murgas 'fest, welcoming KC3LM, KB3UD, and WA3PZO. Section Net freqs/daily times: EPA 3160, 0000/0300Z; EPAEPTN 3917, 2300Z; PTTN 3610, 2330Z. Local & district net freqs/times/ days: D2ARES 145.45, 2000R, Thu; D3ARES 145.37, 1930R, Mon; D5ARES 146.865, 2100R, Sat; D5 Tri-County 146.655, 2100R, 1st Wed; D6ESN 147.00, 2000R, Tu/Th; D8ARES 147.30, 1900R, Tue; PWA/ARES 147.715, 2000R Sun; MARC/ARES 147.06, 2030R Sun; MARCTN 147.06, 2030R, MWF; STAR 146.73, 1830, daily. May SECTION NETS: (QNI/QTC/sessions): EPAEPTN 456/183/31. May LOCAL NETS: May (QNI/QTC/sessions): D3ARES 76/20/4; D5ESN 54/9/4; D6ARES 72/32/9; D8ARES 42/0/4; STAR 150/47/30; MARCTN 155/53/12; MARCARES 70/2/4; PWAARES 100/0/4. May traffic: N3AZW 506, N3COY 210, N3CD 117, N3AIW 115, KA3DLY 102, KU3R 73, W4UQ 67, KB3UD 64, KA3IME 60, KB3FW 52, W3KAG 47, AA3B 40, W3JKX 36, W3TWV 37, WA3CKA 36, KA3JOI 24, N3EFW 22, W3FAF 19, W3ADE 18, K3TX 13, W3TI 4.

MARYLAND-DC: SM, John A. Barolet, KJ3E—About 18 SM Field Day messages were received by phone, cw and packet radio circuits; two messages came by mail. Seven were not in standard ARRL format. What is so difficult about writing a message in a format which has stood the test for many decades? Let's not frustrate the traffic nets and regular traffic handlers with unorthodox and incomplete formats and poor traffic handling skills. KJ3E will send any MDC radio amateur who requests it instructional material on message preparation, traffic handling and net operation. New subject: An angry 75-meter operator in MDC asked me "to do something" about getting a "malicious interference" station put off the air. Contacting the section manager was correct procedure; he alerted the MDC section Official Observer Coordinator, KC3EK in MDC. But, only the FCC can revoke or suspend licenses. The FCC depends on the Official Observer/Amateur Auxiliary appointees for assistance. When the OOs observe poor or illegal operating amateur radio operating they report the "infraction" to the station licensee. If there is no corrective effect a regional, high-tech amateur radio monitoring system obtains quantitative evidence of the OO observations and issues a stern, final warning from the amateur radio community. Still no proper response from the offending station licensee...documentation of the problem is sent to the FCC monitoring service which, with continuing support from the amateur OOs at all levels, confirms the situation and takes final action. The limited FCC budget permits attention to only the most flagrant and defiant cases; we radio amateurs must attempt to solve our own problems BEFORE calling upon the FCC. Help police our bands by qualifying for Official Observer/Amateur Auxiliary appointment. An excellent meeting of MDC ECs was held recently at the Howard County EOC, hosted by EC WA1QAA and chaired by SEC K3RXK. W3ABC, Atlantic Division Director, W3YVQ, RACES Coordinator, and SM KJ3E attended. WB3EFG, Baltimore EC, reported that amateur radio provided emergency communications but cellular telephones were used for administrative communications in a triathlon event. A neat way to avoid being in the "business" of the event. More packet radio stations! KA3T, new MEPN secretary, is in daily packet connection with other MEPN officers—wonder if SSB will survive? KC3TS signed /VE2 and /VE3 this summer. Laurel ARC held a double header on Field Day; they gave ham exams on the spot. Information in the MODULATOR, newsletter of Baltimore ARC, guided KJ3E in putting up his 60-ft 25G tower. How about a section-wide newsletter exchange program? It certainly would out perform this skimpy section news column for getting the word around MDC. I am sorry to report that N3GN has become a Silent Key. With the nets: Net/Mgr QND/QTC/QNI: MDD/W3FA 60/253/480, MEPN/N3EGF 39/121/894, MSN/KC3Y 30/55/401, WRPON/WB3BFK 21/18/231, MDCPON/W3OYY 4/6/40, WC2MN/KC3DW 4/4/61. PSHR: KK3F 107, W3FA 105, KC3Y 99, N3EGF 94, K3RXK 83, KJ3E 82, W3YVQ 73, KC3DW 72. WA3GYW 63. Traffic: KK3F 635, KJ3E 213, KC3Y 152, W3FA 147, N3EGF 121, KC3DW 84, W3YVQ 55, K3RXK 49, KT3T 48, W3DQI 33, KC3AV 25, N3RO 21, KX3U 17, N3DE 15, WB3BFK 13, W3LDD 12, W3ZNW 12, W3FZV 10, WA3GYW 9, N4DLA 6, KA3T 4, WA3VPL 3, KC3TS 2, KA3IID 2.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QIJ. STM: WB2UVB. ACC: K2IXC. TC: KA2RAF. PIO: VACANT. SGL: KA2KMU. BM: WB2UVB. OOC: WA2HEB. ATCs: N2BOT, K2JF and KA2RJA. It is with deep sadness I report to you that Rose Ellen Bills, N2RE, is a Silent Key. For those of us fortunate enough to know her, to say she will be missed is an understatement. Rose Ellen was an extremely active amateur who was past president of the YLRL, an Assistant Director of our Division and a very devoted member of the GCARC. On a much more pleasant note, Field Day '86 seemed to be a success. I received reports from the following clubs: SJRA, SCARA/SPARC, JSARS, Old Barney ARC, RCA/Astro and the Cape May County ARC. I am pleased to announce that Chris Crosby, KA2RAF, of Lakewood has been appointed the Section's Technical Coordinator. In this position, Chris will lend his expertise to any of you experiencing technical problems in various ham-related areas. He should be your primary contact, since League Hq. will route your request back to him anyway. Chris's address: 83 Shady Lane Dr., Lakewood, NJ 08701. Until next month, 73. Traffic: WB2UVB 221, NG2T 89, W2IML 44, N2FKA 39, WA2MGV 28, KA2CQX 22.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—APPOINTMENTS: (NM) KU2N—NYS/E&L, (EC) KA2TF—Cattaraugus, (ORS) WA2FJJ. WB2MCO will continue as STM in ENY; Paul, many thanks for your FB NYS leadership. WELCOME to new affiliated club RRRA in Rochester; OFFICERS W2YGW KD2CU WA2ZNC KA2HLW. TNX for many annual reports that are now rolling in! Club Officers: Cornell KA2ZOO KA2ZON N3BIY KA2ZNF; Lockport N2BIC; Rochester DXA KB2SG KB2SE W2TZ; ARATS NO2E W2VEX WA2BYN; GRAM WB2BRW NA2O KC2QQ WB2JOD; Tompkins KD2IM AF2A W2CFP N2FSD. CONGRATS to new Special Service Clubs: Champlain Valley ARC and Radio Amateurs of Greater Syracuse; WNY now has seven SSCs, with plenty of room for more—how about your club?

NYSEMO 3993	105-005-05	NYSR 3530	020-005-05
NYS/M* 3677	285-148-30	BSN 93/33	
WDN/M* 04/64	256-065-30	JCARCN 10/70	450-009-28
Mike Farad	154-033-30	OARCN 25/85	043-000-04
NYPON* 3913	531-245-30	NYTN 3720	
NYSPTEN 3925	550-057-30	BRVSN /655	321-006-30
ESS 3590	302-056-29	CNYTN* 90/30	091-052-30
Q Net 31/91	270-002-29	Mohawk VTN	011-045-09
OCTEN/E* /94	622-103-30	OCTEN/L* /88	290-074-30
STAR* 13/73	157-046-30	VHFTHIN /64	032-000-04
WDN/E* 57/17	370-136-30	WDN/L* 04/64	424-136-30
NYS/E* 3677	400-234-30	NYS/L* 3677	313-172-30

*NTS Net. PSHR: WD2AFI N2EVG/T WA2FJJ VE2FMQ W2FR NN2H WB2IDS W2MTA KU2N WB2NLU/T WB2OWO WA0PTV ND2S KA2SJG/N KA2UBD K2YAI W2ZOJ. Field Day Messages (SS): NR2B W2CXM W2CXV K2ECQ W2FR KA2GCL K2IQ AF2K W2IZ W2PE KA2QBQ K2QR W2RR K2SA W2SB W2UXC NK2V WB2WDG W2ZJ WA2ZXS—FB show all! Betty and I had a ball on the FD survey; even got W2AE and KS2J FD messages direct on 2M! Who will we see next year? W2FR really was filled with B.O.s and PKT RADIO! (Not to mention TVHO!) W2AE burned out an ignition analyzer. NK2V had the optimum site with the tallest elm tree in the State!—and the holiest tent! (B.O. means Boiled Owls!) Deepest sympathy to the family of ND SM WB0TEE, killed at FD site while installing antenna. Extension ladder supports are a lot safer than trees! COMMs: SKYWARN activations June 12 & 16 with one tornado sighted and heavy damage in Cortland County—KB2KW. Simulated plane & bus crash near Plattsburgh 30 June—WA2HSB. NEW YORK LIBERTY CALLSIGN PLATES call 800-522-2034. OBS Reports: WB2DSR WA2ZPE. SALES TAX: A1429 (Robach) and S1031 (E. Levy) bills are working in Albany, and would exempt all radio comm. eqpt purchased by a licensed radio amateur for use in amateur radio comms, if passed. ANTENNA ORDINANCES: Both Skaneateles and Syracuse are now "involved" in hearings and decision processes— W2BCH. Traffic: WA2HSB 400, WB2OWO 371, WA2FJJ 295, W2MTA 282, KA2UBD 214, WB2IDS 180, WB2OIX 142, NN2H 127, ND2S 107, K2YAI 94, KU2N 91, W2ZOJ 89, N2EVG 87, WB2NLU 86, VE2FMQ 85, N2ABA 83, WD2AFI 78, W2FR 74, WA2JPB 58, AF2K 43, KA2SJG/N 43, WB2IJH 38, N3DPE 33, WA0PTV 33, W2HYM 31, W2GJ 29, WB3CUF 28, KA2DBD 28, K2QR 16, K2IUT 14, WA2OEP 4, K2VR 4.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—ASM & STM: WN3VAW. PIO & ASM: KC3TO. SEC: WA3UFN. OO COOR: KJ3Q. SGL: K3HWL. TC: K3LR. BM: KR3P. ACC: AK3J.

Net	QNI	QTC	SESS	KHZ	T/D	Man
WPACW	251	100	30	3585	7:00P	WA3UNX
WPAPTN	169	99	30	3983	6:00P	WA3HLN
WPA2MTN	385	86	30	146.28/88	8:00P	KA3BGC
NWPA2MTN	571	35	28	144.53/145.13	10:00	KC3NY
KFN	135	31	21	7235	1:00P	N3EMD
PFN	194	101	30	3958	5:00P	WA3THT

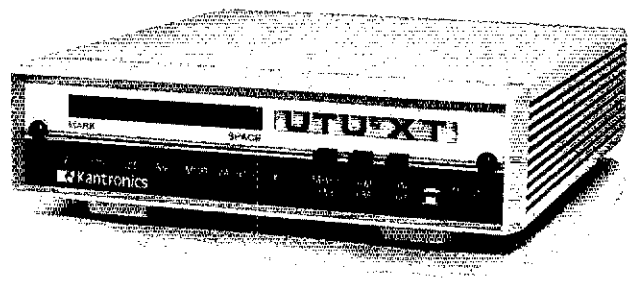
We have a Silent Key this month, N2RE, who was the sister of W2TV. Our sympathies are extended to her family. Our apologies to the Crawford ARC their treas is KA3IPM Not ITM and director is WA3ZSC NOT ZSV. Sorry! Has your club sent in the clubs yearly report? IF not, you will be put on the inactive list and will not receive the club mailings or other club info. Please get in touch with AK3J for necessary forms to report. If your club or you assist in a public event or emergency that amateur radio is used, please report these use Pub. Service Act. Report Form FSD- 175(585). The final total of amateurs assisting Hands Across America in the WPA Section was 138; our thanks to all who helped especially those who came a long way to help. Our traffic nets are in need of more activity. Traffic is at a low point and many stations are missing from the nets. I hope we can get more operators back into the various nets. This is part of the amateur picture PUBLIC SERVICE. Also traffic handling can be very full filling, and it has its rewards. We welcome all, and the members will be glad to assist newcomers in the proper techniques of this part of the hobby.

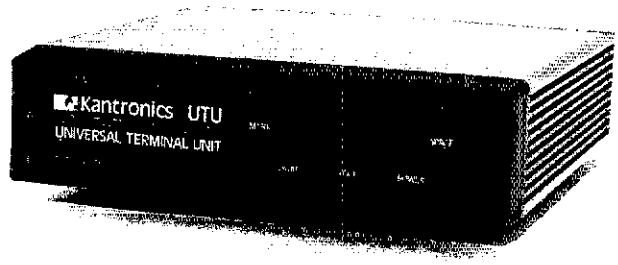
Kantronics "SMARTS"

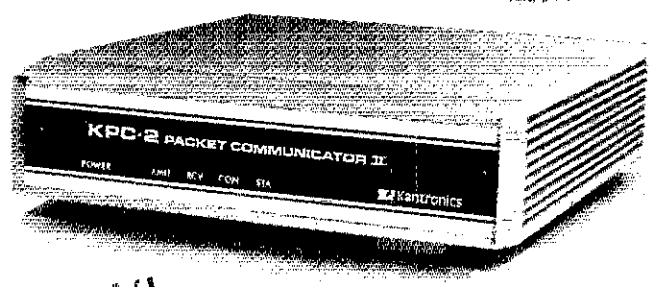
Presenting three intelligent, versatile, compatible terminal units.

"SMART" means an internal microprocessor is used to improve performance and add versatility. The "Smart" Kantronics TU's can transmit and receive CW/RTTY/ASCII/AMTOR or Packet when combined with your computer and transceiver.

Any computer with a serial RS232 or TTL port can connect directly to a Kantronics TU. A simple terminal program, like one used with a telephone modem, is the only additional program required. Kantronics currently offers Pac-term and UTU Terminal Programs for **IBM, Kaypro, Commodore 64, VIC 20, and TRS-80 Models III, IV, and IVP.** Disk version $19.95. Cartridge $24.95.







UTU The Universal Terminal unit (UTU) is the original "Smart" amateur TU. CW, RTTY, ASCII, and AMTOR can all be worked with this single unit. Switched capacitance filters and LED display tuning make using the UTU easy for even the Novice. 12 Vdc 300mv power supply required. Suggested retail $199.95.

UTU-XT The UTU-XT is an enhanced version of the UTU. Programmable baud rates, tone frequencies, and tone shifts give special versatility. Automatic Gain Control and Threshold Correction circuits greatly enhance sensitivity and selectivity. A RTTY signal detect circuit mutes copy with no carrier, and the CW filter center frequency and bandwidth are programmable. Power supply is provided. Suggested retail $359.95.

NEW!

KPC-2 Kantronics AX.25 **Version 2** TNC features a **built-in HF modem, full duplex** operation, **multiple connects,** and **over 100 software commands.** A serial RS-232 or TTL (C-64/VIC-20) port gives **universal compatibility.** The enhanced generic command structure fits any computer, even PC compatibles. All this combines to make KPC-2 the only TNC you'll ever need. **Suggested retail $219.00.**

For more information contact your local Kantronics dealer or write:

Kantronics
1202 E. 23rd Street (913) 842-7745
Lawrence, Kansas 66046

Traffic: KQ3T 174, W3OKN 131, N3EMD 78, WA3DBW 74, W3NGO 68, N3AES 67, WA3UNX 65, WN3VAW 64, N3FM 53, K3SMB 52, W3KMZ 49, N3CZW 47, K3NPW 32, WB3CIS 28, WB3GUK 23, WA3QNT 18, KC3JQ 13, KA3EGE 10, W3SN 8, K3LTV 8, W3TZW 6, W3KUN 17.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ— SEC: W9QBH. STM: KB9X. OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: K9IDQ. ACC: WB9SFT. TC: N9RF. ASM: AA9D. Of all the rotten times for the SM to take a vacation...FIELD DAY and end of the month to boot! I KNOW, I KNOW...but thats what happened when non-amateur friends scheduled their wedding for field day. I tried to get them to change the date but somehow they just didn't understand. While I missed operating FD with the SIARS crowd for the first time in a long time, the up side was that I was able to sneak away between the wedding and the reception to visit the FD site of the Wheaton Community Radio Amateurs who were set up in Wheaton's northside park. I was given the cook's tour of the operation by N9CIB and it was mighty impressive. I was there just before 1800Z on Saturday and they were putting the finishing touches on some of the antenna systems. After the reception I was able to sneak away and visit the Elgin Amateur Radio Society FD effort. The EARS gang was a little farther out in the rough than the WCRA folks as was evidenced by the man eating mosquitoes. By the time I got out to EARS, FD was in full swing and I was impressed by the amount of PACKET FD contacts in the area. On the way back to civilization from EARS I chatted with WD9GHG from the FRRL FD crew. With the cargo Dick had on board I wonder if they made any more contacts after he arrived. Thanks to all for the Field Day hospitality in the northeast part of the state. Many messages reporting field day activity were received both by WD9EBQ and W9QBH. As was reported last month, KW9J has left us to go to school out of state. Even as she was making preparations for her journey she found time to put out an Illinois Traffic newsletter which has not been done since KB9X began his leave of absence. The result is in the hands of the traffic crew as of this writing and was very well done. While I have been taking care of most of the administrative duties of the STM for the last several months, I have been unable to takeover the newsletter because of the repeater coordination workload. If anyone has any interest in becoming the traffic newsletter editor for a while, please let me know. Thanks to W9NXG, W9HOT and W9QBH for picking up the end of the month traffic and the FD message traffic and getting it to me in time for the column. I'll try not to be away on FD again guys... really! Traffic: W9HLX 152, NC9T 142, W9EHS 122, WB8RFB 106, W9HBI 102, W9NXG 96, KA9FEX 80, KJ9L 68, WD0AHO 42, N7DOY 38, K9CNP 37, W9KR 35, KD9K 18, KA9BBV 17, K9EHP 16, WB9TVD 16, W9VEY 12, KA9SHP 11, K9QEW 9, WA9RUM 9, WD9HQW 6, KD9TK 5, KA9RBI 4.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH. SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: K9PS. GLC: WA9VQO. OBC: KC9TA. PIO: K9DIY. OOC: KJ9G. SRC: N9WB. Net Managers: ITN KD9DU, QIN KJ9J, ICN KW9D, VHF W9PMT, IWN KA9ERC.

Net	Freq	Time/Daily/UTC	QNI	QTC	QTR	Ses
ITN	3910	1330/2130/2300	3093	446	2348	89
QIN	3656	1430/0000/0300	616	312	1518	90
ICN	3708	2315				
IWN	3910	1310	1597		357	30
IWN	VHF	Bloom./Kokomo	2000		485	30
Hoosier VHF Nets			5118	67	6252	108

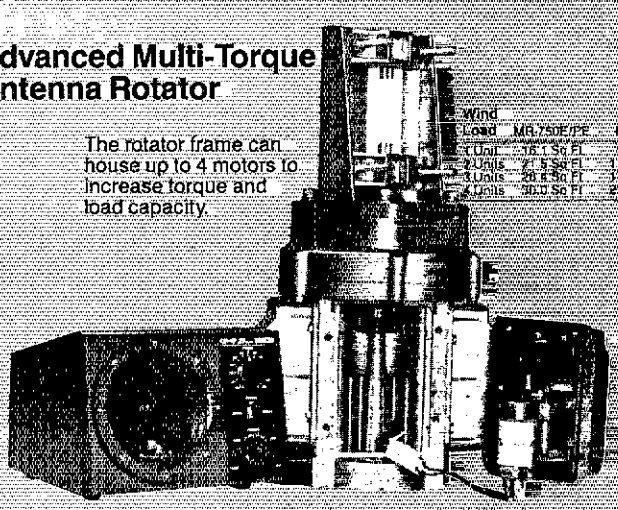
D-9RN: IN 100% TNX TO W9JUJ. IN participation in CAN 100% tnx to KJ9J, W9CSJ, AD7U, W9JUJ, W9FC, WB9UYU, NF9K, N9HZ, K9WWJ, WA9QCF, NJ9F. APPT: KA9RNL, EC DuBois County. BPL: W9JUJ, rcvd, 353; sent, 318; del, 2. Thanks to all groups who sent me Field Day reports. Looks like Hoosier clubs were in the thick of it.. including packet. There's no training like real field training! SSC of the month is Pike County ARC in southern Indiana. Club contact is KD9ER; newsletter is CAPACITOR; about 30 members are active in this rural area. Weekly ARES net on their repeater; area outlet for Teleconference Nets; active in FD and SET and special event station at antique steam & gas engine show in Bonneville; PCARC is an excellent example of what a small dedicated group can do to project a positive image of the hobby and perform public service...all while having fun! Outstanding! Is there an SSC in your area? LaPorte hamfest is Sunday, September 7. Make it if you can. Did you submit your PSHR totals this month? Look in the Public Service section of QST to see who did. State ARRL convention at the Indy hamfest was well attended. I was glad to meet all of you. A number of well-deserved awards were given out. Remember, you MUST maintain your ARRL membership to maintain your ARRL appointment. There is a lot of activity on the low end of two meters these days. Many hams are rediscovering the fun of tropo, aurora, meteor scatter and other exotic propagation. SSB and CW work on two! Traffic: W9JUJ 673, W9JZV 205, KJ9J 164, W9FC 115, KA9FFO 102, NJ9S 83, K9WWJ 78, WA9QCF 74, AD7U 66, WA9YIF 56, W9UMH 55, K9TKE 45, WB9IHR 42, KB9HH 37, W9PMT 32, KD9ER 26, K9KTB 23, WD9DWD 22, WB9PFZ 22, W9ZGC 22, W9UEM 21, N9HZ 18, K9BRF 16, AB9A 13, WD9HII 12, K9ZBM 10.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. September 9th I'll be featured at the Eau Claire ARC talking about the ARRL and answering questions about Amateur Radio news. Stop in to say hello, 7:30 PM at the Parks and Recreation Building on First at Oxford. September 9th, emergency drill at Point Beach Nuclear Power Plant, contact Manitowoc County EC WB9MFB for details. The Wisconsin Nets Association will hold its annual picnic September 20th at Shawano County Park (4 miles north of HWY 29 on County HHH at north shore of Shawano Lake), with camping facilities, swimming, boating, refreshments, and awards. The picnic festivities will get underway about noon, traffic meeting at 1 PM, emergency communication program and other fun activities later, everyone is welcome. Exams September 20th at Waukesha County Technical Institute, send card to WD9JKZ. Our Affiliated Club Coordinator, KA9FOZ, has a telephone campaign going to help club officers complete annual reports to retain their club ARRL affiliation. Clubs can receive extra info from Headquarters and ARRL benefits simply by returning the report. The Ozaukee RC, a Special Service Club, has been approved by the ARRL to have WB9RQR as HF Awards Manager and KY9P as the VHF Awards Manager. Silent Keys W9LQC and N9FDW. KA9RII is helping set up an HF SSB station, with a Drake-4C loaned by Handi-Hams, at Sacred Heart Hospital in Eau Claire as part of a speech- rehabilitation facility and also has become a TCC, OES, and ORS. New ORS WB9YPY, N9DGL, N9BDL, K9LGU, and WB9ICH. Emergency Coordinators needed for: Ashland, Bayfield, Burnett, Clark, Crawford, Florence, Forest, Grant, Green, Iowa, Jackson, Lafayette, Langlade, Lincoln, Marquette, Menomonee, Pepin, Polk, Richland, Rusk, Vilas, and Waushara counties. Must be an ARRL member, contact Gary W9QAK. Traffic: WB9YPY 1342, KA9RII 284, K9GDF 184, W9YCV 149, KA9BHL 129, WA9WYS 113, N9BGE 113, W9CXY 112, W9DND 104,

Superior Ham Accessories

Advanced Multi-Torque Antenna Rotator

The rotator frame can house up to 4 motors to increase torque and load capacity.



Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

Low voltage (24VAC) motors . . . Low-cost 6-wire control cable . . . can be installed on the same base as a TELEX unit.

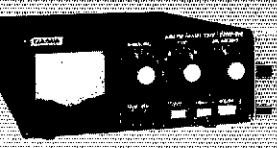
Specifications

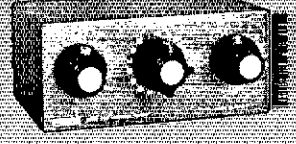
■ **Rotator Unit**

		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)
Output torque Brake power	1 motor	610 lbs/inch 5,200 lbs/inch	220 lbs/inch 1,700 lbs/inch
	2 motor	1,200 lbs/inch 9,600 lbs/inch	440 lbs/inch 3,500 lbs/inch
	3 motor	1,800 lbs/inch 13,900 lbs/inch	650 lbs/inch 5,200 lbs/inch
	4 motor	2,400 lbs/inch 18,300 lbs/inch	870 lbs/inch 7,000 lbs/inch
Rotation angle		375 degrees	
Permissible mast size		1½ ~ 2½ inch (38 ~ 63 mm) < diameter >	
Control cable		6-wire cable 0.5sq—1.25sq (AWG16/18/20 etc)	
Continuous running		5 minutes Max. permissible	
Dimensions		15.6" H x 8.43" W x 8.43" D (397 mm x 214 mm x 214 mm)	
Unit weight		16.5 lbs (7.5 kg) < with 1 motor unit fitted >	

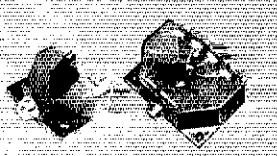
■ **Controller Unit**

	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Motor running voltage	24 V AC	
Dimensions	4.9" H x 7.1" W x 6.9" D (125 mm x 180 mm x 175 mm)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set





Frequency Range:	CNW-518	CNW-419	CL-580 (no metering)	CNW-919
	3.5-30 MHz (8 bands)	1.8-30 MHz (17 bands)	1.8-30 MHz (17 bands)	140–150 MHz
Power Rating:	1 kW CW (50% duty)	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW 10–250ohm
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10–250 ohm	



AUDIO FILTERS

AF-606K
Four stages of filtering . . . variable bandwidth over broad range . . . razor sharp CW reception . . . built-in speaker . . . PLL Tone Decoder circuitry

ELECTRONIC KEYER DK-210

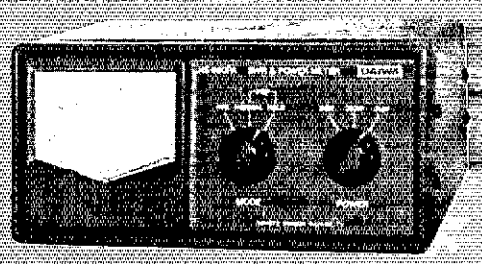
Sharpen your "fist" with Daiwa precision!

COAXIAL SWITCHES

PAT. No. 59-000803

	CS-201	CS-201G	CS-401	CS-401G	CS-4
	2position	2position	4position	4position	4position
Frequency:	500 MHz	1.3 GHz	500 MHz	1.3GHz	1.3 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
VSWR:	Below 1:1.2				
Insertion Loss:	Less than 0.2 dB				

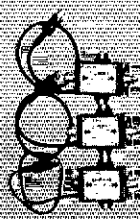
New Cross Needle SWR/Power Meters for All Bands



15° angle face for easy reading and operation

Model*	Freq. Range Int. Sensor	Forward Power	Tolerance Full Scale	Connectors
NS-660A	1.8-150 MHz	30/300 W/3 kW	± 10%	SO-239
NS-660PA	1.8-150 MHz	30/300 W/3 kW	± 10% Av Pwr ± 15% PEP	SO-239
NS-663A/N	140-525 MHz	30/300 W/3 kW	± 10%	SO-239/N Type
NS-668	900 MHz-1.3 GHz	1.5/15/60 W	± 10%	N Type

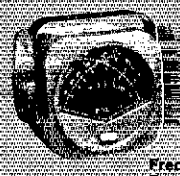
*Optional sensors adapt each meter for use on other bands.



External Sensors (For Indoor/outdoor use)
Permit operation over range of 1.8 MHz through 1.3 GHz. Optional for use with NS-660 series meters.
U-66H, 1.8–150 MHz, Max 3 kW, SO-239 Connectors
U-66V, 140–525 MHz, Max 300W, SO-239 Connectors
U-66VN, 140–525 MHz, Max 300W, N Type Connectors
U-66ST, 900 MHz–1.3 GHz, Max 60W, N Type Connectors
SC-20 50 ft. Cable with connectors for use with remote sensors

SWR & POWER CROSS NEEDLE METERS

CN-620B and CN-720B
Frequency Range: 1.8-150 MHz
Power: 3 Ranges (Forward, 20/200/2000 W) (Reflected, 4/40/400 W)

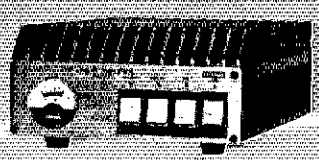


NS-448
900 MHz-1.3GHz
(Forward 5/20 W)
(Reflected 1.6/6.6 W)
Separate Sensor Type

	CN-520	CN-550
Frequency Range:	1.8-60 MHz	144-250 MHz
Power Range:	200/2000 W	20/200 W

	CN-410M	CN-460M	CN-465M
Frequency Range:	1.8-150MHz	140-450 MHz	140-450 MHz
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75 W
Reflected	5 W/50 W	5 W/50 W	5 W/25 W

Back Lit, with mobile bracket



POWER AMPLIFIERS

Band:	LA-2035R	LA-2065R	LA-4040R	LA-2155W
	144-148 MHz	144-148 MHz	430-450 MHz	144-148 MHz
Input Power:	0.5-3 W	0.5-5 W	10 W	10-35 W
Max. Output Power:	30 W plus	60 W plus	35 W	30-150 W

Pre-Amp (Gain) 15 dB

POWER SUPPLIES

Model	Maximum I/ Continuous I	Output VDC
PS-30XM	31A/24A	1-15
PS-310M	31A/24A	3-14.6
PS-310MD*	31A/24A	13.8
PS-560MD**	56A/44A	13.8

*Sub-DC Outlets: 5.6A/5A, 3-14.6 VDC
**Sub-DC Outlets: 10.6A/1-15 VDC

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KD9XE 101, N9AU 90, N9BDL 80, WB9ICH 79, W9UCL 78, WA9FDY 72, WB9RGO 72, AG9G 67, KA9KLZ 67, W9CBE 61, W9IHW 47, K9AKG 45, K9FHI 41, NB9H 40, WB9JSW 29, K9BED 24, WD9DNQ 17, W9UW 16, K9UTQ 16, N9EAX 15, W9IEM 8, KA9BHK 7, K9JPS 6. (May) KY9P 8.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT—SEC: KAØARP. STM: KDØCI. Summer is here, as the drop in on-the-air activities would indicate. I hope you took time to participate in Field Day activities. Between that and the weather alerts we've had so far, it seems to bring a lot of our dedicated people out of the woodwork. Hi! In part due to Field Day, Gov. Rudy Perpich designated the fourth week of June as Amateur Radio Appreciation Week in Minnesota. Local media did its part by promoting the public service functions of our hobby, including Field Day and Skywarn. Our heartiest congratulations to our SM George Frederickson as he will continue in that post for another term. Our "Amateur of the Month" for June is Jerry Van Dervort, WDØGUF, of Virginia, Minnesota. Jerry is the EC for Northern St. Louis County and has done much to promote public service functions on the Iron Range. He has also served as faithful relay station for KAØARP who is in the process of relocating. NET NEWS: With net participation down during the summer months perhaps it's a good time to think about what we can do to make them better. If you are a net member and you have not received a certificate, tell your net manager. We update certificates every six months. Also, a reminder to managers that reports MUST be in by no later than the close of MSPN/E on the 5th of every month, the sooner the better. It's certainly not too early to start thinking about SET. Call sign change, KAØVWA now NØHET. Our regrets to family and friends of John Ryder WDØAKT and Edmond Schoppert NØEDG who are now Silent Keys. A final reminder about the Dakota Division Convention coming up in Fargo ND in Sept. Hope to see many of you there. 73 de KDØCI.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	No Sessions	WAØLUT
MSN/1	3685	6:30P	324/92/30	KAØEPY
MSN/2	3685	10:00P	193/43/30	NCØE
MSSN	3710	6:00P	210/38/30	KAØODQ
MSPN/N	3929	12:00P	439/96/30	WBØWNJ
MSPN/E	3929	5:30P	820/122/30	WDØBGS
MNAMWXNT	3929	6:15P	No Sessions	KAØIZA
PICONET	3925	9:00A	3255/240/117	WDØBAC

EMERGENCY FREQ: 3929 BULLETINS: 3685 & 3929. Traffic: WBØWNJ 417, WAØTFC 265, KT9I 126, KAØCDQ 59, NØCLS 54, KAØAJF 48, W9DM 44, WDØGUF 43, KCØT 37, KAØARP 31, KA2PQW 24, NØEWA 19, NØFOO 19, WØGRW 17, KA9PDM 17, KØOGI 15, WØKYG 12, NIØX 11, KDØCI 9, NØCRO 5.

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—STM: Ole Johnson, NØABE. SEC: Warner Muns, KAØKPY. Congratulations to Lore Anderson, KAØWXE, and Dwight Sholl, KAØYAI, New Novices at Hot Springs and also WØJOZ on retirement from 40 years as a State Employee. KØUEH reports an increase in checkins in the Northeast S.D. 2 meter net but a decrease in checkins in the novice net so lets encourage novices to check in. A Kansas City firm has developed a special QSL card commemorating the dedication of the Statue of Liberty. Inquire to Russprint, P.O. Box 7575, Kansas City, Mo 64116. Only the Watertown and Mobridge Clubs took advantage of an easy 100 points on Field Day by sending a message to the SM or the SEC. Mobridge ARC is sponsoring a Novice Class for four students. Please send me info that you would like to have in this column. Traffic: KØERM 175, KAØAJE 105, KØZBJ 50, WØVRE 43, WBØOMF 35, WØYMB 18, WØHOJ 17, KAØUEN 7.

DELTA DIVISION

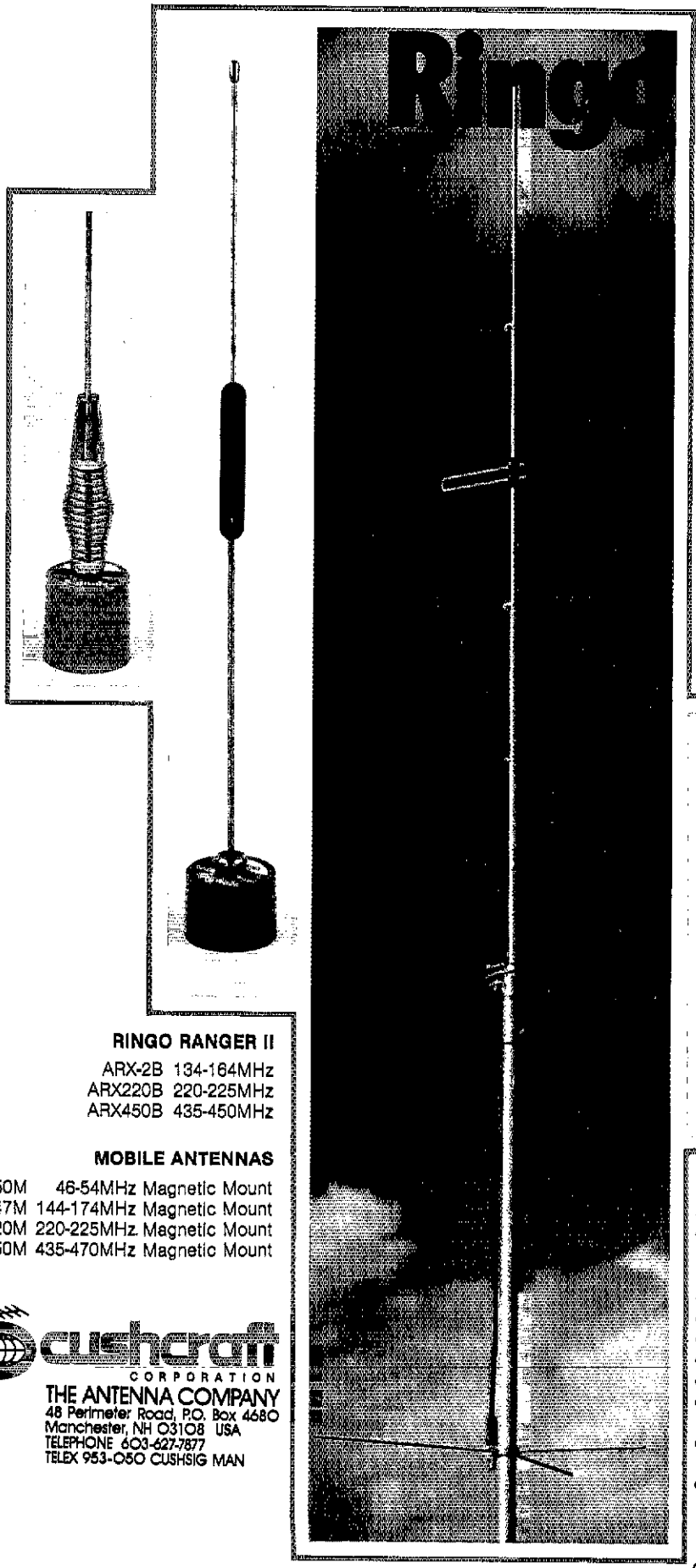
ARKANSAS: SM, Joel Harrison, WB5IGF—ASM: K5UR. SEC: N5BPU. STM: W9OK. TC: W5FD. ACC: NI5D. BM: W5HYW. SGL: W5LCI. Repeater Coordinator: WB5FDP. Arkansas traffic net schedules:

Arkansas Phone Net	3985 kHz	6:00 AM
Mockingbird Net	3925 kHz	4:30 PM
Ark. Razorback Net	3995 kHz	6:30 PM
OZK CW Net	3591 kHz	7:00 PM

Field Day activity has been reported from several clubs in the section and everyone appears to have had excellent success. I apologize to those I was unable to visit during the event. We have an urgent need for CW stations to join the OZK net. If you have capabilities, please join. Traffic: W5QFU 120, W9OK 50, W5UAU 25, W5RIT 12, W5KL 10, WB5IGF 8, N5BPU 8, K5GK 4. If you are unable to reach me on low band or phone, please leave a message on the KC5JH Packet BBS on 145.01 MHz.

LOUISIANA: SM, John "Wendy" Wondergem, K5KR—At the New Orleans Hamfest on 22 June the Louisiana Amateur Packet Radio Society was formed. This organization (LAPRS) will consist of representatives from all major metropolitan areas of the state. Goals are to promote the orderly growth of Packet, to provide a resource for information to newcomers, to interface with neighboring states and other packet organizations. Officers are Emile, NE5S and Jack, WD5ELJ. The board of directors and other officers will be announced at the Shreveport Hamfest in August. Work is now underway to incorporate as a non-profit organization, and plans are to affiliate with the ARRL and the Louisiana Council of Amateur Radio Clubs. Liason has already begun with Houston and the Mississippi Packet Group (MARDA) to link those states with digipeaters through Louisiana. LAPRS is also participating in Southnet which will link GA, FL, AL, MS and now LA. By next hurricane season, we should have a Packet network of digipeaters and bulletin board systems in every corner of the state. For more information contact NE5S or WD5ELJ or write: LAPRS, Box 40723, Baton Rouge 70835. Traffic: DRN-5 647 msg in 60 sessions at 83% by W5GHP, WA5LHL, K5WOD, WA5WBZ, WA5V, WA5TQA.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: K4HKD. SGL: AL7GQ. ACC: KC5VD. PIO: KA5VBE. OOC: W5VMC. VHF Coord: N5DWU. BM: AJØX TC: WB5SXK. WJ5P new net manager of Mississippi Sideband Net; thanks to W5HKW for outstanding job. Speaking of nets, Mississippi Slow Net and Mississippi Traffic Net still need your support; your participation will be warmly welcomed. SEC K4HKD still needs EC's; if there's none in your county, step in and lend a hand. Our thoughts are with N5DUZ on the loss of her father. New appointments: N5HTQ, DEC District M; NM5Z EC Pike County; KA5AGD and NF5Q OOs. The Mississippi ARRL Information Net has been idle over the summer months...look for it to resume shortly. Packet activity blooming, with additional individual ops joining the fun and a new digipeater now up in Biloxi; MARDA continues to make itself heard throughout the area, and Vicksburg ARC made excellent presentation to Greenville club, Keesler AFB club, Hattiesburg ARC, Northeast Mississippi ARA, Tupelo ARC, Jackson ARC, Laurel ARC, Neshoba ARC and Rankin County ARC reported activity in Field Day...watch November QST for results. CAND (W5KLV) Sessions 30 QTC 554 (Mississippi represented 100% by N5AMK and KT5Z). DRN5 (WB5YDD) Sessions



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CS147M	144-174MHz	Magnetic Mount
CS220M	220-225MHz	Magnetic Mount
CS450M	435-470MHz	Magnetic Mount

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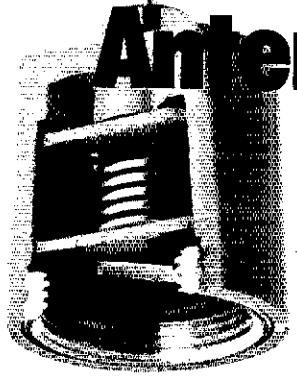

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60 QTC 647 (Mississippi represented 100% by N5AMK, W5HKW, KE5EC, KB5W and W5ACS). MSBN (W5HKW) Sessions 30 QNI 1805 QTC 46. MMN (WJ5L) Sessions 28 QNI 592 QTC 9. GCSBN (W5JHS) Sessions 30 QNI 949 QTC 21. HAEN (WJ5P) Sessions 5 QNI 79 QTC 1. LARES (N5HGN) Sessions 5 (1 emergency) QNI 41 QTC 0. MLEN (WD5O) Sessions 5 QNI 115 QTC 0. Traffic: N5AMK 426, KT5Z 77, K5OAF 74, W5WZ 38.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS. OO/AA: W9FZW. PIO: N7EJI. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. Seems the hot weather is just about over for this year and we need to start thinking about cold weather operations. In other words, the procrastinating period is upon us, HA. It is really good news when it is reported that someone comes along and really makes the statement that they are TOO old to learn the code or the theory to get an amateur ticket. I have been advised that N4KMG has just upgraded and is a 70 YOUNG person. I would ask that we remember that and when the opportunity presents itself, and pass that along to a potential new candidate for the hobby. We all know that we are continually confronted by the younger set that occasionally gains their coveted AMATEUR RADIO ticket. We all know that it is a way to keep the mind active and is continually changing to give a new challenge. Especially with the new modes that present themselves and to say the least the new and sophisticated methods of passing data and information. Even with all the new means to pass information etc., you still have room to plain old "RAG CHEW" if that is your "cup-of-tea." Just a reminder, hope all that have "CALL PLATES" on your vehicle took time to get the request in to the TN motor vehicle people. The deadline was 31 September. Still send it in if you did not make that date. May keep things in the pink, although you will just be getting a decal if you already have call plates. Have been advised that policy is expected to continue until 1988. You don't always know for sure, they just might change the policy as we go down the road. The individual station activity for this period is somewhat light, but that is expected in the summer months. The section traffic for this period is as follows: LF sessions 78, QNI 4197, QTC 115; VHF sessions 62, QNI 1252, QTC 501; CW sessions 39, QNI 208, QTC 62. As can be seen this does not reflect all the activity. We have not tried to measure other activity, just the part having to do with the "public service" part of amateur radio. Individual station activity for the period is as follows: W9FZW 116, WA4FMR 113, K4WWQ 92, W4WXH 70, W4DDK 60, NN4S 38, W4PFP 24, KA5KDB 19, WB4TDB 16, WA4HKU 15, KE4LS 12, W4PSN 9, W4TYV 7, KB4UQ 5. The CW net honor roll includes W4DDK and NG4J. The TSN has a new manager—KB4MSB. He will be looking for a lot of help. He has also been made an "Official Relay Station" also.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—Hope to see all you at the Lexington Hamfest. We are still needing help on liaisons to D94N and 9RN. KTN needs someone to meet late D9RN. MKPN needs some to meet early D9RN. Early D9RN meets on 7284 MHz at 1745 zulu, late D94N meets 7284 MHz at 2100 zulu. Anyone who can help let us know. Many thanks to the following for their help during Hands Across America May 25, 1986: KJ4SU Shank, KJ4LW Gene, KJ4ET Kevin, K4WOT Jerold, WD4TSI Roger, K4EOU Bob, K4WOL Tony, N4DOJ Bob, KD4NYJ Mike, WD4NXM Bernie, N4OAS Bruce, KB4AMA Tim, KA4WFI Hap, K4COM George, WD4CWT Dick, KC4DR Don, N4FFO Paul, WD4OKO Neal, KA4SKT Rickey, Adron Workman. 73 CUL.

MICHIGAN: SM, James R. Seeley, WB8MTD—SEC: WB8BGY. STM: WB8SIW. OO Coord: NJ8S. ACC: K8SB. SGL: N8CNY. TC: W8YZ. Silent Keys, with deep regret: K8ENY, W8JSK, K8MUS. New EC for Delta County: ND8X. Field Day appeared to be a success for MI and the country. I received 18 radiograms, including one via packet. Several groups reported having packet stations on the air during FD—the mode is definitely catching on for traffic and emergency communications. SEC WB8BGY reports that the state EOC monitors packet continuously, address N8GEP-1, and STM WB8SIW is stirring up interest in integrating packet systems with NTS. CMARC (Lansing Area) is to be congratulated on some of the best FD PR I've ever seen. They worked with WILX-TV (Ch. 10) to produce an outstanding documentary which gave the viewers some real insight into what amateur emergency communication is all about. The MI Traffic Handlers' Picnic is set for Sept. 7 in Potter Park, Lansing. Monitor the NTS nets for details. From the MI QRP Club Bulletin: Internationally recognized QRP HF calling frequencies (kHz) are 1810, 3560, 7030 (DX to US), 7040, 10106/10120, 14060, 21060 and 28060. Bay Area ARC reports good results with their work for the Liberty Bicycle Tour on July 5. It can't happen here? Don't say that to the U.P. hams about tornados. Mich-A-Con (Iron Mountain) reports activating their net when a touchdown was reported near Kremlin, WI, on July 4. From all appearances they took this rare incident in stride, with a very appreciative NWS office in Marquette being well served. June net summary (QNI, Tfc, Sess.): QMN 677 202 60; MITN 535 167 60; UPN 1037 69 35; MACS 404 63 29; WSSBN 675 34 30; GLETN 636 33 30; VHF nets 1049 20 95. Traffic: KA8CPS 315, W8QHB 196, WD8KQC 110, WB8SIW 80, NJ8R 76, WA8DHB 72, K8GXV 56, WD8OUO 45, K8HAP WB8MTD WD8RHU 43, N8AHA 42, W8IHX 40, N8EXS 38, K8UPE 35, N8CNY W8YIQ 27, K8OCP 26, W8EOI WB8SYA 16, W8VIZ 14, WB8WJV 8, WD8EIB KB8GT W8URM 7, KI8Q K8ZJU 6, WA8MVH 5, W8RNQ 4, WB8ITT 3.

OHIO: SM, Jeffrey A. Maass, K8ND—

NET	QNI	QTC	Sess	Time(Local)	Freq	MGR
BN(E)	183	77	29	1845	3.577	W8JMD
BN(L)	181	74	30	2200	3.577	W8BO
BNR	181	97	30	1800	3.605	W8EK
BSSN	443	218	57	0945,1900	3.873	K8OZ
ONN	185	53	29	1825	3.708	WD8KBW
OSN	292	113	30	1810	3.577	N8AEH
OSSBN	1819	648	90	1030,1615 & 1845	3.925	WB8JGW
OSSN	170	111	30	0645 M-F	3.577	KA8GJV
				0800 S-Sn	3.577	KA8GJV
O6MN	87	12	13	2100	50.16	WD8CTX
Ohio Section ARES Net				1500 Sun.	3.875	WD8MPV

SEPTEMBER IS TRAFFIC HANDLING MONTH IN OHIO! During this month, make an effort to participate in a Local or Section traffic net and learn more about one of our basic public service responsibilities! Net Control Stations (NCS) on all Ohio traffic nets (CW, SSB and RTTY) will be glad to assist you in writing a radiogram to be sent to a friend or relative, and will answer all of your questions. It costs nothing, and traffic handling is an activity that will improve your operating skills in many facets of our hobby. Contact Section Traffic Manager Len Brady, KF8J, or me for more details or assistance! Hamfests for September: Findlay Sept 9; Twenty Over Nine (Youngstown) Sept 13; Cincinnati Sept 20-21; Cleveland Hamfest Banquet Sept 20; Cleveland Hamfest Sept 21. Amateur Exams: Columbus 13; Maumee/Toledo 13; Elyria 21; Ravenna 27; Barberton 27. Contact me for details. June Field Day activity was as heated as always, with gnerally good conditions after a wet start in Ohio; I found myself in Western Pennsylvania visiting a sister-in-law on her 30th birthday, and dropped in on a FD activity of the Triple "A" ARC in Beaver County. I'm happy to report that our neighbors to the East are as hospitable as our own Ohio crew! The Findlay Radio Club has a new antenna farm installed, with 2 new 80-foot towers and big antennas (mostly monobanders) for all bands 160 meters through 440 MHz. This has been a long-term effort spearheaded by Bill Kelsey, N8ET, and now they can all relax a bit and enjoy the fruits of their labor! More and more clubs are beginning to install large-scale packet digipeaters and bulletin boards for common use in the community, just as repeater clubs began to do with their facilities in the early to mid 1970s. As plans develop for Local Area Networks (LAN) for the high-speed transfer of packets across the State, there will be a need for club sponsorship of some of the facilities to provide for our common use. It's not too early to begin thinking about making a committment to this newest mode: how about your club? The Milford ARC has been designated an ARRL Special Service Club (SSC), and the Portage ARC and TSRAC have met the requirements to renew their status as SSCs. As I write this column (early July), Affiliated Club Coordinator KJ3O and I have received Annual Club Reports from 69 Affiliated Clubs in Ohio, representing a membership of nearly 6000! Is your club Affiliated. I am sorry to report W8YHU as a Silent Key. He was Life Member Number 3 in the Massillon ARC and will be missed. New Appointees: NM8N ORS and OES; WB8GDM, N8HBI, and N8GEC ORS; K8ES OES; and WB8CBO ATC. The Net Managers of Buckeye Net Late (W8BO) and Buckeye Net Early (W8JMD) have opeted for a respite, and effective July 1 Bernie, N8EVC, will serve as NM of BNE and Bill, K8TVG, will serve as NM of BNL. Good luck to both! Traffic: KE8BE 305, WB8JGW 294, WD8KFN 215, N8EFB 187, K8TVG 183, K8JDI 177, KA8GJV 176, KA8KHS 162, K8OZ 151, N8EVC 149, W8JMD 147, KD8KU 136, KV8Q 131, N8GEC 120, W8BO 117, W8QZK 110, W8FPA 98, N8AEH 96, W8SKP 95, W8EK 94, N8AKS 89, N8FWA 89, KA8UYM 85, KF8J 80, K8CMR 68, WD8IKC 67, KA8CGF 64, WD8KBW 64, WB8KWC 58, NE8X 56, WB8MEK 55, WA8HGH 54, NC8O 50, KD8FW 49, KC8UZ 49, WA8HED 48, KC8YV 45, K8ND 42, WA8DYS 41, K8DHD 40, N8HBI 39, WD8RIB 38, KA8TNT 38, WD8JYE 34, NF8B 32, W8HG 32, K8EF 25, KD8XL 25, NM8I 21, WB8KWD 20, K8LQM 20, KA8OQF 19, W8WEG 18, K8IOW 17, W9SWM 17, NK8B 16, N8CJS 16, KA8RIX 16, WA8SSI 16, W8ZOL 16, KC8WH 15, KE8CV 14, N8GOB 14, KD8IC 14, KA8ILZ 14, K8NJQ 14, WD8OYK 14, WD8CTX 12, WB8DMF 12, N8FPH 12, WB8RSM 12, K8DXZ 11, WD8ATN 10, WB8HHZ 10, W8MVE 10, K8VOY 10, N8FBE 9, KA8MFH 9, KD8WH 9, KD8WI 8, KA8DRR 7, N8GIO 7, WB8YFD 7, N8AJU 6, KE8CL 6, WD8CSP 6, WB8GDM 6, NQ8K 6, KA8SON 6, NR8C 5, N8CW 5, N8FWA 5, W8BHL 3, WD8DKQ 3, N8GIL 3, WA4JXJ 3, KA8MFG 3, WB8MRL 3, WD8CKK 3, N8HBF 2, W8KN 2, KA8RQS 2, N8CIY 1, K8EEN 1, KD8EU 1, K8GN 1, N8GSM 1, K1LT 1, W8LT 1, WD8NED 1, WB8OFR 1, KA8UPR 1, KA8VET 1, W8WWU 1. (May) N8XX 301, WB8MEK 60, K8BXT 11, NR8L 5, N8GSM 1.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. STM: WB2MCO. SEC: AK2E. ACC & SC: N2BFG. BM: WB2EAG. SGL: KB2HQ. TC: KC2ZO. ATC: WA2VGM. JUNE NET LISTINGS: (QNI/QTC): AESN 43/2 ATEN 18/2 ESS 325/59 NYPON 531/145 NYSE 400/234 NY2L 313/172 NYSM 285/148 SDN 311/77. LATE MAY REPORTS: CDN 489/81 ESS 335/59 Ulster RACES 12/1. CLUB NEWS: Overlook Mtn ARC had film from AMSAT in June. KA2ZPD finished 7th nationally in Novice Roundup with 37,275—congrats Steve! OMARC with Ulster RACES handled comm. for World Hunger walkathon with KY2J KA2TIP WA2RUW KD2NE AK2H N2FS W2OLT N2AVN N2LL KD2RU K2UR W2ZW WB2OXY K2RGY W2XL helping. Also helped ARC on 12 June with fire at Lake Minnewaska. OMARC and Poughkeepsie ARC provided comm. for Run for Sight with N2AVN KA3ETO WA2KPF KA2TQY W2RI KY2J KA2TIP N2EKS W2IHY AK2H & WA3AFS. Rip Van Winkle had a Skywarn training session in June. The Club heard WA2DHF speak on antenna restrictions at their 35th Anniversary meeting. Saratoga RACES is planning their first HAMFEST to be held Sept. 6! Many clubs do not meet during July and August but there are still plenty of activities. Let's all help out our local clubs! Thanks to WB2MCO who has resigned as NM of NYSE/L and good luck to KU2N who is new NM. If anyone has any suggestions on how we can get more people into the local clubs and participating in traffic handling please let me know. Would appreciate the help very much. All have an enjoyable and safe summer! Hope to get to see all clubs again in fall. JUNE PSHR: W2PKY WB2VUK KA2MYJ K2ZVI WB2MCO K2ZM KC2TF. Traffic: W2PKY 191, WB2EAG 139, WB2MCO 111, WB2VUK 85, KC2TF 80, K2ZM 74, K2ZVI 56, KA2MYJ 40, WA2CJY 20. (May) WA2CJY 17.

NEW YORK CITY—LONG ISLAND:
SM, John H. Smale, K2IZ—ASM/ACC: WB2IAP. ASM/VE: W2NL. SEC: KA2RGI. OOC: NB2T. TCC/RFI: W2JUP. STM: WA2ARC. PIO: W2IYA. The following are traffic nets in and around the section:

NLI	3630 kHz	1900/2200	WB2EUF mgr
NCVHF	6.745 rpt	1930 m-f	K2MT mgr
BAVHF	6.67 rpt	2000 m-f	K2YQK mgr
SCVHF	5.37 rpt	2030 m-f	W2GZD mgr
ESS	3590 kHz	1800	W2WSS mgr
NYS/M	3677 kHz	1000	WB2EAG mgr
NYS	3677 kHz	1900/2200	WB2EAG mgr

*Denotes section net, all times are local, please try and check in whenever possible. LIMARC will continue to conduct examination sessions on the second Saturday of the month at N.Y. Inst. of Technology, Rt. 25A, Old Westbury, in Salten Hall, Rm. 2, applicants are reminded to bring 2 forms of I.D., original and a copy of your FCC license, check for $4.50, made payable to ARRL/VEC, 2 pens/pencils and a calculator for the math questions, for further info, contact Woody Gerstner, WB2IAP, 42 Mohawk Ave., East Atlantic Beach, N.Y. 11561. As of June, there are over 9,000 members in the Hudson Division, at least 3,000 in the NYC-LI section, this year, as happens every 2 years we get a chance to vote for a Director and Vice Director, and a Section Mgr. I urge everyone to vote for the candidate of their choice, stand and be counted or sit and curse. Lots of stations helped out with the 4th of July event in NYC, as I get the lists I will try to get the calls in the column, the following stations supplied communications between first aid stations and EMS ambulance dispatchers: KA2KJI, K2TWZ, KA2CWS, N4GAA, K2CFX, WB2ONF, WA2TGP, KA2KDQ, KA2CYA, KA2ABV, N2CWV, N2GGS, WD4BKD. Hall of Science low band net meets monday 2100 local on 21.365, N2FDJ is NCS, the clubs rptr nets are on 445.225, 223.600 or 144.300 Wed. 2100 local. N2AWM was up from Fla. visiting the area. Dwight, KA2CNN and his wife Sandre, KA2DBW, finally moved, to Germany, south of Frankfurt, most people move to Fla. or out West. There was another incident mentioned in Newsday, thank goodness the problem was listed as caused by someone operating a "high power" CB, people hearing voices, cursing on Ch. 5 and their stereo

radios, but with LILCO warning of "Brown outs" this summer you could find yourself the object of neighbors complaints that your big antenna is "sucking up" to much of the TV signal, causing the shrinking picture. Traffic: K2YGK 155, W2GKZ 36, K2TWZ 24.

NORTHERN NEW JERSEY: SM, Robert R Anderson, K2BJG—ASM (VE liaison): N2XJ. SEC: KB2ZM. STM: KA2HNC. OO/AAC: (Open). ACC: KY2S. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. BM: N2CXX. June appointments are: KC2BW, WA2OZR, and WB2AIV to EC and OES. Ed Trifari, KB2ZM, due to personal reasons, will step down as our SEC although he will continue serving in an advisory capacity. A SM letter to NNJ ARES members has been sent soliciting nominations of qualified candidates to be considered for the appointment of a successor. The following NNJ section members were elected to offices within the Tri-State Amateur Repeater Council Inc. (TSARC). President: Gary Kantor, WA2BAU, Secretary: R Cherry, K2HBX, and 201-Area Director: S Morgan, N5EGX. Outgoing president Steve Mendelsohn, WA2DHF, after serving TSARC in elected office for 10 years declined to run for a 4th term when nominated as he is running for ARRL Hudson Division Director. Our STM has reported that during any given month approximately 75 to 100 NNJ stations are active handling traffic and that only 8 to 10 PSHR/SA reports are received. Our NNJ field organization roster lists only 31 ORS and 6 NM. From this report it is clear that these dedicated individuals who do not hold ORS appointments, or those who do and are not submitting reports, are not receiving the recognition they deserve. If your station operations include handling traffic, even if only occasionally, please contact our STM (444-1041) or me for official appointment as an "Official Relay Station". All ORS and NM are reminded of the importance of submitting monthly reports in a timely manner. Proper recognition of ORS/NM efforts cannot appear in QST if reports are not received in time or not at all. Congratulations to the following who upgraded during June sessions conducted by: Garden State ARC, Bayonne EM, NNJ VE Board, Old Bridge RA, and Lockheed Elec ARC. Technician: KB2ADH, KB2AOI, KB2ATP, KB2ATX, KA2YLJ, KA2ZCA, KB2ASM, and KB2ANI. General: N2FWL, N2FWM, N2GBH, N2GGH, KA2RIT, KA2TXL, KA2UGR, and N2GEQ. Advanced: WA1ADK, WB2FCZ, N2GGU, N6LAK, N2FFB, KA2ZKD, N2GBL, KA2PYK, and KA2YGY. Extra: WB2OXI, KA2ZKT, and KA2OSR. Field Day messages to SM were received from: K2GE, K2NJ, K2RF, K2SC, K2SE, K2YNT, K2ZO, N2WM, NA2J, NA2R, W2GSA, WA2SNA, and WB2CLW. June Data:

Net	Mgr.	Freq	Time	Sess	QNS	QNI	QSP
NJM	W2RRX	3695	1000	Dy	30	142	109
NJPN	W2CC	3950	1800	Dy	30	not	rec
NJN/E	AG2R	3695	1900	Dy	30	190	115
NJN/L	AG2R	3695	2200	Dy	30	195	29
OBTTN	WB2QMP	147.12	2000	Dy	30	333	135
TCETN	KA2SPH	146.685	1930	Dy	30	84	20
NJVN	WB2ANK	146.49	2230	Dy	30	not	rec
NJPTN	(PBBS)	146.01	WA2SNA-1 and WB2GWD-0				

NNJ Amateur Radio Public Info Line: 201-735-8550. SAR/PSHR: N2XJ 233/116, N2DXP 65/68, KA2SPH 100/113, K2UX 58/79, WB2QMP 88/75.

MIDWEST DIVISION

IOWA: SM, Rollin J. Sievers, WBØAYW—SEC: KDØBG. BM: KØIR. ACC: WBØQAM. PIO: NØEBA. TC: KØDAS. SGL: AKØQ. STM: KCØXL. From the various reports around the state, Field Day was another success. Problems at the HARK repeater of Humboldt have been solved which have been evading the expertise of the local hams for some time. I have finally received the negative of Governor Branstad signing the proclamation of June being Amateur Radio month with seven amateurs present, including your SM and SEC. Those wishing a print (5x7), for a small charge notify your SM. I would appreciate any items of interest from anyone in the state to be published in this column. This column is for and about your activities. The Cedar Valley ARC has been given two pagers for a direct link between the CD director and ARES.

NET	QNI	QTC	FREQ	TIME	DAY	MGR
75 meter noon	1129	71	3870	1730	Dy	WBØJFF
75 meter eve.	758	74	3870	2300	Dy	NØAEF
TLCN 60 sess.	258	136	3560	2330-0300	Dy	WØYLS
ITEN 5 sess.	90	10	3970	2300	Sun	KDØBG

DTEN report: 266 messages handled in 60 sess at the rate of .246. Iowa represented 90%. NØGCC asst. DTEN mgr. 120 hams participated in Field Day in Des Moines, a great turn out. I know of 120 stations in Iowa on packet radio. Cedar Valley club has a membership of 125. Traffic: WØSS 170, KØGP 149, WØYLS 105, W4JL 99, WDØFWB 94, KAØADF 87, WBØJFF 37, WBØAYW 26, KAØGSA 25, KDØBG 22, NØAEF 17, WØBW 10, KØJGI 8.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. Have you looked at the League's publication "Operating an Amateur Radio Station" lately?? If not how about turning to the page that describes some of the station appointments available to you—the active HAM. More especially review the requirements for the PUBLIC INFORMATION OFFICER. Kansas does need someone who would be interested in this position to step forward as soon as possible. CLUBS should be looking for a person to assist the PIO as a Public Information Assistant (PIA). Perhaps your club has the right person to fill the gaps we would like to fill. If so how about doing a little arm twisting for the SM. Net activity for the month of May follows: KSBN QNI 1099 QTC 126, KPN QNI 408 QTC 23, KWN QNI 758 QTC 676, KMWN QNI 689 QTC 644, CSTN QNI 1796 QTC 47, QKS QNI 218 QTC 52, QKS-SS QNI 38 QTC 15. QKS-SS also welcomes back WDØESF as an NCS on Fridays. Its the TEETH—not the rig that sounds funny at the shack of our Vice Director KBØZL. Thx for QNI on Ks Nets Richard. New officers for the MARSHALL County ARC, Pres. WBØSZS; KAØVSW V. P. Sec-Tr is KAØRNY. WØGCJ is Trustee. Hopefully next month we'll list those clubs that orig. FD mag's. Traffic: NØGCC 510, WØFIR 280, WØQBK 227, KSØU 129, WØOYH 102, WAØHOZ 96, WØHI 88, WØFDJ 83, KØBXF 68, NBØZ 35, WØMYM 19, WØRBO 10, WØPB 10, WØCHJ 9.

MISSOURI: SM, Ben Smith, KØPCK—Effective July 1, WBØTOK resigned his position as SEC of Missouri. On that date, K9OCU was appointed to the SEC position. I want to thank Steve for his two years of service to the Section. Ken, K9OCU, who directed the Sikeston tornado operation and coordinated Hands Across America communications in Missouri has shown his ability to organize, and the leadership that will give Missouri a very active ARES program. The Heart of America ARC participated in the Liberty Ride Festival. The two-meter operation was directed by KØLSW. Other club members assisting were: KAØSZY, KAØSXY, WØAIB, WBØPPM, WAØRLB and NAØZ. Governor John Ashcroft of Missouri, proclaimed June 23 to 29 as "Amateur Radio Week" in Missouri. This makes three of the last four years that the Governor of the state has recognized the amateurs with a proclamation. Field appointment for the month, KDØUY: ORS. As of July 1, KT5Y resigned her position as Net Manager of the MO SSB Net. I am sure all the SSB Net members appreciate Maria's service to the Net during the last few years and

wish her lots of luck with her studies at the University of Missouri Medical School. The Heart of America ARC provided communications for the Hospital Hill Run in Kansas City on June 1. Club members who participated in the operation were: WDØEIG, KØUAA, KAØSXY, WØAIB, KAØSZY, WBØEJJ, KSØN, WAØRLB, KØFYJ, NØEVC, WBØBBC and KØVBU who was in charge of the amateur operation. Silent Keys reported to me: KØRK and KUØW. KUØW is survived by his brother, KMØO and XYL, WDØCGJ. Nets reporting:

NET	Ses	QNI	QTC	Day	Time PM	Freq MHz	Mgr
MON	60	350	106	Dly	7:00/8:45	C.585	KØSI
MEOW	30	467	99	Dly	5:30	3.963	KØDSO
MOSSB	29	610	38	Dly	8:00	3.963	KT5Y
HBN	21	265	23	Mon-Fri	12:05	3.880	KØDSQ
MOFON	4	25	12	Wed	8:15	222.42/4.02	AIØO
PHD	5	151	11	Mon	9:00	146.43	WAØKUH
RRABN	30	430	5	Dly	8:00	146.39/.79	KAØLLN
CMEN	5	80	5	Wed	9:00	146.16/.76	KØPCK
SLAN	5	323	3	Mon	8:00	146.31/.91	KØWEX
LOZCW	4	11	2	Sat	9:00	3.707	WØRTL
ARESN	5	66	1	Sat	9:00	147.855/255	NØFQW
LOZBC	24	389	0	Mon-Sat	6:00AM	146.13/.73	WØRTL
LOZFM	4	89	0	Fri	9:00	146.13/.73	WØRTL
ZAEN	4	59	0	Tue	8:00	147.84/.24	NØDE
SWMAN	4	55	0	Wed	7:00	146.31/.91	WBØTNX
SARN	4	47	0	Thu	9:00	146.43/7.03	WØENW
JCCCN	4	19	0	Wed	8:00	146.40/7.00	WBØDZX

Traffic: WØBMA 147, KØSI 140, KCØAS 124, NDØN 104, AIØO 96, KØPCK 87, NQØG 58, KT5Y 48, WAØYJX 45, KØORB 30, K9OCU 28, WDØELL 22, WØOTF 19, KDØUY 11, WBØCJB 7.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. A busy summer for Nebraska amateurs is ending after a record number of public service events where amateur radio operators provided communications. Also the dedicated weather spotter networks across Nebraska provided valuable information to the National Weather Service during severe storm activity. Another successful Victoria Springs Hamfest and Sunday Steak-Fry was held the last weekend in July. The annual event is sponsored by the Central Nebraska Amateur Radio Club with help from the Lincoln Amateur Radio Club for the Saturday evening meal and the Sunday breakfast taken care of by the Hastings, Kearney and Grand Island Amateur Radio Clubs. The North Platte Radio Club handled the license examinations given during the Victoria Springs Hamfest. This past summer several Nebraska clubs had the opportunity to see a program on VHF and UHF DXing presented by Charlie Conner, KØNG. Norm Smith, KAØABA, Roger Cox, WBØDGF and Jerry Robb, KCØQR. A reminder, please check the expiration date of your ARRL membership and if necessary you are urged to renew your membership. A section appointment can not be held unless you are an ARRL member. This means your section appointment is cancelled when you let your ARRL membership expire. Traffic: KØDKM 184, WBØTED 85, WØKK 84, KAØBCB 55, KAØKPT 54, WBØGQM 15, NOØA 13, WBØGMQ 13, WDØBOX 6, WAØBOK 3, KAØUNK 2, WØNIK 1.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO—STM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OO/RFI: NA1I. TC: W1HAD. PIO: KX1B. SGL: K1AH.

NET	FREQ	LOCAL TIME	QTC	QNI	NM
CN	3640	1900/2000	157	295	K1EIR
CPN	3965	1800 M-S	83	272	KA1BHT
NVTN	22/88	2130	20	126	N1BOW
WCN	78/18	2030	195	435	WB1GXZ
RTN	13/73	2100	56	212	KA1JAN

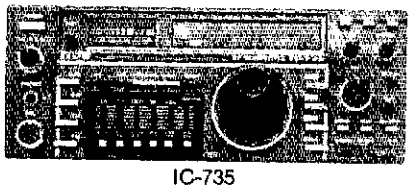
Hands Across America was a complete success as far as amateur radio participation was concerned. 3500 radio operators helped coordinate this gigantic effort to help raise funds for the homeless. Concerning NPRM regarding Novice enhancement privileges, it is my opinion that we should consider this from both sides. The attrition rate for Novices is becoming alarming. At the end of 1983 there were over 66,000 novices. At the end of 1985 there were only 76,000. Perhaps giving a voice privilege to these operators would enhance their appetite and leave them wanting more. I know that we have a serious problem with attracting new hams, and I don't know if this is the answer, but I do think that we should consider all of the possibilities before the situation gets much worse. Field Day has come and gone and we're awaiting results but from everything I have heard so far, it seems to have been a very successful year. If you are having trouble with local zoning/tower height ordinances, contact the ARRL concerning their new PRB-1 package which contains information useful in the battle against unduly restrictive antenna ordinances. Al Jaras, NA1I, is still looking for a few good hams to work as an official observer. If interested, contact him at 122 Columbus Ave., Meriden, CT, 06450-9998. I would like to take this opportunity to thank all of you out there who sent all of the beautiful cards and letters during my hospitalization and recovery. They really cheered me up. As you know, I am not running for reelection as SM. Contrary to what you may have heard, my health is not hindering my decision not to be your SM for the next two years. My overall health is better now than it has been for several years. My recovery, however, makes it impossible for me to campaign for the job. So we will pass the job on to someone who seems to be a born campaigner, and hope that he carries this enthusiasm over to the job. Good luck, John, and stay healthy. 73s. WB1GXZ 325, KA1MDM 209, N1EDD 176, K1EIR 144, W1EFW 118, N1DNA 118, KA1GWE 91, KA1MKJ 82, N1DMV 81, KA1KTH 80, W1WP 60, KA1BHT 50, KY1F 34, KA1EKC 29, W1YOL 22, N1BOW 22, W1BDN 18, WB1ESJ 14, WA1NLD 9, W1CUH 7, WB4FDT 5, NA1O 3, W1QV 3.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: K9HI. SGL: K3HI. OO/AA: KA1KF. SEC: KB1PA. STM: KW1U. ACC:K1AZE. TC: KA1IU. PIO: K1HLZ.

NET	MGR	FREQ	TIME(LOC)	WDY	QTC	QNI
EMRI	N1AJJ	3658	1900/2200	DY	292	317
EMRIPN	N1BGW	3880	1730	DY	248	222
EM2MN	KA1AMR	145.23	2000	DY	355	3319
NEEPN	K1BZD	3945	0830	SN	4	54
HHTN	WB1CMQ	04/64	2230	DY	325	507
EMRISS	N1CVE	3715	1600/2030	DY	61	193
CITN	KB1AF	745/045	1930	DY	240	281

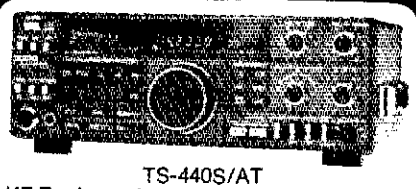
State Government Liaison K3HI needs your help locating local ordinances that are troublesome to Amateur Radio Operators here in the EMASS Section. Have you or anyone you know had any difficulty with applicable ordinances? Contact Shawn or myself with info ASAP. It's very nice to see Pentucket Radio Assn. polling it's members (AKA showing interest!) about topics of importance to all of us - in this case the proposed Novice enhancements. Cape Ann ARA still making large strides in their efforts to provide emergency communications for local fire departments, Civil Defense, and hospitals. This group exhibits the very best in not only spirit but valuable actions for their communities. FBI KZ1V, KY1T, and others of the Lower Cape Cod Amateur Radio Svc Group working on obtaining grants to be used for the formation of club HF (and VHF packet) stations in Cape elementary & middle schools. It's CERTAINLY very clear that the showing of

ICOM KENWOOD YAESU



IC-735

HF Equipment	List	Juns
IC-735 Gen. Cvg Xcvr	889.00	Call $
IC-745 Gen. Cvg Xcvr	999.00	Call $
IC-751A Gen. Cvg Xcvr	1499.00	Call $
Receivers		
IC-R7000 25-1300+MHz Rcvr	969.00	Call $
IC-R71A 100kHz-30 MHz Rcvr	849.00	Call $
VHF		
IC-271A All Mode Base 25w	735.00	Call $
IC-271H All Mode Base 100W	944.00	Call $
IC-27A FM Mobile 25w	389.00	Call $
IC-27H FM Mobile 45w	429.00	Call $
IC-28A FM Mobile 25w	419.00	Call $
IC-28H FM Mobile 45w	449.00	Call $
IC-2AT FM HT	269.50	Call $
IC-02AT FM HT	369.00	Call $
UHF		
IC-471A All Mode Base 25W	839.00	Call $
IC-471H All Mode Base 75w	1149.00	Call $
IC-47A FM Mobile 25w	489.00	Call $
IC-4AT FM HT	299.95	Call $
IC-04AT FM HT	399.00	Call $
IC-3200A FM 2m/70cm 25W	569.00	Call $
220MHZ		
IC-37A FM Mobile 25w	449.00	Call $
IC-3AT FM HT	299.95	Call $
Repeaters		
IC-RP3010 440 MHz	1049.00	Call $
IC-RP1210 1.2 GHz	1259.00	Call $



TS-440S/AT

HF Equipment	List	Juns
TS-940SAT Gen. Cvg Xcvr	2099.95	Call $
TS-940S Gen. Cvg Xcvr	1899.95	Call $
TS-930S/AT Gen. Cvg Xcvr	1699.95	Call $
TS-830S Xcvr	999.95	Call $
TS-530SP Xcvr	799.95	Call $
TS-430S Gen. Cvg Xcvr	779.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1099.95	Call $
TS-440S Gen. Cvg Xcvr	949.95	Call $
Receivers		
R-1000 200kHz-30 MHz	519.95	Call $
R-2000 150kHz-30 MHz	629.95	Call $
TS-670 All Mode Quad 6M	749.95	Call $
VHF		
TS-711A All Mode Base 25w	839.95	Call $
TR-751A All Mode Mobile 25w	TBA	Call $
TM-201B FM Mobile 45w	339.95	Call $
TM-211A FM Mobile 25w	369.95	Call $
TM-2530A FM Mobile 25w	399.95	Call $
TM-2550A FM Mobile 45w	459.95	Call $
TM-2570A FM Mobile 70w	549.95	Call $
TH-21AT FM, HT	239.95	Call $
TR-2600A FM, HT	349.95	Call $
UHF		
TS-811A All Mode Base 25w	949.95	Call $
TM-401B FM Mobile 25w	369.95	Call $
TM-411A FM Mobile 25w	449.95	Call $
TH-41AT FM, HT	249.95	Call $
TR-3600 FM HT	359.95	Call $
220MHZ		
TM-3530A FM 220MHz 25w	TBA	Call $
TH-31AT FM 220 MHz HT	249.95	Call $
TL-922A HF Amp	1399.95	Call $

FT 757GX

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	2859.00	Call $
FT-757GX Gen. Cvg Xcvr	899.00	Call $
FT-767 4 Band New	1759.95	Call $
Receivers		
FRG-8800 150kHz-30 MHz	599.95	Call $
FRG-9600 60 - 905 MHz	679.95	Call $
VHF		
FT-270RH FM Mobile 45w	439.95	Call $
FT-203R/TT FM Handheld 3w	259.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-770RH FM Mobile 25w	449.95	Call $
FT-703R/TT FM Handheld 3w	299.95	Call $
FT-709RH FM HT 4w	359.95	Call $
VHF/UHF Full Duplex		
FT-726R All Mode Xcvr	925.00	Call $
6m/726 6m Module	215.95	Call $
430/726 430-440 MHz	299.95	Call $
440/726 440-450 MHz	299.95	Call $
HF-726 10-15-20M	225.95	Call $
SU-726 Sate Duplex	109.95	Call $
Dual Bander		
FT-2700RH FM 2m/70cm 25W	599.95	Call $
220MHZ		
FT-109 RH New HT	TBA	Call $
FT-103R/TT FM HT	279.95	Call $
Repeaters		
FTR-2410 2m Repeaters	1075.00	Call $
FTR-5410 70cm Repeaters	1249.00	Call $

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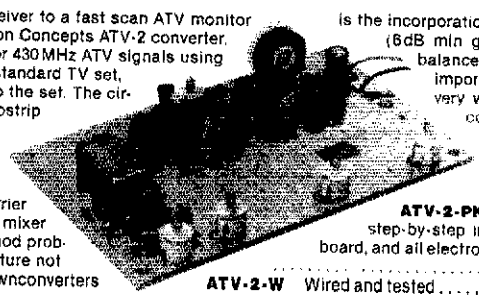

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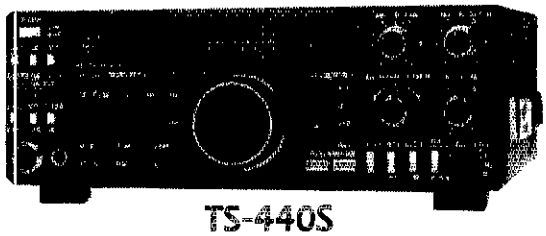

TS-440S

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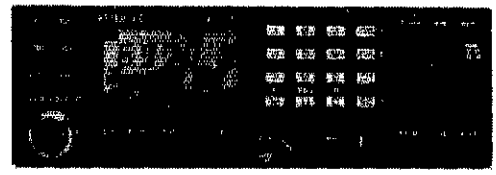

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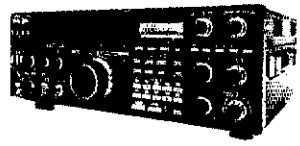

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BT-3 Battery Case for TR2600
PB-21 NiCd Pack for TH-21/41
PB-21H 500 MAH NiCd Pack for TH-21/41
BT-2 Battery Case for TH-21/41
SC-8T Soft Case for TH-21AT/41AT
BC-6 Two-Pack Quick Charger
BC-2 Wall Charger for BP-21H
AJ-3 BNC Adapter for TH-21/41

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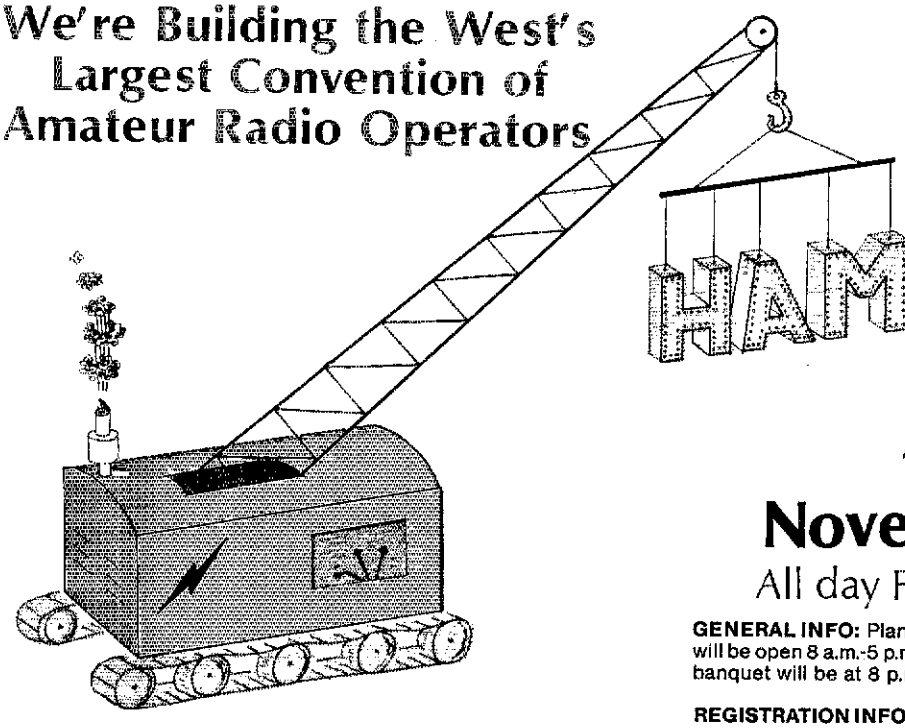

HAM/WEST

November 7–8

All day Friday and Saturday

GENERAL INFO: Plan to travel on Thursday. Exhibits and forums will be open 8 a.m.-5 p.m. Friday and 8 a.m.-4 p.m. Saturday. Awards banquet will be at 8 p.m. Saturday.

REGISTRATION INFO: Every person taking part in the HAM/WEST activities must be registered. Advance registration is $12 before October 24 ($15 at the door) and includes awards tickets and admission to all HAM/WEST activities except the banquet. It is not necessary to be registered to purchase tickets for the Saturday evening awards banquet. Flea-market sellers must be registered; outdoor spaces measure 16'x20' (two parking spaces). Born in 1966 or later? Request complimentary "admission-only" tickets (no awards) at the door. And — there's no fee for VEC exams taken at the convention!

HOTEL INFO: To guarantee your room, you must **make your room reservations directly with HAM/WEST**, either on this form or by phone (if charging to a credit card), and **make payment in full before October 1, 1986.** Reservations not paid by that time will be accommodated on a *space-available basis only.* Call HAM/WEST at 702-361-3331.

RV INFO: Call Camperland directly at 800-634-6942 to reserve a space with full hookups right on the hotel grounds. Be sure to mention HAM/WEST. Call now. These spaces fill up early!

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EXCUSE OUR DUST! We're busy building the largest annual convention of amateur radio operators in the West and we're not stopping to rest along the way. Last year we called it "OCTOBER-VENTION" and it was incredible! Now it's HAM/WEST and it's going to be even bigger and better! We have only one goal — to be the biggest ham convention in the West! We've got it all —awards, technical talks, exhibitors with those new products for Christmas, giant flea market, free VEC exams, free cocktail party, awards banquet and ladies' programs, not to mention all the fun, excitement and glamour of Las Vegas and the beautiful Western scenery and climate!

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( ) **I WANT TO REGISTER FOR HAM/WEST '86:**

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(Please enclose a self-addressed, stamped envelope marked "VEC Exam" with this application if you are planning to take an exam.)

( ) **PLEASE RESERVE A ROOM FOR ME AT THE HACIENDA HOTEL:**

Register room to _____
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Departure day/date _____ Number of nights _____

How many persons will stay in this room? ( ) One ($55.00/night) ( ) Two ($55.00/night) ( ) Three ($65.00/night) ( ) Four ($75.00/night)

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Any special requests? _____

Amount for room $_____ ( ) **Check or money order enclosed**

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Advance reg., $12/person $_____ Print your name _____ Phone _____

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Flea market, $20/space $_____ ( ) AMEX Authorized Signature _____

Total amount $_____ Note: We will bill your credit card account in full when your registration form is received.

HAM/WEST, P.O. Box 19675, Las Vegas, NV 89132, 702-361-3331

Amateur Radio movies - loaned by ARRL HQ - is an easy way to generate interest in school age people. Try it - you'll see how simple it really is! Congrats to top public service honor rollers KW1U. N1DDC, WB1CMQ and WA1FCD. Traffic: KW1U 1875, WA1TBY 706 KB1AF 550, N1BGW 544, KA1BBU 436, KN1K 413, WA1FCD 314, N1DDC 310, W1ZHC 295, KA1AE 213, N1BHH 168 WB1CMQ 165, KY1T 153, N1CVE 143, K1ABO 116, KA1AMR 113, K1LCQ 104, N1AJJ 102, K1BZD 93,K1BA 73 K1SEC 63, KA1KCU 49, KA1LIH 49, KA1ON 48, WA1FNM 44, N1DVI 39, KA1LIK 26, KB1PA 24, W1CE WA1SNH 10. Have you expressed your opinions to your Section Manager and Division Director? 73.

MAINE: SM, Clift Laverty, W1RWG—ASM: W1KX. SEC: KA8UVQ. STM: AK1W. ACC: KY1C. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. Mid-Coast Amateur Radio Repeater Club received ARRL affiliation cert at annual mtg and elected KB1HA, pres; N1DXM, vice pres; KA1FKS, secy, W1PXE, treas, WA1DEQ, dir; KQ1L, tech comm. KB1VZ reports the Downeast Repeater Group has enlisted aid of ARRL Washington lobby to reopen dialogue w/Park Dept abt Cadillac Mtn rptr site. Mid-Coast members participated in Waldoboro Days Triathalon include K1JHN, W4SME, KA1NNN, N1DXM, K1NYY, N1DHO, N1DOZ, KQ1L, KA1FKS. The following amateurs provided comms for the Maine Lung Assn's three-day "Bike Trek Across Maine" from Bethel to Farmington to Unity to Rockport (181.4 miles): W1HTG WA1JZP K1YXO KA1GZR W1WXI first day, W1JTH W1TGY KA1GPO KA1JGF KA1FXI KA1FXH KA1HRZ KB1YA W1KX WA1JCN second day, W1RU W1JTH W1TGY KA1FTO KB1QN N1CBA N1EBC KA1LPW KA1MLF N1AII and KB1YA third day. PSHR: WB1CBP 92, WA1YNZ 77, W1RWG 62. Traffic: WB1CBP 157, AK1W 127, W1ISO 87, ND1A 43, W1RWG 39, W1KX 34, WA1YNZ 31, K1GUP 29, W1JTH 26, W1BMX 17, KA1FTL 10, W1QTQ 6. Net reports (sessions/checkins/ttc): SGN/25/792/131/K1GUP, MPSN/5/70/13/KL7IJG, LPTN/19/48/10/WA1YNZ, AEN/4/75/0/WA1YNA. Windsor Hamfest September 6, 1986. See you there.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—STM: W1TN. ACC: KI1M. This month was dominated by Field Day preparations and activities. Gov Sununu proclaimed the week prior to Field Day as "Amateur Radio Week in New Hampshire," and several clubs engaged in extensive press release and TV news spots leading up to the activity. Seven clubs around the state reported FD activities with a total of close to 200 hams participating. Site visits by the general public were encouraged and many people got to see Amateur Radio in action for the first time. A group of hams in the town of Mason are in the process of forming a club and, with the able assistance of Dale, AF1I, did their first FD with 8 ops running 2A! During the month, I visited the Twin State Club in Hanover, NH and spoke to a group of club members and non-hams at the Montshire Museum of Science in Hanover. The club is working with the museum to establish a station and meeting site. It looks like a good opportunity for the club to be in constant contact with young people and adults interested in science and to expose them to Amateur Radio in a "hands-on" environment. This was my first Field Day as SM and I visited two sites—the Central NH club's location in Meredith, NH and the Nashua club site in Hollis. The Central NH group, led by president Dick Christopher, N1LT, was set up in a local park with a beautiful view of the mountains and a constant breeze! Included in the operation were Joe N1EEB, the club PR specialist, and his two young sons—all busily making SSB contacts on HF. It was encouraging to see active family participation in the event. Speaking of family activity, the Nashua club ran 15A again (it brings some interesting responses when you say 15A!!). Several husband and wife teams operated this year and the 2M station benefited from having several young ladies at the mike, including N1DMW and KA1KPM, pulling them out of the woodwork! TRY THIS—Many organizations are looking for programs and speakers for their groups. Work up a short presentation on Amateur Radio together with a video tape such as the recent SAREX video released by the ARRL. Offer the program to other area groups—computer user groups, retired community groups, scouts and SWL groups. Also try your local library for an "Amateur Radio Day" at the library with video, demo's and handouts! The VE program continues to role along at high speed. Ken K6UXO, VE coordinator reports that the pass rate in the NH Section is several points above the national average. The program is succeeding because of the dedication and hard work of the Volunteer Examiners and the candidates' willingness to put in the hours of study. Thanks to all for making it work! Traffic: GSFM 173, GSPN 36, MSOVTP 14, N1CPX 355, W1PEX 315, N1NH 313, W1FYR 253, W1TN 120, KK1E 109, N1AKS 86, K6UXO 84, W1ALE 62, NE1J 34, K1TQY 34, KI1M 19, KA1LBW 12, KA1HPO 10, KB1XI 8, K1OIQ 8, N1DQA 7, WA1YZN 5.

RHODE ISLAND: SM, John (Bob) Vota, WB1FDY—Note: 76 Flea Mart Sept 20, Woon. R.I., come on up and enjoy an eyeball QSO and pick up some goodies & gud can be found at the auction also. C U there. Now that Summer is almost over we can get ready for contest season and try out all those new ants. u put up this summer. WA1CRY has received the Secretary of the Navy Career Service Award for 40 yrs of service to the Dept. of the Navy. Congrats to Jim. E.B.A.W.A. WA1YPN/R on the air in Warren R.I. Congrats to N1BVY, KA1EHR, K1POM in upgrade. EBAWA Exam session. New Toy for N1RI FT757GX with Rice Vile from N1DM. The N.C.R.C. worked with the Red Cross manning 7 First Aid Stations for the Tall Ships, another job well done. Traffic: KA1JXH 276 (PSHR 116), W1EOF 187, WA1CRY 70, N1RI 8.

VERMONT: Ralph T. Stetson, KD1R—Well folks, it has been a genuine pleasure to have worked with so many dedicated volunteers in Vermont that make the ARRL presence in Vermont. It hardly seems 2 year have passed. I have been so busy with League affairs that time has truly flown away. I leave behind a few unfinished tasks that I had hoped to see become reality such as the call-letter plates for our cars. Yet many other tasks have been realized. We have an outstanding group of both NTS and EC personnel prepared to give that helping hand when needed. For example as I am sure most of you know, there was a drill at Yankee-Rowe in Mass. that involved hams on 3 different fronts from VT, NH and MA. From VT we had KA1DLK and WA1MAG with their packet gear set at American Red Cross, Bennington. In addition, WB1AJG, KT1Q, AE1T and several others also participated in handling traffic related to the drill moving as smoothly from the packet mode to that of either CW or voice as required. It is a participation of those that were just mentioned and the folks who helped out by just listening that make me proud to be a Ham in VT. One last item before I close this column out; my apologies to all Vermonters for not having the May Sect. report in here last month. We were overwhelmed with both additional work requirements, plus N1BYC, our son Tim, graduated from H.S. this past June and will be attending UVM in Sept. Needless to say, Karen, WA1SQD es I are very proud of our son. Now I return to the ranks and turn the helm over to Frank, W1CTM, our new Section Manager. I hope you are able to have even more success in your term, Frank, than I enjoyed in mine. I will be available in case you need any help. So don't hesitate to give me a call. To all my friends here in Vermont,

VY 73 es 'BCNU QTR. May station reports: KT1Q 583, WA2SPL 386, AE1T 113, N1DHT 92, W1JLZ 60, W1KRV 25, *W1OAK 18*. May Nets: VTN 31/171/158, GMN 27/357/35, VTPHN 4/66/6, CVFM 4/92/5, VSSB 21/188/6, VTRFD 3/12/6. June station reports: KT1Q 733, WA2SPL 228, AE1T 112, N1DHT 77, W1KRV 51, W1OAK 40. June Nets: VTN 30/160/152, CVFM 5/98/5, CAR 25/330/47, VTPHN 5/21/7, GMN 25/337/37.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—SEC/SGL: WB1HIH. OO/RFI: N1CM. PIO/ACC: K1BE. TC: KA1JJM. STM: W1UD. Welcome back from summer vacations. Hope that all enjoyed some mobile or portable operations while on your breaks. The weather was good for Field Day, and many stations were heard from WM. The Yankee Rowe test was its usual great success due to complete planning by all involved. Packet was used for the first time this year and much was learned which will be of value in future activities. As you get back into more radio activities this fall, try to get active one or more days per week in any of the traffic or emergency nets. The nets, freqs, and times are: West Mass Emergency 3937 8:30 AM Sunday and 8:45, 9:00, or 9:15 on various repeaters throughout the Section. West Mass Traffic 146.91 1:00 PM M-F. West Mass Phone 3937 6:00 PM M-Sat. West Mass CW 3562 7:00 PM Daily. For anyone who wants to get their CW speed up, participation in the CW net will sure help, as will some contesting. Hopefully, the solar cycle will start its upswing and DXers can bag several of those rare ones. PSHR: WB1RTH 118, N1DMU 81. Traffic: KA1T 319, N1DMU 300, W1UD 189, WB1HIH 75, KA1EKQ 59, W1ZPB 40, K1PUG 17, WA1OPN 7.

NORTHWESTERN DIVISION

ALASKA: SM, Jim Moody, Jr., NL7C—SEC: KL7JIM. STM: KL7T. ACC: AL7AC. TC: AL7L. NM: KL7GID, KL7AF, KL7JKW. DEC: AL7AC, KL7WM, KL7JFT. Congratulations to KL7IKX, the governor presented him a plaque honoring him for his public service through Amateur Radio. It is nice how things change, the Arctic ARC was able to participate in FD, the weekend after providing support for the Yukon 800 boat race (nothing like staying active)! September is going to be a big month, the annual visit of our Division Director, K7QGP, and Flea Markets in Fairbanks and Anchorage. KL7VL is starting a Handiham program in the state, if you have any questions contact her.

IDAHO: SM, Lem Allen, W7JMH—ASM: KA7T. STM: W7GHT. TC: W7ZRC. OO: KU7Y. RFI: K7QQP. PIO: WB7PFQ. SEC: N7BI. CLUB NEWS: W8CCI ARC (Airstream Trailer Group) had their National Convention in Boise June 28 to July 4, brought their own 2-meter repeaters for traffic control and chatting, had over 4000 trailers in their group, with approx. 160 Hams attending. The Boise Club gave VE Exams for the group, and the general public. Congrats to the following who upgraded: J. W. Gorman, KA8WHZ, KA8WIA, D. G. Palmer, KA8BGV, KA7SXH, KA7ZAY, N6LWZ, KB4SIY, KA8ZBA, N7GXQ, KA7VIO, R. A. Lonn, KA7VWA, F. Robertson. *ARRL MATTERS:* Congratulations to Don Clower, KA7T, who will be new Idaho SM October 1st. *PEOPLE AND THINGS:* KD7HZ has new TS 130 Mobile. Our sympathy and best wishes for a speedy recovery go to W7NJU, who underwent two operations recently, is doing well now.
NET REPORTS:

Net	Freq-time	SES	QNI	QTC
FARM	3937 Lsb 8P Da	25	1337	27
ID CD	3990 Lsb 810AM-F	21	692	16
IMN	3635 Cw 9P Da	30	339	118
NW TFC	146.38/98 FM 730P Da	30	753	25

GENERAL: Eagle Rock ARC, Meridian DX Club, Magic Valley ISRA sent Field Day messages to SM. Hope all who went out on Field Day learned something valuable and had a lot of fun—73, Lem. Traffic: N7BHL 265, W7GHT 134, KE7MO 16, W7JMH 12.

MONTANA: SM, Les Belyea, N7AIK—SEC: W7LR. STM: KF7R. ACC: KA7MAH. BM: K7KCR. SGL: W7JMX. PIO: N7HAZ. ASM/TC: K0PP. Upgrades reported: to Extra—W7KZB, KE7LL, KD7DF, KA7BRB. Pls note that KA7YYH got his Novice license one day and went to Extra the very next; to Adv.—KA7FVQ, N7IFU; to Gen.—KA7WIJ, KA7WVE; to Tech.— KA5QGJ, KA7LFI/TRW/YLA/YTY. Sorry to report that a counterpart and friend of mine (the SM from North Dakota) WB0TEE became a SK during Field Day near Bismarck. In Sidney, KA7IOR and KA7MJK will be sharing the same microphone as Mr. & Mrs...Montana has lost WA1JXN/7 from Frenchtown due to a move back east. You may recall he was the first ham to make contact with the Space Shuttle on 2 m. W7QYA of Lewistown who has traveled much of the world has been giving a few club a slide presentation of many countries. PSHR: KF7R, WB7WVD 21.

NET	SESS	QNI	QTC	MGR
MTN	30	1556	112	KF7R
IMN	30	339	118	WA7GQO
MSN	5	89	0	K0PP

Traffic: KF7R 56, WB7WVD.

OREGON: SM, William R. Shrader, W7QMU—STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. STC: N7ENI. ACC: KB7CC. OO: N7SC. RFI: AK7T. I am on vacation so no Upgrades this month. One important topic this month is the Technical Coordinator program. N7ENI heads up the program in this section. He is ably assisted by many but not by enough people. Help is needed all over the state but most important in Southern Oregon, the Eugene area, Central Oregon, and Klamath Falls area. What does an Assistant Technical Coordinator do? You can be useful in many ways in your local area. As a member of an RFI committee to help a fellow ham resolve his interference problems, as a supervisor/helper in assisting new hams with their antenna systems, as a source of Club information on technical subjects, arrange/give technical talks, write technical articles for QST and other magazines if your talents go that way, help other amateurs with technical advice, and lots of other ways. The list is endless and you don't have to be a technical giant. The N.W. region TC Net is a source of help for the individual TCs. It meets on Sundays at 2 to 3PM Local Time on 3920 kHz. Net controls are N7ENI and N7HMV. If you have questions contact Jim N7ENI on the net or write to him. Pitch in and give him a hand and help Amateur Radio progress. Traffic: W7VSE 505, K7OVK 167, W7ZB 155, N7FXJ 140, N7BGW 62, W7ODG 47, WA7VTD 18, KA7AID 15, W7LNE 14, KA7EEE 10. (May) N7ELF 218.

WASHINGTON: SM, Gene Sprague, KD7G—ASM(East) & ACC: KC7PH. OOC: N7IL. STM: KD7ME. TC: W7BUN. SEC: N7DRT. ASM: KR7L. Congratulations to N6EQZ who has been appointed an Official Relay Station (ORS). There are other field appointments which are available, if you are interested contact the staff member in charge of your area of interest or if you need to know what is available contact me. I frequent the traffic nets and my address is on page 8 of this publication. EVENTS: Walla Walla Valley ARC Hamfest on Sept. 20-21 at Milton- Freewater, OR. GENERAL INFO: Hope you all enjoyed Field Day. It was a very good demonstration of our ability to communicate under emergency conditions and have

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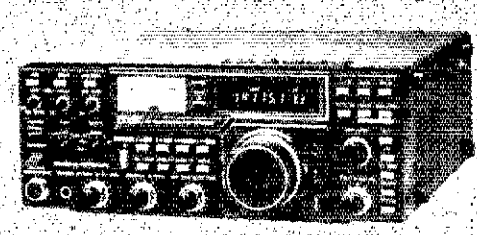

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NEW IC 12AT for 1.2 GHz

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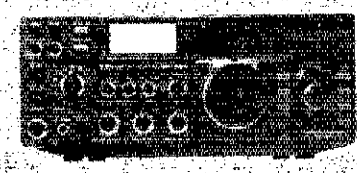
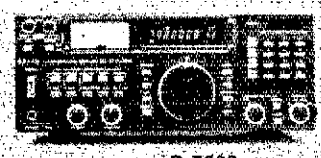


IC 745
HF Transceiver with General Coverage Receiver

IC 02AT/04AT
Handheld for 2m/440 MHz



R-7000
General Coverage Receiver

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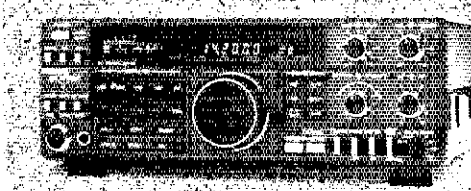

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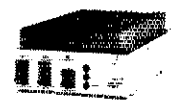

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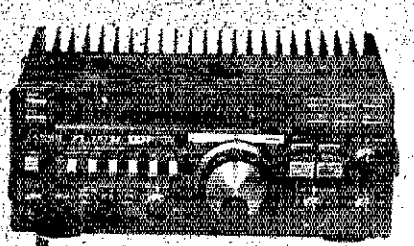
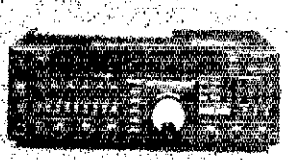


FT-757GX
HF Transceiver with General Coverage Receiver

FT-209RH



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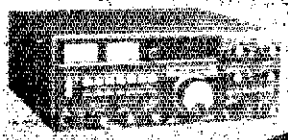

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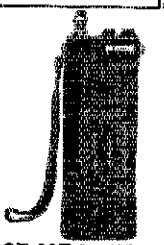

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ST-400ET 440 MHz HT
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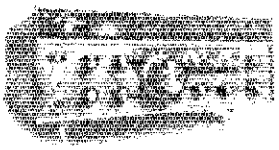

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TA-33 3-element 10-15-20m	339.95
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214S 14-element 2-meter Beam	CALL
BN86 Beam Balun	CALL
V2S 2-meter Vertical	CALL
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40'	Call	Call
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160 Through 15 Meters

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The **AL-1200** uses the rugged, inexpensive Eimac 3CX1200A7 high-mu ceramic/metal triode in a Class AB_2 grounded grid circuit.

The built-in ALC circuit prevents the amplifier output from exceeding 1500 watts if the exciter gain is inadvertantly set too high.

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Two bias settings allow either high efficiency RTTY and CW operation at 1500 watts of continuous output at nearly 70% plate efficiency or low distortion 1500 watt PEP, SSB, SSTV, or AM output.

AL-1200 SPECIFICATIONS:

Frequency Coverage: 1.8, 3.5, 7, 14, 21 MHz and WARC bands. Export model also includes 28 MHz.

Input Circuit: adjustable pi-network, VSWR 1.2:1 or less at resonance.

Input Bandwidth: 20% for 2:1 VSWR or better.

Drive Requirements: 90 watts typical for 1500 watts output.

Dimensions: 18½"D. x 17"W.x10"H.
Weight: 77 lbs.

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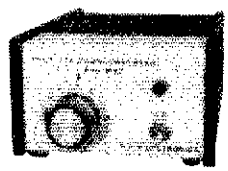

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70 CM ATV DOWNCONVERTER
FEATURES: Contains sensitive GaAsfet preamp & mixer - Tunes 420-450 MHZ down to ch. 2, 3, or 4. 120 Vac or 12vdc. Cabinet 4x2.5x7". TVC-2G tested board $59.

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fun all at the same time. Some groups are large and some small, but they all get the job done. Thanks to the many clubs and groups who sent field day messages to me. Congratulations to KA7DWH who has been named the state's outstanding biology instructor of the year. Ken is a Wapato High School science teacher. He has been very active in amateur radio, is a member and past president of the Yakima ARC. By the time you read this column the Hamfests, except for Walla Walla, will be over in this Section for the year, so when you get a chance, you might thank the clubs who work so hard to put on these events, which we all enjoy. PUBLIC SERVICE: Want to help? Want to practice your communications skills? Check with your local EC, who can explain the ARES program. You may wish to volunteer your time and skills. The SEC, N7DRT and I have his name and call if you need it. CLUBS: Each month I get newsletters from many of the Washington Clubs. There is a lot of information in them (items that would be interesting to the majority of most Washington Amateurs are placed in this column). If you are looking for friendship, common interest activities, the latest Amateur Radio news, etc. you might try visiting a local club. If you wish to join, and the club has a newsletter, you will get the latest information the club has to offer. Traffic: WB7WOW 345, W7LG 223, KR7F 126, N7GGJ 115, W7GB 77, K7SUX 58, W7IGC 56, K7GXZ 51, W7IEU 48, W7APS 43, N6EOZ 43, KA7TCE 19, K7AJT 18, N7GDW 15, W7LBK 8, N7FXM 4, no individual scores: KD7G, KD7ME & KC7PH. Note: There are traffic handlers who handle traffic each month, but do not want their calls or scores listed. Everyone does a great job, TNX. Congrats to all new Amateurs and up-grades. 73.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASM: W6ZF, N6DHN. SEC: W6LKE. STM: K6APW. Field Day messages were received from W6CUS, East Bay Amateur Radio Club, and K6LI, North Bay Amateur Radio Association. Many other section clubs were active in Field Day. K6APW will be visiting section clubs soon to explain the National Traffic System and encourage check-ins in our section nets. NBARA mourns the passing of member WD6FVF. EBARC newest Novice licensee is KB6LGF and member Tim Howe is watching the mails for his Novice license. They also welcomed new member WB6PIV, Gina Burke and Jeff Dalriki. LARK member W6OA is the current recipient of their JK Murphy Award for his work in helping aspiring "hams" get their tickets and maintain their interest. Their latest Klutz-of- the-Month Award went to AD6X. Traffic: W6VOM 153, WB6DOB 107.

NEVADA: SM, Joe Lambert, W8IXD—ASM: Curly Silva, K7HRW. New Field Appointments are KD7QY: PIO and NK7N: OO. Successful Field Day activity reported by FARS, NARA and TARA. SNARS now has the new IRS tax status as 501(c)3 club. SNARS is actively preparing their new hilltop repeater site with lots of donations from local hams. LVRAC hosted a discussion of ARES and RACES by representatives of those groups. The Reno Radio Store is now open. TARA reports successful Super Run II Communications support. For VE test info contact K7HRW in Reno and NK7N in Las Vegas. LVRAC has replaced its 450 MHz repeater on Tropicana Hotel. Southern Nevada ARES is holding training nets Tues. 7 PM on 145.39. Contact WB5PTO or NK7N for info. Congrats to KK4M on being appointed L.V. Stn. Mgr. for Sunworld Airlines. Make plans now for HAM WEST Nov. 7-8 in Las Vega. Contact W7IA or N7YL. If you have contributions for column, send them to SM.

PACIFIC: SM, Army Curtis, AH6P. Aloha and hafa adai to all of the Pacific. June was proclaimed Amateur Radio Month by Governor George Ariyoshi and by Hawaii County Mayor Dante Carpenter. Both of these actions were the work of PIA K1GAO. Sorry to report K1GAO has since moved back to W1 land. We'll miss Kevin and Linda very much. Also moving back to the big, big island is Frank, KH6DW from Maui. Frank was pres of MARC and an avid DX'er from Kihei. New MARC pres is AH6GR, new VP is NH6EV. Congrats! Maui also reports that ARES there has new agreement with County hospitals and nursing homes for commo. Very good work! Field Day activity from Kauai, Oahu, Maui, and the Big Island. Too soon for scores, but all had fun! W6ORS off to San Diego on a US Navy fast frigate compliments of the Navy League. Great fun! Traffic: KH6S 36, KH6H 14.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—STM: WA6WJZ. SGL: N6IG. ACC & TC: W6RFF. DEC North: KF6KJ. DEC Sierra: KA6GHI. SECTION NET: First Sunday each Month, 8 PM, on 146.085, Input up, Yuba/Sutter repeater WD6AXM/R. Net Control—W6IEW or W6RFF. Tahoe ARA not only reports public service in several races and 60 operators at field day, but at least one member has time for private interests. Paul, WA6EWV is soon to be married. For those who like to visit Tahoe, remember TARA also sponsors VE tests so the next time you go, plan to go on a test date and upgrade. Contact Curly, K7HRW at 702-972-3933. Other clubs reporting assisting in races and other public service activities are River City ARCS, El Dorado ARC, Sacramento ARC, Yolo ARS, Mt. Vaca RC, John I. Sabin Pioneer RC, Amador County ARC, Hangtown ARC and Golden Empire ARS. A recent graduate of GEARS Novice Class, KB6MQU is planning to build his own transmitter. That is great, more power to him—but it is interesting that it is so unusual these days that it is "NEWSWORTHY." The Amador County ARC had the Icom TS-430S Xcvr they won in the Club Challenge for the 80's contest in the emergency communications van supplied to them by the Department of Forestry at Field Day. They had a surprise visit from Director Stafford who was spending the weekend nearby in the gold country. Traffic: WB6CLD 311, N6LUY 277, N6CVF 156, WA6WJZ 145, K6SRF 99, WD6BZQ 52, WA6ZUD 36, W6RFF 27, WA6ERZ 12, WB6SRG 7, WD6EEZ 6.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. Asst. SMs: W6TRP, K6YK. Congrats to the Sonora Pass AR Klub (SPARK) on becomming an ARRL Affiliated Club. K6PDE, W6JBL, and WA6Z are SILENT KEYS. KA6BIM had the top phone score in the Pacific Division for the ARRL 10 meter contest. KI6DI is Extra. WB6AEM, KB6LBZ, and KB6JQT are General. KB6LWV, KB6JYL, WD6GVS, and KA6PTJ are Tech. WA6SHV is WS6Q. WA6KBK is WT6X. WD6GVS has a 1R 2400. W6ZZC has an IC 751. The Fresno ARC put new a Yaesu FT 757 GX and accessories and a FT 270RH in its Communications Van. The California QSO Party (CQP) will be Sept. 27-28, 1986. This is one week earlier than usual for this contest. The ARRL Pacific Division Convention is October 3-5, 1986 in San Jose. Traffic: N6AWH 184, W6DPD 27, WA6YAB 10, N6MXG 2.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: K6ITL. TC: WA6PWW. STM: N6JLJ. PIO: WB6NLA. ASM: N6JQJ & NS6N. ACC: W6MKM. BM:(vacant). OOCoord:(vacant). There was lots of Field Day activity in the section this June, as evidenced by the messages I received. Bill, WB6OML, has been VERY busy coordinating various public service activities, tnx to Bill for doing this demanding job. Many ARES members participated in the July 4 CDF Red Flag Patrol. Fortunatly, we had a quiet fourth. Welcome to NEW SCV STM, N6JLJ. For those of you who have not yet heard, we now have a new Section Traffic Manager (STM). He is Andy Cromarty N6JLJ. All ORS and other NTS traffic reports should be sent to him. Also, we have a new Public Information Officer (PIO). He is Bert Sacks WB6NLA. He will be working on getting good media publicity for amateur radio and will be available to help various clubs with publicity-related problems. Our newest ASM, Dave N6JQJ has been quite busy setting up the section ARES training database. If you've any ideas for training or if you'd like some info on what to do for training, call Dave. The San Jose State Amateur Radio Club has finally moved to new digs as the old ones are being dug up. No antennas up as of this writing, but there are plans...The section now has a slide show designed to explain and hopefully recruite new Hams. Call me (WB6W) if you'd like more info on it.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. OOC: K1PLR. SGL: KE4ML. Amateur Radio License Plate Bill—HB-952 received unanimous approval in the Senate Transportation and Finance Committees. Bill now awaiting full Senate approval and hopefully the bill will become law effective October 1, 1986. Hope to have full details in next months column. FIELD DAY followup: Record numbers participated according to large number of Radiograms received. W4BFB via WC4T reported that everyone forgot the key for CW contacts. Someone then made a homebrew key out of a stick, 2 screws, and a strip of metal from somewhere. It was described as a WOUFF HONG KEY. Congrats to SECTION NTS/ARES members for placing in top 10 sections nationally in SET. And to new upgrades: KB4EFF, WA4ORQ, WB4PMO, N4KJM, KB4RER, KA4APA, KB4TEX, KB4TEW, KB4TEY, KB4HDQ, WA4VMC. To KB4FKF new editor of HAM CHATTER (W4AMC Newsletter). To New League Affiliated Clubs: Chicora Amateur Radio Group, Lumberton Repeater Assoc., Union County ARS. To AA4MP new NM of CSN, to KB4OGH Asst. NM of CSN, to N4LST who guided CSN to new heights in 85/86. Thanks for a job well done, Bill. Stay ready for any emergency. This month is usually worst time of year for Hurricanes. Congrats to RARS, W4DW, newest Section Special Service Club and the new YLRARS. School is NOW open so DRIVE CAREFULLY. Now's the time to get your antennas ready for winter DX. Had great response to call for OOs in Field Organization. Now let's get some PIAs, IES, ORS. Traffic: K4NLK 405, NJ4L 230, WB4HRR 193, KA4EYF 156, K4JHF 154, AA4MP 102, KA4TLC 92, K4SWN 57, WB4WII 57, N4LST 52, WA4MNR 45, WB4N 43, N4NOY 40, KA4YMY 37, KI4YV 33, N4MQU 30, KB4OGR 29, W4EHF 25, N4JEO 22, K4IWW 21, WB4CYN 18, K4QXA 18, WD4RMQ 18, AK1E 17, N4MMM 16, WD4HTE 12, NT4K 10, N4LUO 9, WD0DQL 7, N4CJJ 5, N4KYD 5, N4NTO 5, N4LUB 3, N4UE 3, AK4H 1, (May) N4UE 7. Total (June) SARs: 36. Traffic: 1,987

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—Governor Riley proclaimed June 23-29 as Amateur Radio Week and the following amateurs were present to receive a Proclamation and picture of the signing: W1BNS, N4EMP, KA4FBS, W2GW, W0IKT, KI4JK, W4JZ, N4LOG. I thank these individuals for taking the time to support Amateur Radio during this important event. I received messages from the following clubs giving details of their FD activities: Anderson, Lancaster, North Augusta, Belvedere, Orangeburg, Rock Hill, Spartanburg, Sumter. If your club was active and does not appear above, there is always next year. DON'T FORGET! The Anderson and Blue Ridge Clubs have requalified as Special Service Clubs. CONGRATS to each! Keep up the good work. SoCarVOAD is planning to have a one (1) day meeting in Columbia in the fall of the year. Amateur Radio (ARRL) is an active member of this organization and we have been asked to have a display booth during this meeting. I will be expecting you to attend and help with the display - details will follow. Traffic: K4ZN 169, KB4BZA 87, W0IKT 86, W4ANK 44, W4FMZ 40, K4FRX 40, WB4UDK 38, KA4LRM 27, K4ZB 23, KA4YEA 20, WD4FJP 12, W4DRF 4, K4LYU 4.

VIRGINIA: SM, Claude Feigley, W3ATQ—By this time all should have returned to normal after a BIG Field Day. As SM, I have received 18 msgs from FD stations. Of these, 12 were received via Packet Radio indicating increased activity and interest in this mode. All msgs were taken from either the N4XG or WA4CCK Packet Bulletin Boards. This is an excellent way to contact me since I try to check these PBBS daily. KB4PW reports the Roanoke ARES group has installed a SKYWARN station in the National Weather Bureau building at the Roanoke airport. They plan to install similar facilities in the local Red Cross Disaster Service office. DEC, WA4RTS, reports the Lynchburg ARES active with plans to assist in the local Police Dept marathon, a Festival at their stadium and the Lynchburg Classic Band Competition. Thanks to the East River ARC for sending me a copy of their fine newsletter. N4EXQ, the State RACES Emergency Coordinator, reports that the amateur participation in the North Anna nuclear power station emergency drill received high praise from Federal, State and local officials. Both VHF and HF emergency nets were utilized in this drill. Through the efforts of W4NTG, N4XG, W4VOB, K4JST, KA4VHR, KJ4MF and WJ4X a Packet digipeater has been installed at Toano, near Williamsburg, using the call N4XG-4. This station should serve as a link between Packet circuits north of Richmond and the Tidewater Area. WA4RBC reports his new MFJ TNC is working fine. Upcoming Exam schedules are; Sept. 6 Williamsburg contact WJ4X, Sept. 7 Gaithersburg Hamfest, Sept. 20 Southwestern Va Wireless (Roanoke) contact KB4PW, Sept. 27 Richmond contact WU4G, Oct. 4 Sterling Park ARC. If you desire additional info on the Exam sessions contact the SM, W3ATQ. With the Hurricane season now in full swing, all ARES stations should be ready to serve in case of an emergency. All stations should check into their local nets to assure their equipment is ready to go and at the same time sharpen their communication skills. During an emergency is too late to learn how to communicate effectively. Packet stations should be checking into the local PBBS, so they will know the correct procedure to follow. Tfc flow for the month is about normal for this time of year with a total msg count of 3825 with 38 stns submitting reports. Once again N4GHI followed by N4EXQ lead the pack. Traffic: N4GHI 829, N4EXQ 536, W3ATQ 301, KB4WT 240, K4JST 188, WB4PNY 186, KB4NGO 172, AA4GL 157, WA4CCK 131, K4MTX 131, W4JLS 116, WA4LJI 95, WD4ALY 81, WB4KIT 69, AA4AT 66, K4JM 59, WD4OCW 49, K4VWK 41, NN4I 37, KA4IUM 36, NT4S 36, N8ANQ 33, KB4PW 31, K4GR 29, WB4ZNB 27, K4AXF 26, W4TZC 25, WB4EDB 20, WB4UHC 19, K4MLC 12, N4KSO 11, N3RC 10, N4FNT 8, WA1VRL 8, WA4TVS 4, K4BGZ 2, NW4O 2, W4YE 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. ACC: WA8CTO. TC: K8CG. SGL: K8BS. Rept Coord: WB8GDY. K8LG was selected as outstanding amateur for 1986, congrats Mike. 1985 F. D. winners were MARA, 1st prize at Jax Mill Conv. was won by K8BS.

Conv was very nice and a good time was had by all. Congrats to W8AH and entire Committee. Net Mgr positions were filled as follows: WVMD W8FZP, WVRN K8LG, WVN KZ8G, WVNN WD8LDY. W8YP reported nice growth in WVFN. WD8KOI is now extra class. Congrats to all who upgraded at Jax Mill.

Net	Time	QNI	QTC	Sess.	NM	FREQ
Hillbilly	Noon Su	154	27	5	W8YP	14290
WVFN	6:00	602	219	30	W8YP	3865
WVMD	11:45	539	29	30	W8FZP	7235
WVRN	6:30	181	25	30	K8LG	3639
WVNN	5:15	150	31	28	WD8LDY	3730

Traffic: W8YP 214, WD8LDY 174, K8TPF 140, KA8WNQ 112, W8FZP 81, K8UQY 73, N8GJO 63, K8KT 61, KE8FI 47, KA8TIK 37, K8QEW 35, KD8G 25, KA8OGF 12, N8FXH 11, N8CG 9, WB8BMX 9.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: W0RSG, KA0MOA. SEC: WB0FQB. STM: N0DZA. OO: W0ACH. ACC: WB0DUV. PIO: N0FOE. SGL: WD0GQL. TC: NC0F. BM: KA0CZW. Well summer is just about gone and we have had many activities throughout the state. Swapfests and picnics, not to mention Field Day and numerous public-service events. The State Convention was well attended. Congrats to the host club RMRL and their chairman N0FIK for a job well done. Communications for the Jerry Ford Charity Golf Tournament for the second year had packet radio utilized with communications handled by both the Western Slope and Eastern Slope. Congrats to N0BRI and ECHO for their organization of this event. Congrats also to PPRAA for the communications handled during the Pikes Peak Hill Climb. It is once again time for ECs and ARES along with NTS to be thinking about SET. Our Section and local nets did extremely well last year placing 5th in the nation...let's try to better that this year, a reminder that your SET reports should be sent to the SEC: WB0FQB & STM: N0DZA. 73, KQ0J. NETS: Col: QNI 608, QTC 42-Inf 84, time 958. 25 sess. CWN QNI 76, QTC 44, Time 328. 26 sess. CWXN no totals. HNN: QNI 1647, QTC 99-346 Inf, Time 1310, 30 sess. NCTN: QNI 302, QTC 92, Time 376, 29 sess. SCTN: QNI 159, QTC 13, Time 152, 17 sess. Traffic: WA0OYI 266, N0DZA 82, WD0BSZ 74, KB0Z 70, W5HRS 37, KQ0J 31, W0NFW 29, KA0NLI 22.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 120 msgs with 184 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 60 msgs with 1169 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 87 msgs with 780 stations in. Yucca 2-mtr Net 78/18 handled 16 msgs with 414 checkins. Caravan Club 2-mtr Net 66/06 handled 33 msgs with 180 checkins. SCAT 2-mtr Net 66/06 handled 8 msgs with 617 checkins. FD a big success with good WX and lots of participation. KE5VH is new president of W5ES Club in El Paso. Traffic: ND5T 432, W5DAD 86, W6SX 57.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Field Day, as in past years, was enjoyable for our group—hope all the Utah groups had as good a time as we did. Packet radio continues to grow in Utah, with more than 85 stations on the air, and several mountaintop digipeaters on— including KD7YK-2 at Snowbird, WA7GTU-2, -1 north and south of Cedar City, and K7EA-1 on Pix Peak near Salt Lake. Several Bulletin Boards are on as well, including WA7UZO in Salt Lake. 73 de NA7G. Traffic: K7HLR 192, WA7MEL 70, WA7KHE 64, NS7K 31, W7OCX 17, NA7G 14.

WYOMING: SM, Dick Wunder, WA7WFC—ASM: KA7AWS. SEC: W7TVK. STM: NS7X. Field Day was fairly active with the following clubs reporting to SM: Cedar Mtn. ARC, SHYWY ARC, Casper ARES/RACES, Sweetwater ARC, Sheridan RAL, Campbell Co ARC. Also participating were W7HLA, K7MM, and NA7R. NS7X reports 2 new Novices in her family for a total of 8 Hams in the family. NN7H reports the Rawlins exam generated 8 new Novices and 2 new Techs. Will pass on calls as they come in. I would like to thank NS7X, Mary Ann Lenth, STM, for her help and guidance in the Traffic field. Mary Ann is leaving the Section, but we hope to have her back in a year. WCBN held 21 sessions, 755 QNI, 8 QTC. Traffic: NN7H 150, W7HLA 41.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith, Jr., WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. TC: N4AU. ATC: WB4BYQ. ACC: WA4RNP. It's time for the Mobile Hamfest, and I hope to see many of you there this month. I want to find out if there are enough packeteers in the state that would be interested in establishing a packet radio section net. If you are interested pse give me a shout. Here is a list of the "nets" on the HF bands in our section pse check in. AEND—Slow Speed CW—3725 at 5:30 pm local. ATNM—Voice Traffic Net—3965 at 6:30 PM local. AENB—CW Traffic Net—3575 at 7:00 PM local. My thanks to all the clubs who send me a copy of their newsletter as it helps me let others know what you are doing. If your club doesn't have a newsletter would you please send me any info that would be of interest to others. Traffic: CAND reports 554 messages passed in 30 sessions with Alabama rep by WA4JDH and W4CKS. DRN5 reports 647 messages passed in 60 sessions with Alabama rep by WA4JDH, W4CKS, NW4X, and W4WJF. AEND reports 65 messages passed in 30 sessions with other nets rep by WD4NYL, WA4JDH, KC4MG, W4CKS, N4DCS, N4CBK, and NW4X. AENB reports 51 messages passed in 30 sessions. Brass Pounders League: WA4JDH. Public Service Honor Roll: WA4JDH, W4CKS, and WA4RNP. Totals: WA4JDH 880, W4CKS 155, WD4NYL 51, K4AOZ 39, WA4RNP 36, W4WJF 24, WB4TVY 6, W4DGH 6. Very Seven Three. Joe

GEORGIA: SM, Eddy Koscbucki, K4JNL—ASM & BM: K4VHC. SEC: NC4E. STM: W4PIM. ACC: WA4ABY. OOC: NA4I. PIO: WA4PNY. SGL: W4BTZ. The section had a gud FD turnout, remember get your forms in ASAP & let's see how each of u scored this yr. Are u a ham & attend the Univ of Georgia? If so KB4JCI is trying to start a UGA Ham radio club. After Sept 25 contact him at 404-542-5333. Ga Tech has a FB club, why can't UGA. As I told u before, I have a new deadline to meet with my reports. PSE get ur PSHR Reports to me by the 5th. June had W4PIM, K4MOG & W4HON agn making the necessary points. If u are an SSC club remember u must qualify each yr. Several in the section still haven't sent in the paper work they received from ARRL. Pse get in touch with ur club officers. If u hold an ARRL appointment u must keep up ur League membership. Recently I had to cancel some for this reason. Whatever rate u come under still is cheap, remember who else is there that helps fight for what we face day to day in this FB hobby. Once agn I want to thank the members of GARS for their hospitality & fine food during my recent club visit. If u have the desire to go on a DXpedition contact Bob. K4UEE & he'll put u in contact with someone who is planning one. Might be a lot of fun. Once agn I want to thank all of the clubs & groups that send me their monthly bulletins. It's vy enjoyable reading & the efforst that are put in by the editors must be commended. So the next time u talk to ur local writer thank them for a job well done. Well fall is here so maybe we can get rid of the heat that we've had all summer. Be an ELMER & get some young person interested in AMATEUR RADIO. We need them. Traffic: W4JWO 131, W4PIM 101, K4MOG 89, W4WXA 80, W9HXC 50, KF4FG 41, W4HOH 37, K4NM 23, WB4DVZ 22, K4BAI 20, N4UZ 20, KA4HHE 19, K4EV 18, N4MWR 14, AA4JV 8, KC5VH 6, W4OHH 5.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—BM: KB4LB. ACC: N4ADI. SGL: KC4U. TC: N4KF. OO: K4JJE. STM: WB4GHU. PIO: WA4PUO. SEC: WA4PUP. By now each Affiliated Club in the Section should have had a letter requesting names of a candidate for the ACC position. It would be great if we could have one from the North-Central or Northeast areas of the State. Our other volunteer positions are fairly spread in the Southern and Western portions of our State. Your SM is looking to hear from more of the clubs in the Section. There are now 31 of them. HQ and I have had to remove a few clubs because they have not sent in the Annual Reports which is one of the criteria for maintaining an active status. There is a two or three-year grace period, but some clubs have not responded. If you need an Annual Report form, let N4ADI know. The CLARC has been recognized for it's 100% ARRL membership. We congratulate this active SSC and hope they keep up their excellent service to their community. A Certificate of Affiliation has been presented to a new club Holmes County Ham Club with Ewan, N4LMI as President. We wish them many good years of service to their community too. BARS Pres. for '86 is Ed, WU4R. CFDXA pres. is Dan, N4SA and CARC Pres. is Will, N4KNN. We hope these clubs have an active and fruitful year. By now we have passed our 1986 FD and we have heard from a number of clubs from their FD sites all over NOFL. It will be several months before we learn who the winners are, but anyone who was active on that weekend was a winner in my sight. To be out there helping to set up antennas and stations as well as those who operated and logged. You all are winners. Traffic: WX4H 529, N4PL 518, WB4ADL 389, WA4OXT 321, KB9LT 211, KC4VK 187, KD4KK 161, WC4D 150, WF4Y 150, WD4IIO 120, KB4LB 109, AA4HT 94, N4GMU 86, N4ADI 85, KF4U 75, KF4TM 59, N4JAQ 55, WA4EYU 55, W4KIX 53, WB4TZR 46, KB4FIY 44, KA4KAH 36, NQ4P 24, KI4CO 24, N2AOE 22, N4EDH 21, W4DTV 20, NS4C 20, WBIM 16, WA4SXW 14, WA4PUP 14, WD4HBP 12, W7YWF 11, WB4RJI 8, KJ4HS 7, KF4GY 7, WB4AWG 5.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OO: W4SS. ACC: WA4NBE. Very sorry to hear that W4IYT suffered a stroke but so relieved that Andy is recovering so quickly—he has already checked into Gator Net! WD4KBW, Bulletin Manager, reports 34 bulletins received and 43 sent during June by AA4BN 14, W4DL 27, WA4EIC 2, KA4GUS 10, K4IEK 6, W4ESH 2 and WD4KBW 15. I received a radiogram on June 14 from WD4KBW telling me that he is now active on packet with Packratt 64 using VHF and HF—On June 21 I got a phone call from him telling me that his station was hit by lightening and ALL station equipment was severely damaged and that he will be off the air for as much as two months. WA4NBE traveled to Tampa to present a 50 year plaque to the Tampa ARC. W4DVO sent his ORS certificate in for endorsement and also said that he is now a 50 year member of ARRL. Congrats to the South Brevard Amateur Radio Club which has been officially renewed as a Special Service Club. The long skip and band conditions that QFNS has experienced the past several months has prompted KA4FZI to refer to QFNS as the 8 PM DX Traffic Net in the Bad Band Era! QFNS had a London, England station call net control one evening! WB4WDK writes that he has been elected President of the Highlands County ARC. WB4WDK also stated that local hams have been active in providing communication for the Sebring Bicycle Races, the Precision Aerobatic Contest as well as the March of Dimes Walk- America. Field Day messages were received from the Amateur Radio Association of Southwest Florida, BSA Communications Post 177, South Florida Hamsters, Ft Myers ARC and the Tampa Amateur Radio Club. Many thanks to Steve Ewald, Assistant Public Service Manager, who called me on the landline to get my entire set of May reports which had been lost in the mail. I read and he wrote for forty minutes! K4SCL sent word that he is vacationing in Houston, Texas the first couple of weeks in July. KA4FZI, manager of QFNS the past year, has each month focused on a net member for the Florida Skip article—this month's focus is QFNS. A partial quote of her Florida Skip article follows: "This month's focus is QFNS herself. Earliest information dates back to 1968 when she was named "Novice Hurricane Net" and met only on Saturday and Sunday afternoons on 7165. Her managers were WB4DDO with N4TW assisting. The next records begin March, 1976, when, as QFTN, a decision had to be made whether she would be a code practice net or traffic net. It was decided at the March Orlando hamfest to affiliate her with QFN. This took place May 1, 1976. W4WZR was manager then. In July of 1976 WB4GHU became net manager, and WA4JPW/KM4G was the first station to qualify for a net certificate from the newly organized QFNS. Net managers since then are: 1977 KM4G, 1978 WD4LUG, 1979 WA4PFK, 1980 WD4DNC, 1981 KA4LNA, 1982 WA4OXT, 1983 KA4AMC and AF3S, 1984 WB4YQP, and 1985 KA4FZI. To this date, QFNS continues her traditional role of service to ALL hams, novice to extra as a traffic handlers training net with great code practice as a side benefit. She now heads into the 1986 year with a bright outlook for many more challenging years serving Florida's amateurs." A further note— WA4QXT has been appointed QFNS manager beginning July 1, 1986. WA4QXT will be on vacation for one to two months so he has asked KA4FZI and WA4PFK to help oversee the net in his absence. KB9LT will take net reports for relay to WB4GHU. I have asked KA4FZI to accept official responsibility for maintaining the history of QFNS—if anyone can supply additional information please contact her via radiogram. 73 de WA4PFK. Traffic: W3CUL 3031, W3VR 982, WA4PFK 436, K4SCL 210, K4ZK 187, KA4FZI 181, WB4WYG 141, KF4JA 135, WA4RUE 124, K4EUK 115, K4IA 112, AA4BN 90, N4KB 89, KA4GUS 88, KY0T 74, W4DL 72, N4KFU 69, KA4NXF 68, KF4RL 59, KA4SIH 56, WD4KBW 56, N4JOA 48, W4TAH 48, N4HAS 48, W3TLV 45, N4ET 39, KA4YHS 37, KB4LKT 37, N4MXH 34, N4MML 33, KB4MON 31, K5IHH 30, WB4GCK 25, KI4ZW 21, KB4LPL 19, KY8Y 18, W4ESH 16, WA4HXU 15, K4BLM 14, W3IJR 14, K4OVC 12, W4WYR 10, WK4F 10, KA2DAY 9, WA4EIC 8, K4IRT 7, KA4KDD 7, WA8BQM 7, W4MPV 6, N4ILN 6, WA9VND 6, W4MFD 6, WD9AEP 6, WD4MCC 6, KA4GDU 5, KA4JHM 4, KA9AKY 4, KB4EWO 2, W4WGR 1, AA4CH 1, W4DWN 1.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K6LL, KA7HEV, WB7CAG. Field Day in AZ Section was a great success again this year. Your SM received FD messages from: Scottsdale ARC—K7TR; Desert Corps—AA7A; Flagstaff group—N7FU; Mogollon Monsters—KE7GR, Green Valley ARC—W0ROD, QPRC—W7GV, Arizona AHC—W7IO; and our national HF SS contest winner, K6LL, with twenty-five ops in Yuma. Heard other groups operating, some from mountain top locations. Excellent preparation for future emergencies. Pima County DEC, K7KYW is recruiting GVRC members for A.R.E.S. Walt has appointed two new ECs in GV; K8TXT and KB0KP with WB6TYP repeater as OES. Congratulations. Tucson Rptr Ass'n reports new 146.22/82 machine on the air with a brand new controller and autopatch, spearheaded by KB7JM. New Arizona YL group to be called "Cactus Keys"

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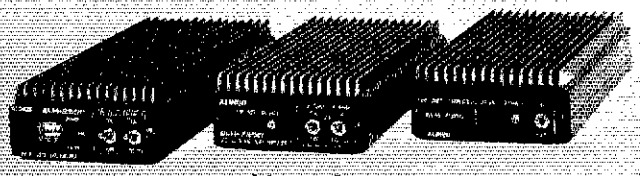

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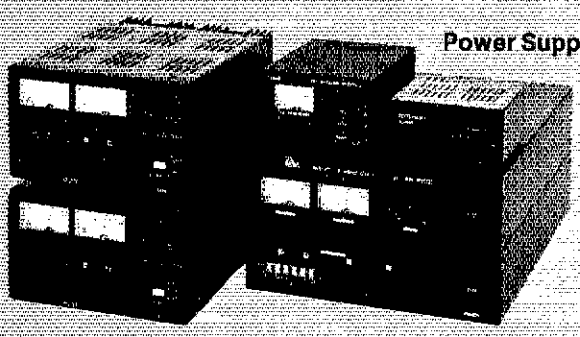

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ICOM

Noise Blankers: Some Work Better Than Others

As many of you know, ICOM America displays and discusses amateur equipment at numerous conventions around the country. One of the most interesting questions received during those times concerns apparent differences of noise blanker performance in today's receivers and transceivers.

ICOM feels such inquiries hold importance to the full amateur community because even the same model of transceiver can exhibit noise performance variations in different locations, plus a unit's overall design cumulatively affects its noise blanking abilities. Antenna types and noise sources also fluctuate between setups, and each amateur habitually adjusts a transceiver's controls in a slightly different manner.

Combining all of those factors sets the stage for mentally categorizing some noise blankers as "good" or "bad" according to personal experiences. The Tech Talk's purpose is to help all amateurs to understand their equipment's abilities and limitations in noise reduction. While ICOM is confident its units offer maximum noise immunity, let's discuss the facts and let you decide for yourself.

Unlike older style amateur equipment that used basic pulse limiting circuits, modern receivers and transceivers include an independently operating and very effective noise blanking section. Two or three amplifier stages in this section are controlled by a noise derived AGC. Their output is processed and used to control the operation of a noise gate located between a receiver's I.F. stages. During the precise time of each noise pulse, that gate reduces or "gates off" I.F. signal flow to prevent interference. This action might be visualized as a separate section within a receiver that's continuously seekng noise and instantaneously interrupting the receive path to sidestep detection of that noise.

Numerous factors affect the performance of any unit's noise blanking section, and each situation has its peculiarities. Pulse type noises such as those produced by an auto's spark plugs or intermittently arcing AC power lines can usually be blanked quite effectively. Continuous noises such as band hash or constantly arcing power lines seldom leave listening gaps in which receive signals can be heard (there are no "quiet times").

Modern noise blankers are great items but they are not magicians. Few noises are so strong and constant they can't be reduced to an acceptable level, however, low noise levels are easier to blank than high noise levels. Herein lies the "combat zone" and the more advantages we have, the greater our chances of overcoming the noise foe.

Shifting the odds in our favor begins by minimizing noises **before they reach a receiver's antenna terminals.** This includes separating antenna and noise sources and/or using their pickup/radiation patterns (and "end effects") to minimize noise reception.

The noise reducing ability of any receiver or transceiver is directly related to its overall circuit designs and operating flexibilities. First and foremost is a noise blanker control that can be adjusted for inserting only enough blanking action to minimize the "noise of the day" (and band) without adding distortion or intermod from too much blanking action (which, incidentally, might actually increase noise). **Effective and fully adjustable noise blankers are included in all ICOM HF transceivers.**

Selectable RF preamplifiers that can be switched in/out of use are also ideal for combatting noise conditions. Increasing or decreasing a receiver's "front end gain" gives the optimum signal to noise ratio even **before** a unit's RF gain control is considered. These features are **also included in ICOM's HF transceivers.** Finally, the effects of ICOM's Passband Tuning (which further narrows bandwidths when off-center tuned) and IF Notch control (which also functions electrically "before" audio stages) can be utilized to minimize even constant noises and assist noise blanker action.

When all of the previously mentioned features are combined, ICOM's units truly reflect modern technology and support its opinion of being "Simply the Best". Shouldn't you, too, be enjoying the **"ICOM advantage?"**

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Options Available. Options for the IC-751A include the IC-PS30 external AC system power supply, IC-PS35 internal AC power supply, IC-AT500 antenna tuner, IC-EX309 microprocessor interface connector, SM-8 or SM-10 desk mics, IC-2KL linear amplifier, RC-10 remote controller, SP-7 or SP-3 speakers, IC-EX310 voice synthesizer and GC-5 world clock.

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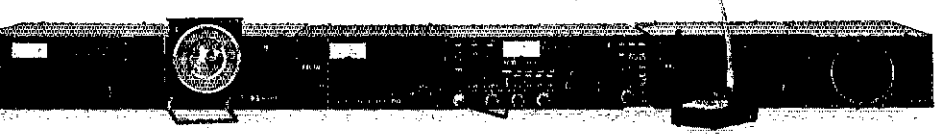

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is being formed with first meeting held at Ft. Tuthill hamfest. Interested licensed YLs can contact Marilyn Waite, N7DFH. Praises and congratulations are still pouring in for the three hundred-plus Arizona hams who volunteered and participated in "Hands Across America." Though no serious emergencies or accidents occurred, those of you who were there demonstrated the finest spirit of unselfish service to your fellow citizens. Ham radio coverage was spectacular. You were noticed! Thanks... A new packet radio repeater N7CL is now operating on Mt. Bigelow on 145.15/down 600. This again links the Phoenix areas with Tucson and further south, and it's working like crazy! KH6PP was the sparkplug. Congrats. Also, congrats to Sam, K2DNR, who is the single op leader for 7th call district in 1986 VHF SS contest. From IBM "Sparks," NN7D reports the Coconino ARC now had a twenty meter rhombic antenna. Must be nice to live in the wide open spaces! Coconino A.R.E.S. net meets Wednesday at 1900 local time on 147.08 repeater, or 146.52 simplex, when repeater not on. Thanks, Bruce, N7CEE. OPRC had an "Old Timer's Nite", and quite a few OTs showed up. Some of the stories told about the "early days" were fantastic. About the time you read this we'll be getting ready for the ARRL National Convention at San Diego Sept 5-7. Hope to see many of you there...73 Jim.

NET	SESS	TFC	MGR
Southwest Net	30	115	K6LL
Cactus (HF)	30	113	WB7CAG
Cactus (VHF)	30	85	WB7CAG
ATEN	30	97	KA7HEV

Traffic: KA7MUL 394, NS7C 220, KB7FE 154, W7EP 141, WB7CAG 86, K6LL 78, W7GAQ 65, KA7HEV 51, N7ETP 18, W7KXE 7, K7NMQ 4, WA7KQE 4.

LOS ANGELES: SM, Bob Poole, AJ6F—ASM: K6IYK. SEC: AK6Y. STM: W6INH. ACC: KX7Q. OOC: K6BMG. TC: WBØQPO. K6BMG and WBØQPO are recruiting heavily in the areas of Volunteer Monitors and Assistant Technical Coordinators, respectively; contact Russ or Al for further information. I regret to pass the word that Bob Bright, WA6AQQ, became a Silent Key June 24th; Bob will be remembered as a supporter, an active ham and just a very pleasant person...SK. I QSL the following Field Day reports thru packet radio: W6SD, W6CN, W6QFK, K6ZT and K6AA (in spite of the technical problems with the SM's mailbox). First time, as far as I can tell, that the SM collected FD messages this way as well as the more conventional methods (including W6TRW and W6VIO). W7CB, Larry Miller (same rascal that won the 94D at Visalia), has thrown in the towel as an educator; congrats, Larry, and hope to QSO frequently. Our latest affiliated club is the Mountain Repeater Association; MRA sponsors the 224.48 repeater at Contractor's Point; welcome! WA6TIU, WA6PHS, KE6FL, N6HEK, WA6YSK, KI6Z, WD9AXE and KE6B did a bang-up job in the June 15 Dad's Day/Big Brother 10k in Hermosa Beach (TNX WA6MZV). W6FNO/R is again in the news for their handling of emergencies in the area; the top five reporters were: WA6UUV, N6AHT, K6IDU, KA6ZDL and KB6HJW. The San Gabriel (W6QFK) club has a LONG list of Elmers for your questions; contact W6VIF for details (PO Box 88, Monrovia, CA 91016-0088). The Downey club sponsors a paper/aluminum drive on a continuous basis; contact DARC at 12708 Glynn Ave, Downey, CA 90242. The W6SD net (San Fernando area) meets Thursdays on 147.735 (-); give a listen and check-in. Anecdotes for W6NAZ's book are still being accepted; call or write Lenore for the details. DX'ers are encouraged to submit material for the SoCal DX Club bulletin; please contact Don, NK6A with your input (12567 Brooklake, L.A. 90066). Thanks again to W6TRW for inviting me to their July meeting; it's always a pleasure to visit their club. Independence Day found the Palos Verdes ARC out among the Rancho Palos Verdes residents (and visitors) who were in attendance at the Country Days activity; PVARC presented an exhibit of amateur radio to the public. W6VPZ/6 the ASD branch of the growing Northrop RC, put on a great effort in the first IARU HF Championship; nice work folks. What a list of affiliated club reports: W6KA, N6ME, W6GNS WB6JHC, Marquardt, W6TRW, K6GIP, W6JW, W6NRY, W6QFK, WB6WKF, PVARC, K6OX SoCal DX Club, Sam's Radio Hams and W6VPZ; thanks for the reports from me and KX7Q! A very nice group attended the SOWP DINNER in Downey this last month. Don't forget to get your shoes ready for the big convention in San Diego in September. There will be lots of our gang there. Traffic: K6UYK 541, W6INH 132. N6LHE 99, WB6VPY 27, W6NKE 17.

SAN DIEGO: SM, Arthur R. Smith, W6INI—PIO: KG6LF. TC: N6NR. STM: N6GW. SEC: W6INI. San Diego FCC office now located at 4542 Ruffner St., Rm 370, San Diego. Same phone number. The Palomar ARC meets on first Wednesday in cafeteria of Lincoln Middle School, corner E Vista Wy and Escondido Ave., Vista, at 1930. Visitors welcome. The club operates three repeaters on Palomar Mtn: 146.73(-), 449.425(-), 145.05 (Packet). PARC also sponsors the N County Traffic Net, daily at 2000 on 146.73(-). This net provides entry into NTS. ARES 75 m Section Net meets at 0900 each Sunday on 3.905 MHz. This net carries ARRL Official Bulletins, WESTLINK, and general ARES info. All ARES 75 m stns monitor. Net Mgr: K6DBJ. Net controls: K6DBJ, KS6L, WB6LLO, W6QLJ. At 0915 District nets meet on 3905 MHz (Central), 3.910 MHz (Southern), 3.925 MHz (Eastern), 3.930 MHz (Imperial). At 0845, 3.920 MHz, Tri-city, Escondido, Poway Districts (formerly Northern District). Upgrades: KB6DIH, N6MOY to Extra. WB6IPT, WA1WTF to General, KB6MQG, KB6NTW to Tech. N6MRR is new editor of the Counterpoise, newsletter of the ARC of El Cajon. NCTN met 29 times, handled 106 msgs. Traffic: N4KRA 55, N6GW 44, KU6D 28.

SANTA BARBARA: SM, Byron Looney, K6FI—It is very important that you register with your County Emergency Services if you expect to participate in ARES/RACES work. VIPs are OK so far as CDF is concerned but should register with county OES for other emergency work. This affects your liability and workmen's comp status under the state code for volunteer workers. See your July/Aug SBAR Newsletter for more info. N6LFJ has received the Top Flight Operator award from YLISSB for the month of May. Congratulations, Marilyn. Many stations in section on for FD but messages to SM indicate you should include FSD-218 in your preparations. Better yet, try handling some messages with one of our traffic nets. See you in San Diego? Traffic: K6YD 41, N6HYM 17.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst SM/ACC: NI5V. STM: AE5I. BM: W5QXK. SGL: W5UXP. PIO: K5HGL. TC: W5LNL. RFI: WB5JBP. I have just returned from our ARRL State Convention at San Antonio. This year it was held in conjunction with the Texas VHF FM Society summer meeting. An informative program, highlighted by our league president, Larry Price, and our Director, Ray Wangler, featured topical subjects of interest to all facets of our hobby. Lots of fine fellowship and fine hospitality. One item of interest to repeater operators is that frequencies will now be coordinated on an annual basis. This will assure that the latest info on the technical specs of each machine are readily available and that any inactive repeaters will be decoorinated in a timely manner, giving someone else a chance for the frequency. This will all be included in a master data base for FCC use in interference cases involving uncoordinated machines. A tremendous task taken on by our Texas VHF FM Society; most deserving of our financial support through membership. My apologies to Paul Gilbert, KE5ZW, who changed call signs, and I failed to make the data base changes! All is now well, Paul! Field Day reports from Ham Assn. of Mesquite, Garland ARC, Arlington ARC, Metrocrest ARS (Carrollton) and Dallas ARC. I hope you all did well and had lots of fun in the process! Sorry the April and May ltrs. was omitted from the column. Error has been corrected! PSHR for June: KA5QYV, AE5I, K5EVI, KA5SPT and W5VMP. Traffic: W5TNT 382, N5BT 240, WB4HML 220, KD5RC 154, W5VMP 138, W9QYL 135, K5EVI 74, AE5I 66, KA5QYV 20, N5HEN 20, WA5EZT 14.

OKLAHOMA: SM, Dave Cox, NB5N—ASM: K5WG. SEC: W5ZTN. STM: KV5X. ACC: NJ5Y. BM: W5AS. PIO: WD5IFB. OOC: K5WG. SGL: W5NZS. TC: W5OMJ. Ham Holiday '86 is now history and no doubt carried the Division Convention banner well. To recognize the valuable service that we amateurs provide to the citizens of Oklahoma, Governor Nigh proclaimed the week leading up to HH86 as "Amateur Radio Appreciation Week", thanks to Larry, W5NZS, our SGL. Get well wishes go out to Joe, WA5ZNF, C&E editor. And many thanks to Joe, K5JB for all the hard work he put forth to see that the C&E went out on schedule. Its official now—EARS received final approval from the ARRL Executive Committee to become the third Special Service Club in the OK Section. Also congrats and welcome to the Rogers County Wireless Assoc. and the Wheat Straw Radio CLub for their recent approval as ARRL Affiliated Clubs. Ray, W5EDZ, West Gulf Dir., has appointed WB5CDW as an Asst. Dir. for northeast Oklahoma. Feel free to give Ernie a call regarding ARRL policy matters. Six weeks and counting. Thats how much time I have left in my term as SM. Then I get to become reacquainted with my family and return to a normal life. All appointees should begin reporting to the new SM October 1st. Traffic: W5AS 240, K5CXP 216, NQ5W 152, WB5SRX 136, WB5OHK 116, KV5X 90, WA5OUV 82, W5REC 71, NB5N 44, W5RB 44, WD5IFB 33, N5IKN 33, KA5WGS 32, W5VHP 30, K5GBN 29, WA5ZOO 25, W5VLW 25, WA5OGC 23, NX5E 20, K5CAY 17, W5VOR 13, NQ5Y 5, N5DWN 5, AA0O 5, ND5S 4.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—SEC: KA5KRI. ASM: N5TC. STM: K5QEW. OOC: WA2VJL. BM: W5OVH. SGL: K5KJN. ACC: KS5V. PIA: WA5UZB. June saw Hurricane Bonnie hit the Gulf Coast near Port Arthur. It also saw Amateurs from all over the states of Texas and Louisiana on the air ready to help. The list of calls I copied is much too long for this column. THANKS A MILLION, GANG! PIA WA5UZB has mailed each of the 49 ARRL affiliated clubs information packages and applications; each club should have a PIA to help us blow our own horn; how about putting WA5UZB on the mailing list for your club bulletin? The Brenham ARC has begun issuing a bi-monthly club bulletin; quite an active club, sponsors an Explorer Post and other youth activities, packet radio, repeater with phone patch and speed dial; that first issue bulletin is a jewel and worth reading; GOOD LUCK! Houston ARC has new officers: WA5F, Pres; WD5GNI, VP; NC5A, Treas; N5AYX, Membership; WA5ARI, Programs. El Paso ARC W5ES, has a batch of new calls: KA5ZLX, KA5ZIU, KA5ZLP, KA5ZLO, KA5ZJP, KA5ZKP, KA5ZLR, and KA5ZOU; also reports W5RO received 50 year ARRL Membership plaque. CAND Mgr W5KLV reports 554 messages in 30 sessions; DRN5 represented 100%; STX stations helping were W5AC, K5WOB, NS5V, KD5KQ, N5DFO, WB5FQU, and WB5EPA. San Antonio ARC bulletin reports plenty activity in June; heaviest rains in 65 years had hams literally immersed in emergency work; some waded into swollen streams to check bridge clearances and depth at flooded crossings; TV Channel 5 weathercaster gave the Rainfall Net high praise; there were Hams at National Weather Service office, at club station W5SC, at two Red Cross centers; a few days later a railroad derailment caused escape of noxious fumes through fire and seepage; again, too many calls for the space available. OBS W5KLV reports 4 bulletins, 30 satellite bulletins, 5 propagation forecasts. 4 DX bulletins, 3 CRRL bulletins given 157 readings on 8 nets. CHARRO and TSARC in the Rio Grande Valley had successful FD exercises; this SM received a record number of FD messages. DRN5 Mgr WB5YDD reports 647 messages in 60 sessions; STX represented 100% by W5CTZ, NX5V, KD5KQ, WD5Z, N5DFO, AC5K, W5KLV, W5TUK, WB5EPA, WB5FQU, WA5ZJY, and WB5YDD. Traffic: WB5YDD 333, W5KLV 245, AJ5K 232, W5CTZ 164, W5TFB 120, WD5GKH 117, WA2VJL 110, WB5EPA 81, WB5FQU 71, AC5Z 41, W5BGE 30. (May) WA5UZB 6, NZ5J 2.

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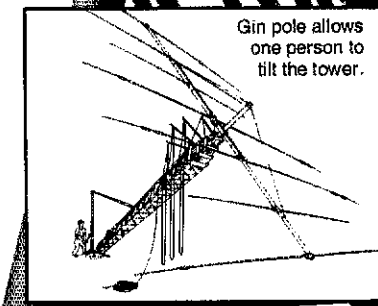

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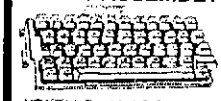

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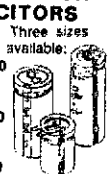

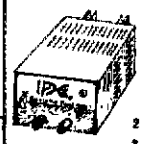

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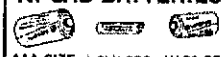

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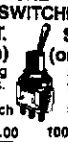

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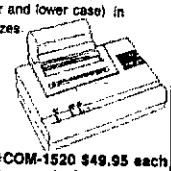

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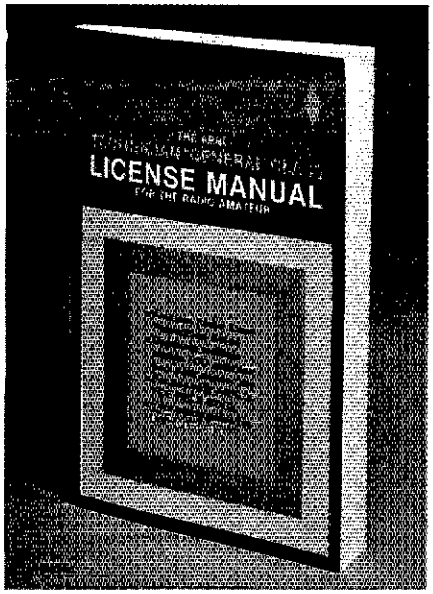

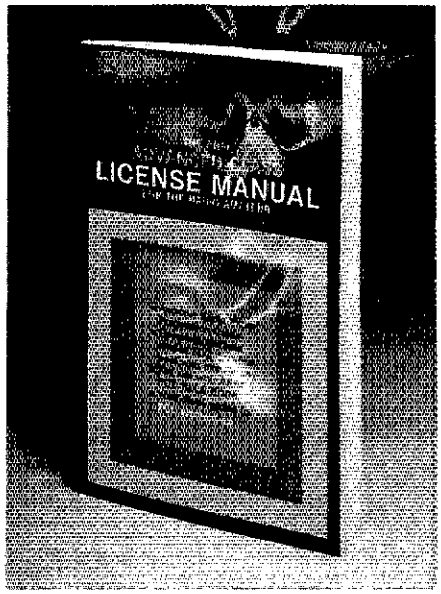

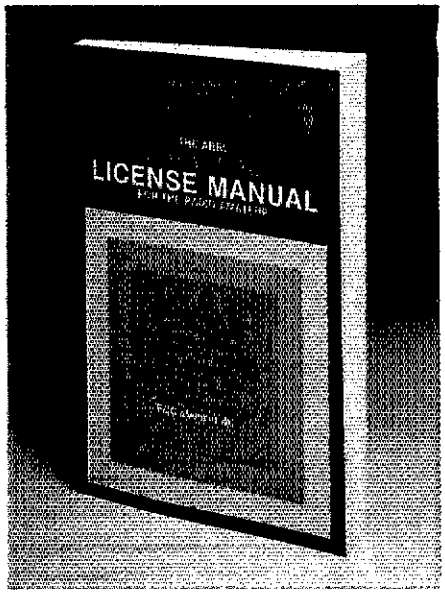

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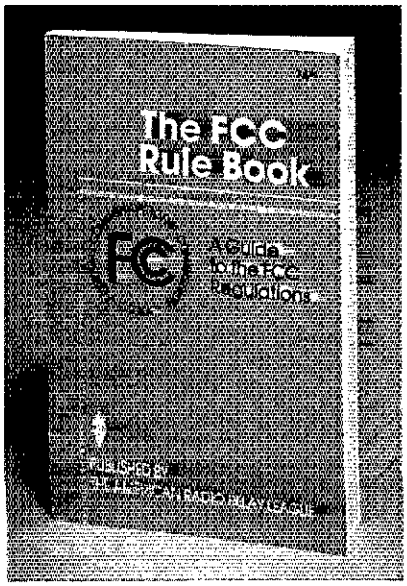

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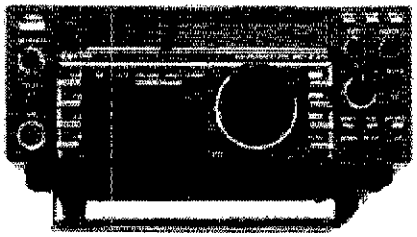
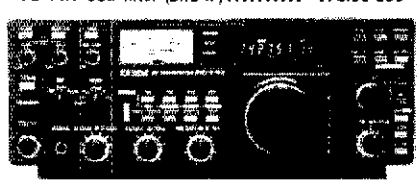


HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	999.00	849.95
PS-55 External power supply	199.00	179.95
AT-150 Automatic antenna tuner	445.00	359.95
FL-32 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	899.95
PS-35 Internal power supply	199.00	179.95
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
EX-243 Electronic keyer unit	56.00	
FL-45 500 Hz CW filter (1st IF)	66.50	
FL-54 270 Hz CW filter (1st IF)	53.00	
FL-52A 500 Hz CW filter (2nd IF)	108.50	99.95
FL-53A 250 Hz CW filter (2nd IF)	108.00	99.95
FL-44A SSB filter (2nd IF)	178.00	159.95



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	999.00
IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	1399
PS-35 Internal power supply	199.00	179.95
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99.95
FL-53A 250 Hz CW filter (2nd IF)	108.00	99.95
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

Other Accessories:	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	169.00	154.95
PS-30 Systems p/s w/cord, 6-pin plug	299.00	269.95
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
MB Mobile mount, 735/745/751A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
PP-1 Speaker/patch	159.25	149.95
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	124.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	559.00	489.95
OPC-118 Adapts AT-100/500 to IC-735	16.00	

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Other Accessories cont.	Regular	SALE
AH-2 8-band tuner w/mount & whip	625.00	549.95
AH-2A Antenna tuner system, only	495.00	429.95
OPC-137 Adapts AH-2/2A to IC-751/745	16.00	
GC-5 World clock	91.95	

6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	549.00	489.95
BP-10 Internal Nicad battery pack	89.00	
BP-15 AC charger	14.00	
EX-248 FM unit	55.50	
LC-10 Leather case	39.50	

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	799.00	699.95
EX-106 FM option	140.00	126.95
BC-10A Memory back-up	9.50	
IC-271A 25W 2m FM/SSB/CW	859.00	759.95
AG-20 Internal preamplifier	64.00	
IC-271H 100W 2m FM/SSB/CW	1099.00	969.95
AG-25 Mast mounted preamplifier	95.00	
IC-471A 25W 430-450 SSB/CW/FM xcvr	979.00	869.95
AG-1 Mast mounted preamplifier	99.50	
IC-471H 75W 430-450 SSB/CW/FM	1399.00	1169
AG-35 Mast mounted preamplifier	95.00	

Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	115.00	104.95
PS-35 Internal power supply for (H)	199.00	179.95
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM, TTP mic	639.00	569.95
IC-490A 10W 430-440 SSB/FM/CW	699.00	599.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379.95
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399.95
IC-28A 25W 2m FM, UP/DN mic	429.00	379.95
IC-28H 45W 2m FM, UP/DN mic	459.00	399.95
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-37A Compact 25W 220 FM, TTP mic	499.00	439.95
IC-47A Compact 25W 440 FM, TTP mic	549.00	489.95
PS-45 Compact 8A power supply	139.00	129.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
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Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00	1099
IC-120 1W 1.2 GHz FM Mobile	579.00	499.95
ML-12 1.2 GHz 10W amplifier	379.00	339.95
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00	1079
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	104.95
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	119.95
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1479.00	1299

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IC-04AT for 440 MHz	449.00	389.95

Standard models	Regular	SALE
IC-2A for 2m	279.00	249.95
IC-2AT with TTP	299.00	259.95
IC-3AT 220 MHz, TTP	339.00	299.95
IC-4AT 440 MHz, TTP	339.00	299.95
IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	399.95
A-2 5W PEP synth. aircraft HT	569.00	

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.95
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.35
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.00
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
EX-390 Bottom slide cap	5.50
MB-16D Mobile mtg. bkt for all HTs	21.99
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	31.50
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100 kHz-30 MHz, 117V AC	$949.00	799.95
RC-11 Infrared remote controller	67.25	
FL-32 500 Hz CW filter	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25 MHz-2 gHz scanning rcvr	1099.00	969.95
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
AH-7000 Radiating antenna	89.95	(8)

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A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR." Dimmer switch.

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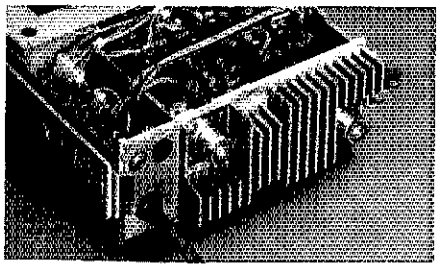
10 memories with offset recall and lithium battery backup.
Stores frequency, band, and repeater offset. Memory 0 stores receive and transmit frequencies independently for odd repeater offsets, or cross-band (2 m/70 cm) operation.



- **Rugged die-cast chassis.**
- **Two separate antenna ports.**
  Use of separate antennas is recommended. This simplifies antenna matching and minimizes loss. However, mobile installations may require a single antenna. The optional MA-4000 dual band mobile antenna comes with an external duplexer.
- **Programmable memory scan with channel lock-out.**
  Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.
- **Band scan in selected 1-MHz segments.**
  Scans within the chosen 1-MHz segment (i.e., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.
- **Priority watch function.**
  Unit switches to memory 1 for 1 second every 10 seconds, to monitor the activity on the priority channel.
- **Common channel scan.**
  Memories 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.
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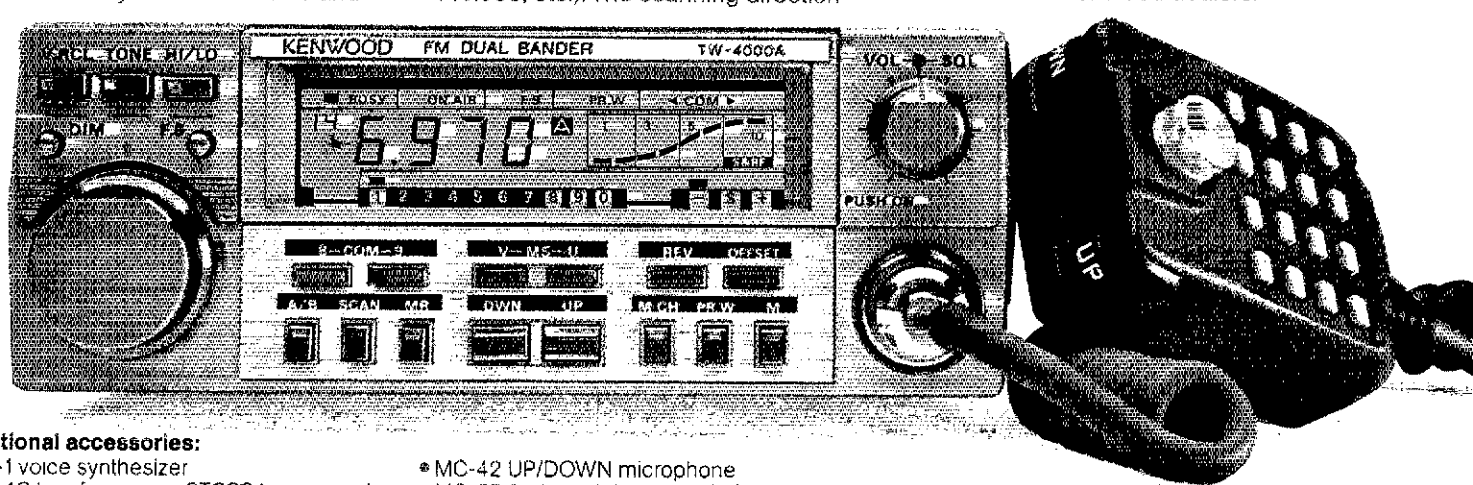
  Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Repeater reverse switch.**

More TW-4000A information is available from authorized Kenwood dealers.



Optional accessories:

- VS-1 voice synthesizer
- TU-4C two-frequency CTCSS tone encoder
- PS-430 DC power supply
- KPS-7A fixed station power supply
- MA-4000 dual band mobile antenna with duplexer
- SP-40 compact mobile speaker
- SP-50 mobile speaker
- MC-42 UP/DOWN microphone
- MC-55 8-pin mobile mic. with time-out timer
- SW-100B SWR/power meter
- SW-200B SWR/power meter
- SWT-1/SWT-2 2 m/70 cm antenna tuners
- PG-3A noise filter
- MB-4000 extra mounting bracket

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Antenna mag mount is not Kenwood supplied

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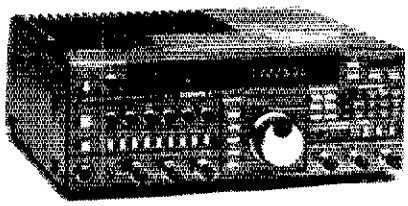
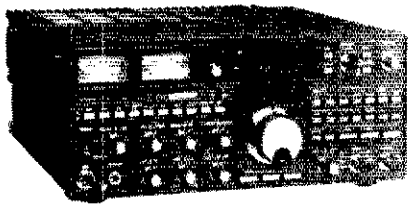
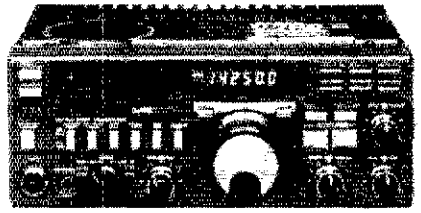


HF Equipment	LIST
FT-767GX 160-10m xcvr/.1-29.99 MHz Rcvr	$1895.00
6M/767 6m module	179.95
2M/767 2m module	179.95
430/767 430-440 module	219.95
440/767 440-450 module	219.95
FT-ONE Xcvr/Rcvr/4 filters/RAM/FM	2859.00
KY-ONE Keyer unit	50.00
DC-ONE DC cable	15.00



FT-980 9-band CAT Xcvr/SW Rcvr	$1795.00
SP-980 Speaker with audio filter	99.95
SP-980P Speaker/patch	99.95
FC-757AT Automatic ant. tuner w/memory	359.00
FAS-1-4R Remote antenna selector	79.95
E-980 Interface cable; FT-980/757AT	46.50
XF-8.9HC 600 Hz CW filter (1st IF)	50.00
XF455.8MCN 300 Hz CW filter (2nd IF)	59.95
KY-ONE Keyer unit	50.00
FIF-65 Computer interface; Apple IIe	69.95
FIF-80 Interface; NEC PC-8001	119.00
FIF-232C for VIC-20/TI/most RS-232	79.95
FRB-1 External relay box	20.00
GC-980 General coverage kit	14.95



FT-757GX 9-band Xcvr/SW Rcvr/mic	$995.00
FP-757HD Heavy duty supply with fan	249.00
FP-757GX Compact power supply	235.00
FP-700 Power supply	209.95
FRB-757 External relay box	10.95
FC-757AT Automatic ant. tuner w/memory	359.00
FAS-1-4R Remote antenna selector	79.95
MMB-20 Mobile mount	25.95
FIF-65A Interface; Apple IIe	59.95
FIF-232C for VIC-20/TI/most RS-232	79.95
GX Turbo/F01 Software; Apple II	59.95
GX Turbo/C01 Software; C64/128	89.95
GX Turbo/V01 Software; VIC-20	89.95

FTV-700 Transverter w/no module	175.00
2M/FTV 2m module only	189.00
6M/FTV 6m module only	139.00
70 cm/FTV 430 module only	255.00
Misc. accessories	LIST
SP-102 Speaker with audio filter	$ 99.95
SP-102P Speaker/patch	99.95
MD-1B8 Desk microphone	89.95
MH-1B8 Mobile microphone	24.95
YS-60 1.8-60 MHz 2kw PEP wattmeter	84.95
YS-500 140-520 MHz 200w wattmeter	69.95
YH-55 Lo-Z headphones	21.95
YH-77 Lightweight headphones	21.95
FF-501DX Low pass filter	34.95

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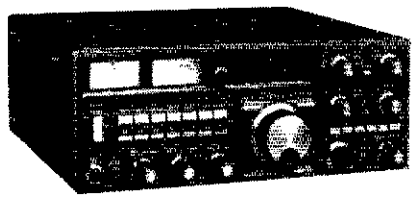
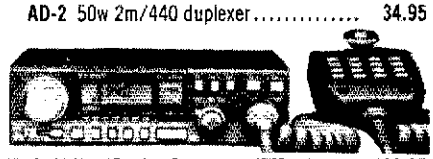
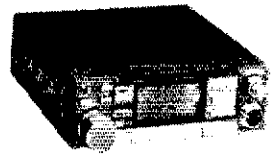
All items are shown with the Manufacturer's Suggested LIST Prices. On Major items and some accessories, we can offer a Substantial Savings.



VHF/UHF equipment	LIST
FT-726R VHF/UHF Xcvr w/2m, TTP mic	$1095.00
HF/726 10-12-15m unit	289.95
6M/726 6m unit	269.95
430/726 430-440 MHz unit (OSCAR)	329.95
440/726 440-450 MHz unit (FM band)	329.95
SU-726 Satellite duplex module	129.95
XF-455MC 600 Hz CW filter	69.95
DC-726 DC cable for FT-726R	10.05
FTE-36 Tone board for FT-726R	58.00
AD-2 50w 2m/440 duplexer	34.95



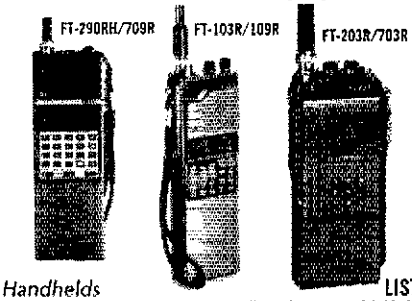
FT-270RH 45w 2m FM Xcvr w/TTP mic..... 439.95



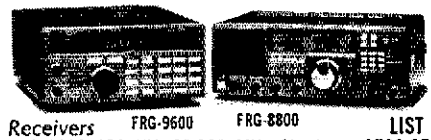
FT-2700RH 25w 2m/440 FM w/TTP mic	599.95
FTS-8 Encoder/decoder	44.95
FVS-1 Voice synthesizer	31.95
AD-2 50w 2m/440 duplexer	34.95
FT-770RH 25w 440 FM xcvr w/TTP mic	479.95

FREE Encoder/decoder! (Limited offer)

FTS-8 Encoder/decoder • **FREE** with the purchase of a FT-270RH or FT-770RH



Handhelds	LIST
FT-209RH 5w 2m FM HT/TTP/batt/cgr	$359.95
FT-109R 220 FM HT/TTP/batt/cgr	TBA
FT-709R 4w 440 FM HT/TTP/batt/cgr	359.95
FT-203R/TTP 2.5w 2m FM HT/batt/cgr/TTP	259.95
FT-103R/TTP 2.5w 220 FM HT/batt/cgr/TTP	279.95
FT-703R/TTP 2.5w 440 FM HT/batt/cgr/TTP	299.95
Accessories for 09-series/03-series	LIST
FBA-5 Alkaline battery holder	12.95
FNB-3 425ma 10.8v batt (comes w/03 series)	49.95
FNB-4 500ma 12v batt (comes w/09-series)	59.95
FTS-6 Encoder/decoder; 09-series	49.95
FTS-7 Encoder/decoder; 03-series	49.00
LCC-6 Leather case w/top cover; 09-series	39.95
MH-12A2B Speaker/microphone	39.95
NC-9B Wall charger for FNB-3	9.95
NC-15 Desk quick charger/AC ps	89.95
NC-18B Wall charger for FNB-4	9.95
MMB-21 Mobile bracket	14.95
PA-3 Mobile adapter and charger	39.95
TA-2 2m 19" telescoping whip ant	11.95
WB-3 Waterproof baggie for HTs	29.95
YH-2 VOX headset	26.95



Receivers	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$599.95
FRA-7700 Indoor active receive antenna	59.95
FRT-7700 Antenna tuner	64.95
FRV-8800 118-174 MHz VHF converter	119.95
FIF-232C Interface; VIC-20/TI/RS-232	79.95
FF-5 500 KHz low-pass filter for VLF	20.00
DC-8800 DC kit	3.50
FM-W/8800 FM-wide kit	20.00
FRG-9600 60-905 MHz receiver	679.95
VU-9600 NTSC video unit	25.00
Catpack software (specify computer)	79.95

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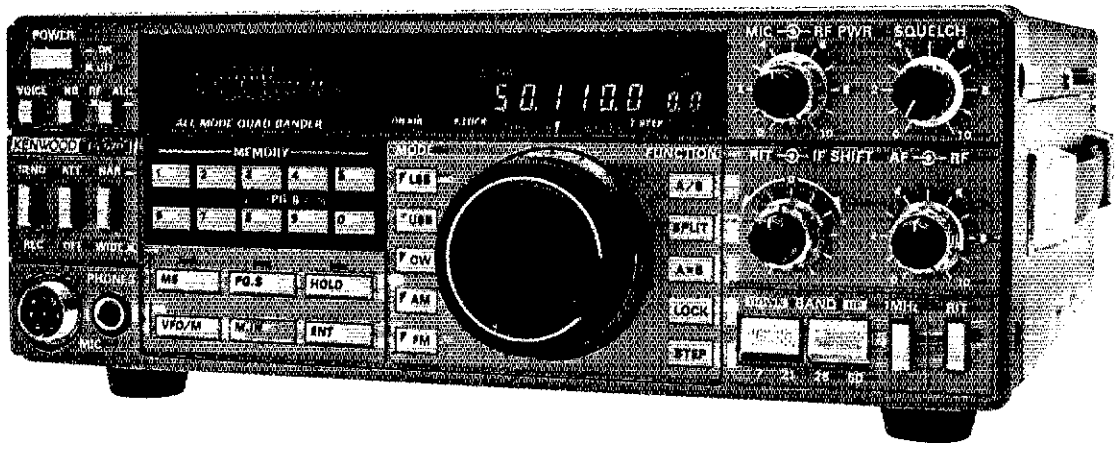

TR-50

1.2 GHz FM transceiver

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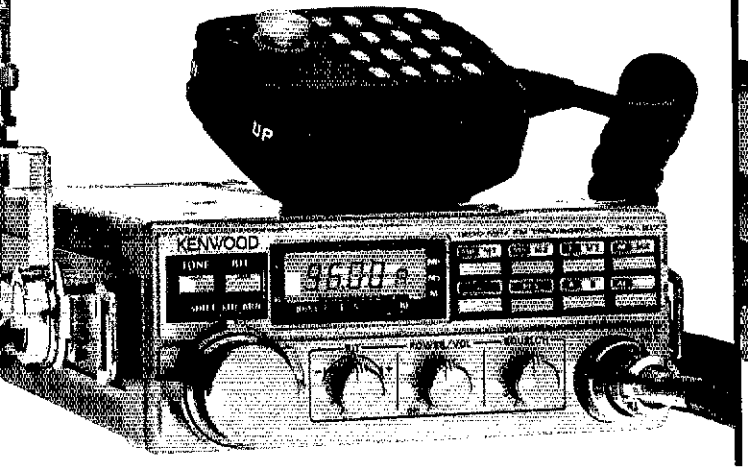
- 5 memory channels
- Odd split on memory channel 5
- Includes: Battery set, charger, external power cable, 16-key DTMF hand microphone, sleeve antenna with adjustable mount, shoulder strap.



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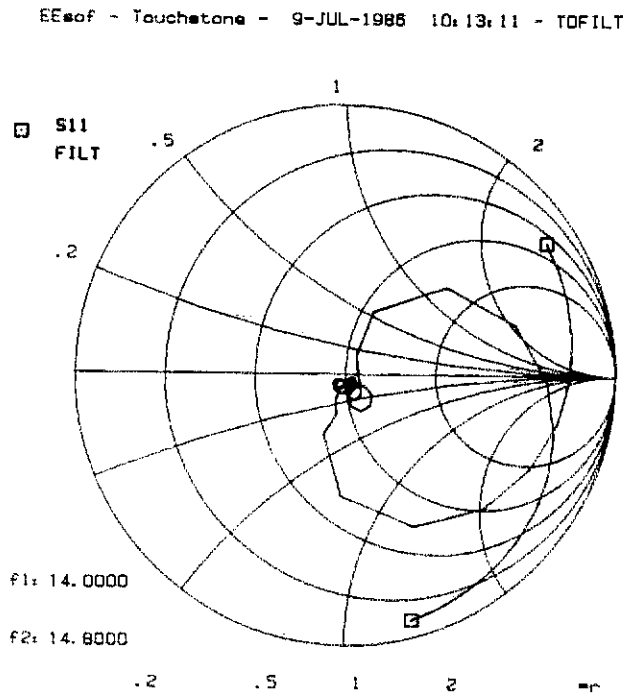
- **Sr. Analog Engineer—DESIGN & ANALYSIS**
- **Assoc. Engineer—RF SYSTEMS**



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- **Repeater offset switch.**
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  TH-41AT/A: ±5 MHz, simplex.
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- **Quick change, locking battery case.** The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
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- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-8A/9A/10A** StubbyDuk antenna
- **BH-3** belt hook

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Santec ST20T Handi Talkie	289.00
Icom IC735	879.00
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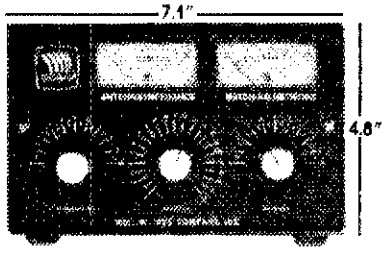

NYE MB102 Tuner 189.00

ACCESSORIES

B&W VIEWSTAR ANTENNA TUNER	89.95
Heil HC3/HC4/HC5	Stock
Heil BM10 Boom Mike headset	53.95
CSI Private Patch III	469.95
Triplett 3360 VOM (same as FLUKE 77)	69.00
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8237 RG8	39c/ft
8267 RG213	55c/ft.
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8448 8 conductor rotor cable	33c/ft
9405 Heavy duty 2-16 Ga 6-18 Ga	56c/ft
9258 RG8x	20c/ft
9269 RG-62A/U	16c/ft
8403 Mic Cable, 3 conductr & shield	45c/ft.
100 feet 8214 w/ends installed	94.00
8669 7/16" tinned copper braid	1.00/ft.
International Wire RG214 non-mil good cable	70c/ft
International Wire 9086 exact replacement for Belden 9913	36c/ft
International 16 Ga stranded antenna wire	6c/ft.
International 4063 RG-213	28c/ft

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831J Double Female UHF	2.00
82-61 N Male	3.00
82-97 N Female Bulkhead	3.00
82-63 Inline Female N	4.00
82-98 N elbow	9.00
31-212 BNC-RG59	1.50
31-2 BNC-RG58	1.50
34025 N Male, RG58	3.00
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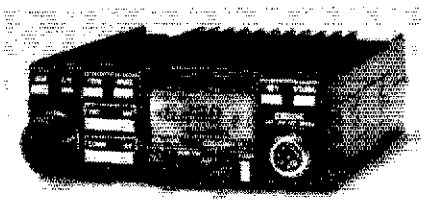

IC28A List 429 Your Cost 369.00

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Avanti APR450-5G on glass	39.00
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Valor AB-5 Mobile	79.95
Stoner DA100 D Active Rx Antenna	190.00
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3/16" Guy Cable, 3700 #7 x 7 strand, import	12c/ft
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1/4" Wire clips	.50
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10 watts	—	10A	10B	10C	10D	10E
25 watts	—	25A	25B	25C	25D	25E
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
5000 watts	5000H					

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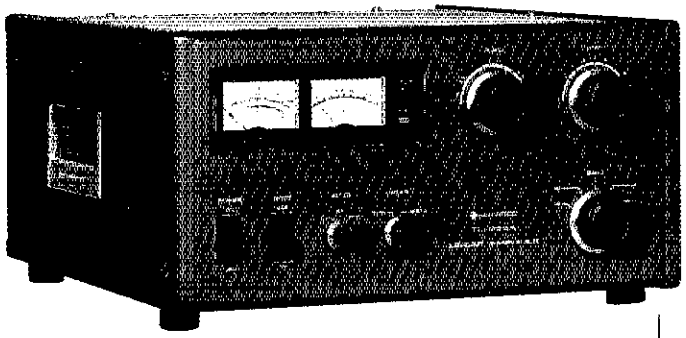
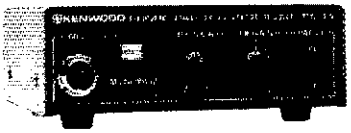
Accessories



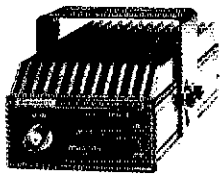
TL-922A 160-15 m 2 KW PEP/1 KW DC Input Linear Amplifier. Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.



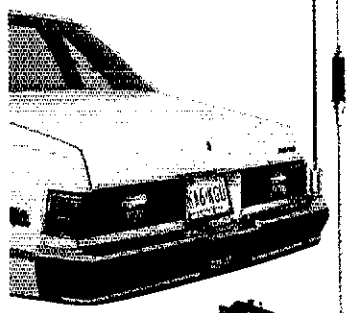
PC-1A Phone Patch (FCC Part 68 registered).

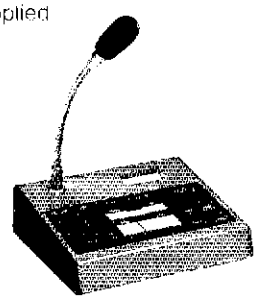
MA-5 80/40/20/15/10 meter mobile antenna. All resonators supplied. 200 W PEP max., VSWR 1.5:1 or less. Easily adjustable for center frequencies.

VP-1 Bumper mount for above.

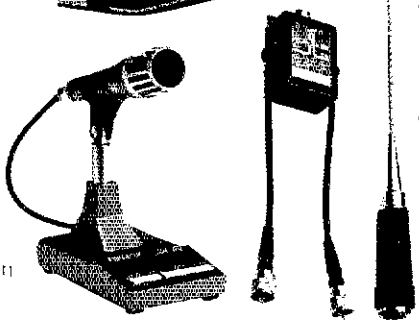


VB-2530 25 W RF Power Amplifier (for TR-2600A). BNC-BNC cable, and mounting bracket supplied.





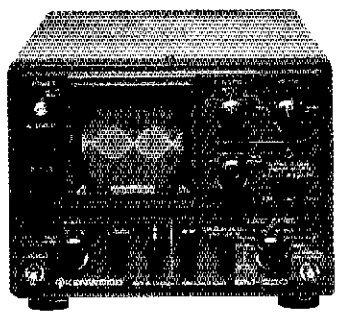
MC-85 (8-pin) Multi-function desk-top microphone (8-pin) 700 Ω unidirectional electret condenser mic. Built-in audio level compensation with output and tone control, meter, and UP/DOWN switch. Selector switch for up to three transceivers. (Additional 4, 6, or 8-pin cables optional.)



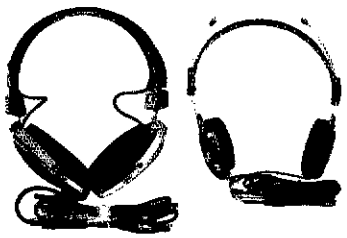
MC-60A (8-pin) Deluxe desk-top microphone. Pre-amp built-in, PTT, LOCK and UP/DOWN switches. Hi/Lo Z selector switch.

SP-40 Compact mobile speaker.

SP-50 Mobile speaker.



SM-220 Station monitor/10 MHz oscilloscope. Pan display capability with optional BS-8 (for TS-940S, TS-830S). Monitor transmitted waveforms and/or received signal waveforms. Built-in 2-tone generator.



HS-5 Deluxe headphones.

HS-6 Lightweight headphones.

LF-30A Low pass filter, 1 kW, 50 Ω. Insertion loss: less than 0.5dB at 30 MHz.

MA-4000 2 m/70 cm dual band mobile gain antenna. Duplexer supplied. Ideal for use with the TW-4000A "Dual Bander" and TM-211A/TM-411A. (Mount not supplied.)

MJ-Series Microphone adapters

Not Shown:

MC-50 Desk-top microphone. Hi/Lo Z, 4-pin connector.

MC-80 Desk-top microphone. 700 Ω unidirectional electret element with flexible boom. Built-in mic pre-amp and UP/DOWN switch, with lock. (8-pin).

MC-48B Hand microphone with 16-key DTMF pad and UP/DOWN switches. (8-pin).

MC-46 As above, but with 6-pin connector.

MC-43S Hand microphone with UP/DOWN switches. (8-pin).

MC-35S Noise cancelling hand microphone, 50 kΩ (4-pin).

MC-30S As above, but 500 Ω.

PG-4A Microphone cable for MC-60A. Converts MC-60A to 4-pin connector.

PG-4B As above, but 6-pin.

PG-4C As above, but 8-pin, as supplied with MC-60A.

PG-4D Extra 4-pin cable for MC-85.

PG-4E As above, but 6-pin.

PG-4F As above, but 8-pin.

HS-7 Micro-headphones.

KPS-7A 13.8 V DC, 7.5 A intermittent DC power supply.

RA-3 2 m, ¼ λ telescoping antenna with BNC connector.

RA-5 2 m ¼ λ /70 cm ⅝ λ telescoping antenna with BNC connector.

RA-8B 2 m StubbyDuk™ with BNC connector.

RA-9B As above, for 220 MHz.

RA-10B As above, for 440 MHz.

RD-20 Dummy load, 50 Ω DC-500 MHz 20 W continuous, 50 W intermittent.

PG-3A DC line filter for mobile use.

Service manuals are available for all Kenwood transceivers and most accessories.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Specifications and prices subject to change without notice or obligation.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Very few amplifiers have generated the excitement and emotional involvement associated with the powerful LK-800A Amplifier. We termed the commercial export version of this "rock-crusher" to the FCC type accepted 1500 watt output model. It is now offered to the discriminating Amateur.
For 1986 Amp Supply has taken one more step in the thoughtful evolution of the classic LK-500ZB. We think you'll agree that the front panel is smashing, and that the LK-500ZB will be one of the most attractive pieces of equipment you will own. And no matter how you equip your LK-800 or LK-500 series amplifier, it carries the full 2 year warranty.
We feel the LK series of amplifiers are the best all-around HF amateur amplifiers in the world. Wouldn't you like the strength and power of an Amp Supply LK-800 or LK-500 behind your signal?
• LK-800A has Three 3CX800A7's
• LK-500ZB has Two 3-500Z's
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• Hipersil Transformer
• Jennings Vacuum Relay
• No-Tune-Up Versions
• 2 Year Warranty
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• Quiet Operation
• Made in USA
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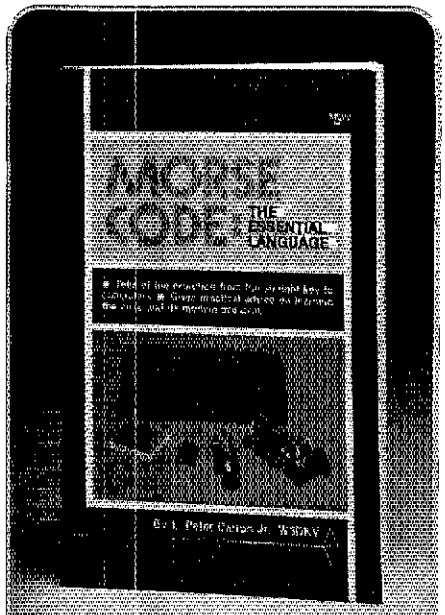
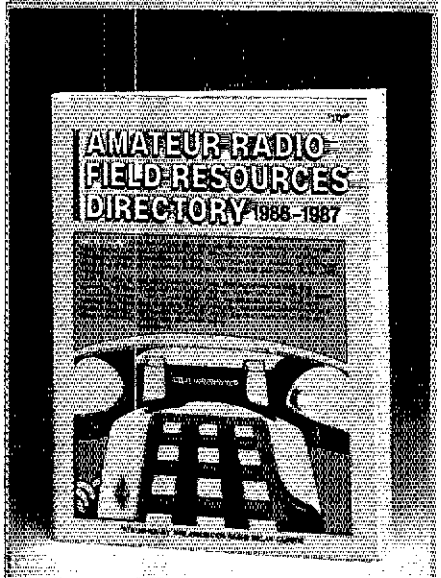
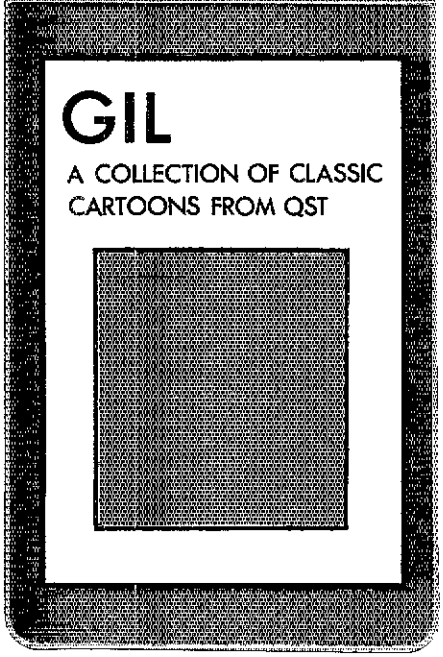
• Built-in Power Supply
• Commercial Models Available
LK800-A
LK500-ZB
All Prices Post Paid USA
Amp
Supply Co.







NEW! FROM ARRL

MORSE CODE: The Essential Language tells of the evolution from the straight key to computers. Using the code is a fun and exciting way to communicate, and author Pete Carron, W3DKV has incorporated his own enthusiasm into this book. The beginner will find practical advice on learning to receive and send. There are chapters on high speed operation, distress calls and what the future has in store for CW operation. An extensive history of the code is presented and the appendix lists abbreviations, the RST system, associations and organizations of CW operators and manufacturers of equipment. If the sight of a radio operator sending a message in code generates a certain intrigue that makes the mind wander to thoughts of mysterious signals in the night, ships in distress and faint transmissions from distant lands; then *MORSE CODE: The Essential Language* is must reading for you! 111 pages, copyright 1986 #0356 $5 plus postage and handling.*

The Amateur Radio Field Resources Directory for 1986-87 is now available. Its 514 pages are divided into three sections. The WHITE pages list those individuals who can help with almost any Amateur Radio-related question or problem. The BLUE pages include a 10-year **QST** cumulative index, ARRL organization and much more. The YELLOW pages contain advertisers. Copyright 1986 #0321 $10 plus postage and handling*.

GIL - A Collection of Classic Cartoons from QST Phillip "Gil" Gildersleeve, W1CJD contributed over 1500 cartoons and drawings to ARRL from the late twenties until he became a silent key in 1966. This book presents only a small portion of the "best of Gil." Most hams would love to have a "Jeeves" character to do the tough chores around the ham shack, and what radio club doesn't have characters similar to those portrayed on the famous field day covers? Gil was an avid radio amateur, and a member of *Who's who in American ART.* This book is a tribute to W1CJD, and we are sure that you will have as much fun reading and viewing Gil's work as we did in assembling the material. Approximately 110 pages, copyright 1986 #0364 $5 plus postage and handling.*

*Shipping and handling charges are $2.50 per order for book rate or parcel post, $3.50 for UPS.

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Introducing all-mode radios for your mode of travel.

Yaesu's 2-meter FT-290R and 6-meter FT-690R Mark II Series are the perfect all-mode traveling companions.

On the road, simply snap on the heat sink, apply 12 volts of power, and you've got a 25-watt mobile station. (FT-690R: 10 watts).

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You get around fast on SSB, CW and FM with ten memories, dual VFOs, LCD display, automatic storage of repeater shift into memory register, offset tuning during receive or transmit for satellite operation, relative power output/S-meter, and optional CTCSS unit.

And everything fits into a lightweight yet rugged case measuring just 2¼ x 6½ x 8¼ inches.

The FT-290R and FT-690R Mark II are perfect for emergency use, camping trips, talking around town, and DX work.

Plus each is priced to maximize your ham budget's mileage.

So discover Yaesu's 2-meter FT-290R Mark II and 6-meter FT-690R Mark II all-mode transceivers today. They're just a quick trip away at your nearest Yaesu dealer.

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Prices and specifications subject to change without notice.

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. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

(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 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 14 through September 13 will appear in November *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(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 permitted in *QST* advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealerware exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you 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 characters of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

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.

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 non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleufer, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old 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. 1417 Stoneybrook, Mamaroneck, NY 10543.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FCC EXAMS, Novice-Extra. Sunnyvale VEC ARC, 408-255-9000, 24 hour. 73, Gordon, W6NLG, VEC.

ILLINOIS: Sept. 20 & 21, The Peoria Area Amateur Radio Club presents Peoria Superfest '86 at Exposition Gardens, W. Northmoor Rd., Peoria, IL. Admission $3 advance, $4 gate, children under 16 free. Gate opens 6:00 A.M., commercial buildings 9:00 A.M. Talk-in 146.16/76 call W9UVI. Latest Amateur & computer product displays, huge flea market, free Sunday bus to Northwoods Mall. FCC exams Saturday & Sunday, all classes. Full camping facilities. For tickets and info SASE to Superfest '86, Box 3461, Peoria, IL 61614.

FIND OUT what else you can hear on your General Coverage Transceiver or Receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter $1. Association of North American Radio Clubs, P.O. Box 4b2, Northfield, MN 55057.

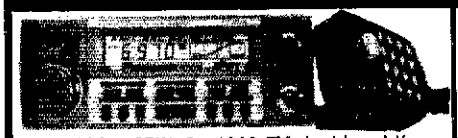
HAMFEST SUNDAY September 21, 1986. LIMARC sponsors ARRL Long Island Hamfair at the New York Institute of Technology Route 25A Northern Blvd., Old Westbury, NY. Outdoor tailgating, no reservations needed, sellers car space $5, general admission $3. Wives, children and sweethearts free, all Hams must buy a ticket! Exit 39 North Route 495, North on Glen Cove Road 2 miles to 25A, turn right 1 mile to site. Talkin 146.85. Food, refreshments available and many awards to attendees. Open 7:30 AM for sellers, 9:00 AM for buyers. If further info needed call LIMARC Info Line 516-796-2366 or Hank Wener, WB2ALW at night 516-484-4322.

SCARA Flea Market, Sunday, Nov. 9, Lindly Street, North Haven CT. Talkin 01/61. Info: SCARA, P.O. Box 81, North Haven CT 06473.

THANK YOU for attending the Butler, PA, Hamfest. See you Sept. 7, 1986.

GRARA SWAP and SHOP, Saturday, Sept. 20 Hudsonville Fair Grounds, Hudsonville MI., I-196 West from Grand Rapids to Hudsonville exit. 8AM, $3 at gate, trunk sales tables $4. Talk-in 146.16/76 K8PUJ, 616-459-8722.

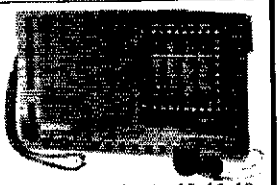
SAVE on these AES/KENWOOD Specials!



TW-4000A 25W, 2m/440 FM dual band Xcvr
Call for New Low Sale Price
TU-4C Programmable encoder ($39.95 value)
Now only **$1** with **TW-4000A** purchase.

TM-2570A 70W, 2m FM Transceiver w/TTP
Call for Sale Price
TU-7 Programmable encoder ($24.95 value)
Now only **$1** with **TM-2570A** purchase.

R-11
SW Receiver
CLOSEOUT
SAVE $50



Features: **11 bands** - AM, FM broadcast + 13, 16, 19, 22, 25, 31, 41, and 49M SW bands. **No BFO.** Band-spread tuning, meter, 3" speaker, record/phone jacks, whip/ferrite antennas. 7⅞"w×4½"h×1½"d, requires 4 'AA' cells. Soft case and earphone, shown with **optional** HS-7 micro-headphones ($19.95)... **Closeout $69.95**

Factory REBATES

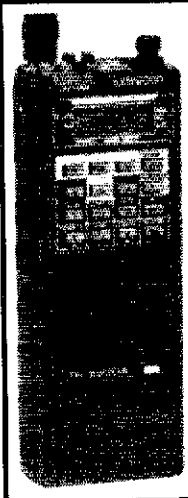
From July 21st. to Sept. 30th. 1986, get the LOW **AES® Sale Price** plus **KENWOOD Factory Rebate** when you purchase the following equipment. .

Model	REBATE
TS-440S HF Transceiver...	$50
TM-2570A 70W 2m FM ...	$40
TS-430S HF Transceiver...	$25
TR-2600 2m FM HT	$15
TR-3600 440 FM HT	$15
All TH-series HT's	$10

Call for Sale Prices

To receive Factory Rebate, the form supplied with radio must be completed and mailed to KENWOOD by October 31st. 1986.

Due to changing prices and limited quantities, all listings in this page are subject to change without notice. Please check with salesperson when ordering.

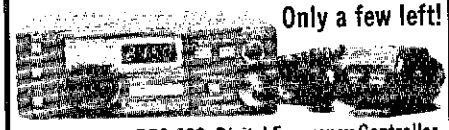


FREE Extra Battery!

For a Limited time!...
Purchase a **TR-2600A** or **TR-3600A** at our LOW Sale Price and receive an extra **PB-26** battery pack - **FREE!**
or
Purchase any of the **TH-Series** handhelds at our LOW Sale Price and receive an extra **PB-21** battery pack - **FREE!**

Call for Sale Prices

Only a few left!



KENWOOD DFC-230 Digital Frequency Controller for TS-120S, 130S/SE, 530S, 830S. 20 Hz steps, 4 memories, scan, UP/DN mic..... **Closeout $169.95**

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Clip out this handy Coupon and Mail Today!

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I am interested in the following new KENWOOD Equipment:

I have the following to TRADE (What's your DEAL?)

Rush me your quote - I understand that I am under no obligation.

Name

Address

City/State Zip

RADIO EXPO 86 - Saturday and Sunday, September 27 - 28th 1986 at the Lake County Fairgrounds, Rts 120 and 45, Grayslake, IL. Flea Market opens at 6 AM & Exhibits at 9 AM. Displays by major manufacturers and distributors. Reserved indoor Flea Market tables $7.50 per day - electric at a nominal charge. Limited number - reserve by Sept. 10. Seminars, technical talks, Ladies' programs, Amateur exams Novice thru General given by DeVry. Hourly Awards. Tickets good both days, $4 advance (before Sept. 10th), $5 at gate. Talk-in on 146.16/76 MHz. Send SASE to Radio Expo 86, Box 1532, Evanston, IL 60204 or call 312-582-6923.

OHIO (FINDLAY)-Sept 7. The 4th Annual Findlay Hamfest sponsored by the Findlay Radio Club, will be held at the Hancock County Fairgrounds on East Sandusky St. in Findlay on Sunday, Sept 7, from 6:30 A.M. to 4 P.M. Fleamarket opens at 6:30 A.M., building at 8 A.M. Advance ticket $3 each; ticket at door and after Sept 1, $4 each. Indoor table reservation $6 each; outdoor fleamarket spaces $3 each, first come first serve. Talk-in on 147.75/.15 and 449.15/4.15. For advance ticket, table reservation for more information, write to FRC Hamfest, P.O. Box 587, Findlay, OH 45839-0587.

CONNECTICUT (NORWALK)-Sept 7. The Fairfield ARA, Norwalk ARA, Stamford ARA and the West Haven ARA are sponsoring the Fairfield County Hamfest 9 AM-5 PM. There will be a flea market, tailgating, distributors, VE exams, ARRL forum and technical seminars. Refreshments also available. Talk-in on 99/39 and 52. Admission $3, tailgate $5, tables $10, power free. Location is at the Norwalk National Guard Armory, immediately off Merritt Parkway, exit 38. For registration or info, write to PO Box 326, West Haven, CT 06515.

QSL CARDS/RUBBER STAMPS/ENGRAVING

CANADIANS: QSL samples $1 (refundable) M. Smith, VE7FI, Box 1376, Delta, B.C. V4M 3T3.

POST CARD QSL Kit - Converts Post Cards, Photos, to QSLs! Stamp brings circular. Labelcraft, P.O.Box 412, West Sand Lake, NY 12196.

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.

FREE samples—stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50 cents. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

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.

QSLs-1)Famous KØAAB custom collection. 2)Railroad employees and raitan's specials. 3)Front report styles. 4)Multiple callsigns. 5)Ham business cards. State your sample wants. 39 cents self addressed business size envelope required. Marv Mahre, WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

QSLs Samples 40 cents (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

BE SURPRISED-get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

QSLs - since 1956, free samples. Rusprint, Box 7575, Kansas City, MO 64116.

FREE, 100 QSLs with first order. Samples 50c. Gazebo Press, Rt. 4 Box 4148, LaPlata, MD 20646.

ENGRAVING: CALLSIGN/name badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

CADILLAC of QSLs...Completely different! Samples $1, (refundable). Mac's Shack, P.O. Box 43175, Seven Points, TX 75143.

PICTURE QSL cards of your shack, etc. from you photograph or black ink artwork. 500 $24; 1000 $36.50. Also unusual non-picture designs. Send stamp for illustrated literature. Generous sample pack $1; half pound of samples $2. Custom printed cards, send specifications for estimate. Raum's RD 2, Orchard Road, Coopersburg, PA 18036 (formerly of Philadelphia).

QSLs Quality and Fast Service for 26 Years. Include Call for Decal. Samples 50c. Ray, K7HLR, Box 331, Clearfield, UT 84051.

BROWNIE QSLs since 1939. Catalog & Samples $1(refundable with order) 3035 Lehigh Street, Allentown, PA 18103.

FIRST CLASS. Full Color QSL from your prints or slides. Confirming report and address printed on back. $199/2,500. Smith Printing, 20420 Calhaven Dr., Saugus, CA 91350. 805-251-7211.

QSL CARDS - Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSL's, Dept. B, 310 Commercial, Emporia, KS 66801.

QSL samples - 25c Samcards - 48 Monte Carlo Dr., Pittsburg, PA 15239.

FREE QSL Card samples - quality cards at low prices, wide selection available. Send for free samples: KE7GY, INSTACOPY, Rt.1 Box1486, Roosevelt, UT 84066.

QSL CARDS: SASE brings free samples. Shell Printing, KD9KW, P.O. Box 50, Rockton, IL 61072.

T-SHIRTS, HATS and Jackets. Fine quality garments printed with your club's name and individual calls. For catalogue write: Backwoods T-Shirt Productions, 36 North Main Street, Bel Air, MD 21014. 301-838-9290.

AVAILABLE MID-AUGUST

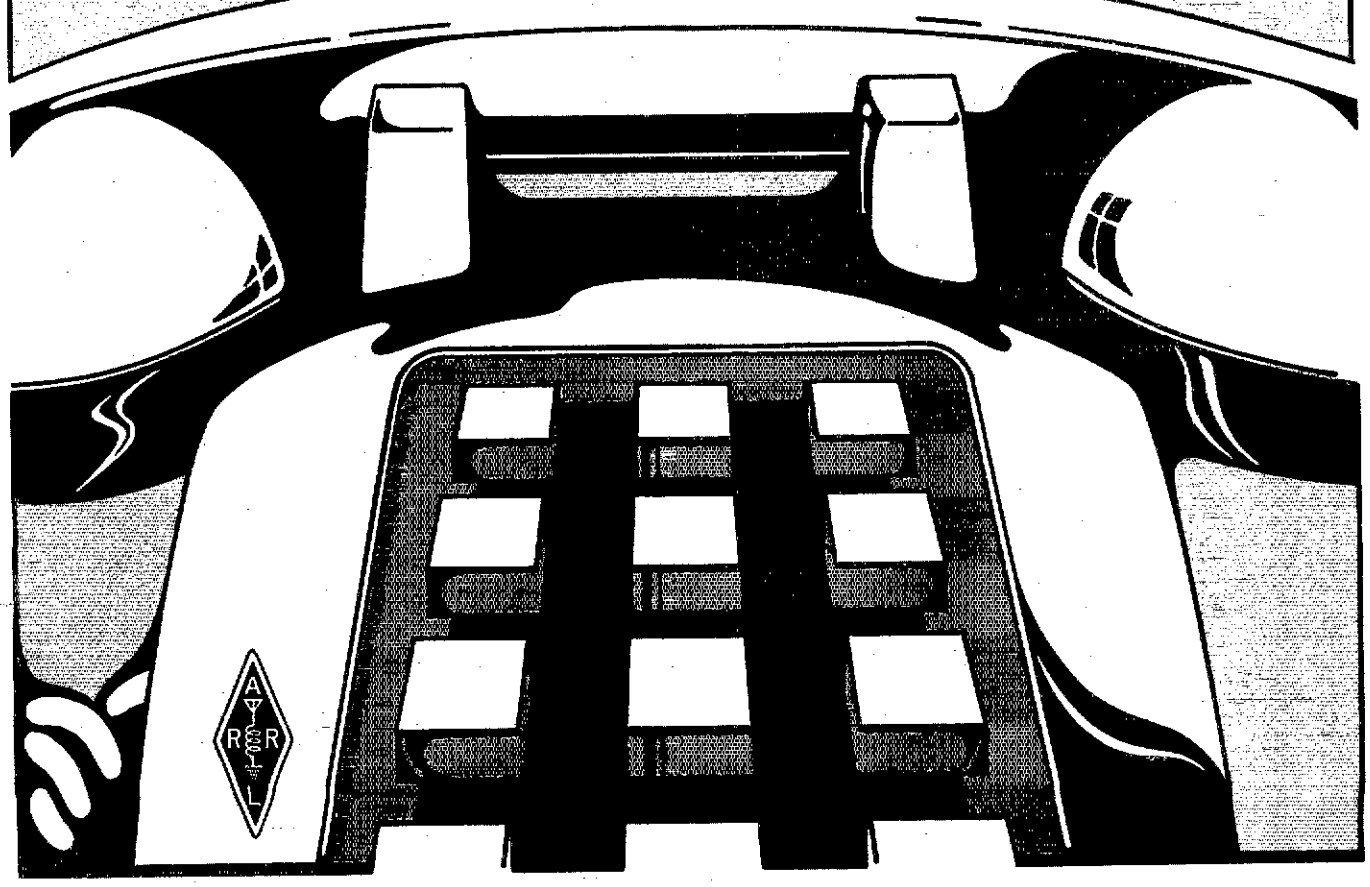
$10.00
($2.50 S.H.)
($3.50 UPS)

AMATEUR RADIO FIELD RESOURCES DIRECTORY 1986-1987

WHITE PAGES: Lists the people who can help with almost any type of Amateur Radio-related problem or question: ARRL Directors, Vice Directors, Assistant Directors, Advisory Committee Members, Field Organization Volunteers, Affiliated Clubs and ARRL/VEC Volunteer Examiners all organized geographically by ARRL division.

BLUE PAGES: 10 Year ***QST*** Cumulative Index, Bibliographies for ***QEX*** and ***Gateway,*** Affiliated Club and Instructor Program, W1AW Schedule, QSL Bureaus and how they work, ARRL Letter Index, ARRL Audiovisual Library, Technical Information Resources; including lists of Assistant Technical Coordinators and Radio Frequency Interference Handbook; Public Service Communications and Field Appointment Guidelines and ***much more.***

YELLOW PAGES: Advertisers.



PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

ANTIQUE-VINTAGE-CLASSIC

WANTED: old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

MANUALS FOR most Hamgear made 1937/1972, plus Kenwood. No quotes. Our current catalog "F" at $1 required to order. Over 2,000 models listed. Hi-Manuals, P.O. Box F802, Council Bluffs, IA 51502-0802.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn,IL 60642.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond Glendale, CA 91201. 818-242-8961.

MICROPHONES and related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid: trade items available. Write: James Steele, 80 Central Park West, New York, NY 10023-5206.

WANTED: *QST* VOLUME 1. W6ISQ, 82 Bellbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brandname, Model No., SASE Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

EARLY ELECTRONIC and Mechanical Television Sets, parts, literature wanted for substantial cash. Finder's fee paid for successful leads. Arnold Chase, 9 Rushleigh Road, West Hartford, CT 06117 203-521-5208.

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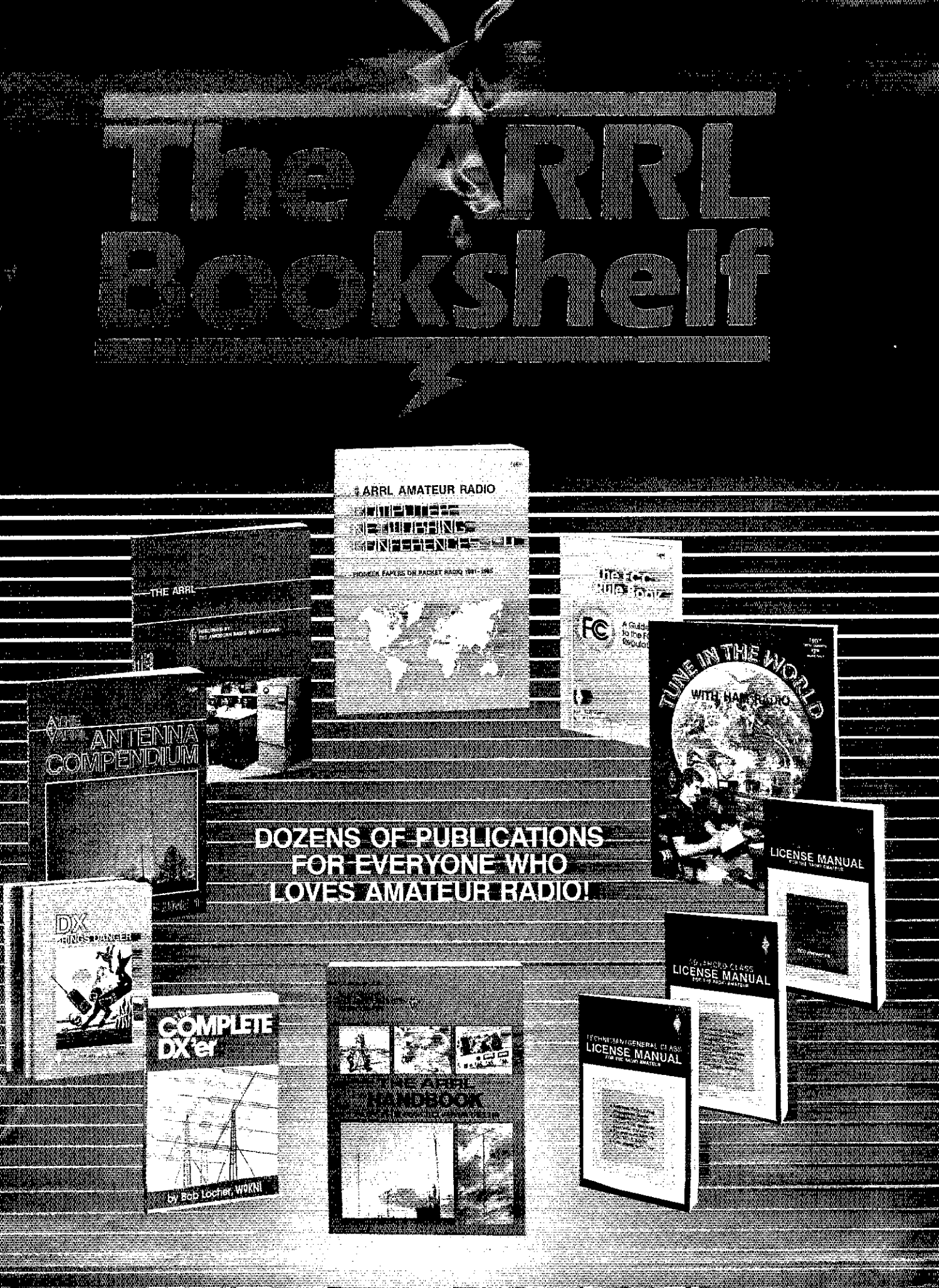
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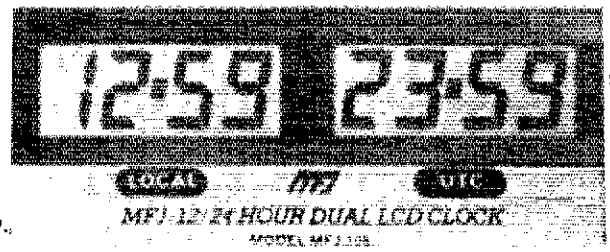

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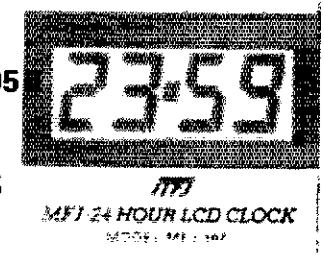

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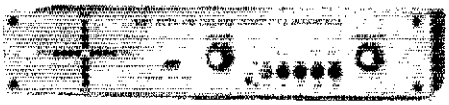

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A handy Normal/Reverse switch eliminates retuning while checking for inverted RTTY.

An extra sharp 600 Hz CW filter really separates the signals for excellent copy.

12½ x 12½ x 6 inches. Uses floating 18 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 18, 15, 12, 10 meters from apartments, motels, camp sites, vacation spots, any electrically clear location where space for full size antenna is a problem.

A telescoping whip (extends 54 in.) is mounted on self-standing 5½ x 6¾ x 2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter. 50 feet coax. Complete multi-band portable antenna system that you can use nearly anywhere. 300 watts PEP.

MFJ-1621 **$79.95**

MFJ ANTENNA BRIDGE MFJ-204B $79.95

Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

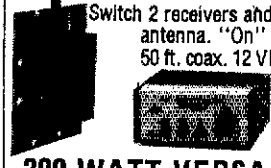
You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches.

REMOTE ACTIVE ANTENNA

The authoritative "World Radio TV Handbook" rates the MFJ-1024 as "a first-rate easy-to-operate active antenna ... Quiet, with excellent dynamic range and good gain ... Very low noise factor ... Broad frequency coverage ... the MFJ-1024 is an excellent choice in an active antenna"

54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minimum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control. Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.



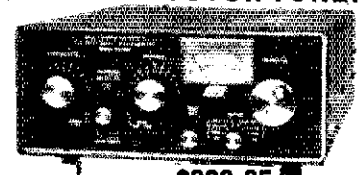
MFJ-1024 **$129.95**

200 WATT VERSA TUNER

MFJ-901B **$59.95**

MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier. Efficient air-wound inductor gives more watts out. 4:1 balun, 5x2x6 in.

ROLLER INDUCTOR TUNER



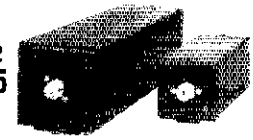
MFJ-989 **$329.95**

Meet the "Versa Tuner V", the compact roller inductor tuner that lets you run up to 3 KW PEP and match everthing from 1.8 to 30 MHz.

Designed to match the new smaller rigs, the MFJ-989 is the best roller inductor tuner produced by MFJ. Our roller inductor tuner features a 3-digit turn counter plus a spinner knob for precise inductance control for maximum SWR reduction. Just take a look at all these other great features! **Built-in 300 watt, 50 ohm dummy load, built-in 4:1 balun and a built-in lighted meter** that reads SWR and forward and reflected power in 2 ranges (200 and 2000 watts). Accuracy ±10% full scale. Meter light requires 12 VDC. 6 position antenna switch. 10¾ x 4½ x 15 inches.

MFJ "DRY" DUMMY LOADS

MFJ-262 **$64.95**



MFJ-260 **$26.95**

MFJ's "Dry" dummy loads are air cooled—no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor in aluminum housing with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt),** SWR 1.1:1 to 30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 in. **MFJ-262 (1 KW),** SWR 1.5:1 to 30 MHz, 3x3x13 inches.

MFJ ELECTRONIC KEYER

MFJ-407 **$69.95**

MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7 x 2 x 6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

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MFJ TUNERS

This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs-only 10¾"Wx4½"Hx14 7/8"D.

Matches coax, balanced lines, random wires—1.8 to 30 MHz. 3 KW PEP—the power rating you won't outgrow (250pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

MFJ-989 **$329.95**

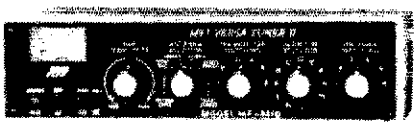
Accurate meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter, MFJ-1312 is available for $9.95.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**



MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

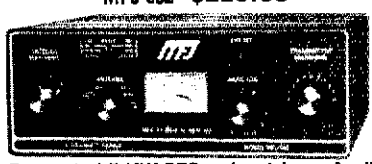
New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 2.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:2 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962 **$229.95**



Run up to 1.5 KW PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. 6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 in.

MFJ's Best VERSA TUNER

MFJ-949C **$149.95**

MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

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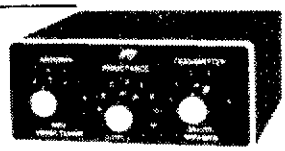
$29.95 MFJ-1701

MFJ-1701, $29.95. 6 positions. White markable surface for antenna positions.

MFJ's Smallest VERSA TUNER

MFJ-901B **$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

MFJ's Random Wire TUNER

MFJ-16010 **$39.95**

MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

MFJ-945C **$79.95**

Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. **No need to go outside and readjust your mobile whip.** Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for $5.00.

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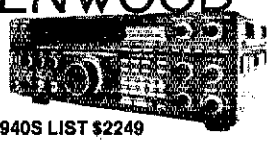

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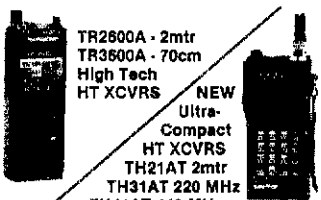

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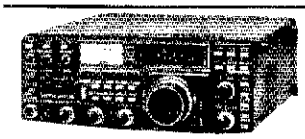

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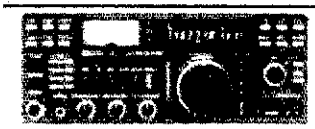

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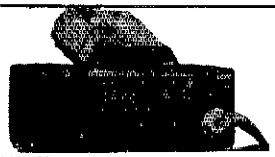

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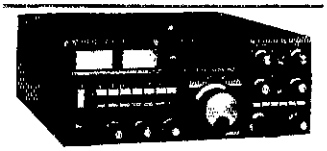

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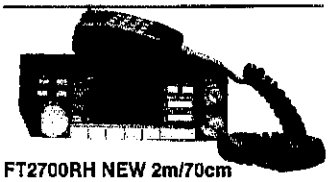

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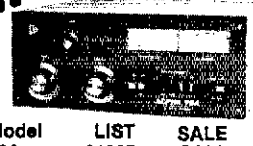

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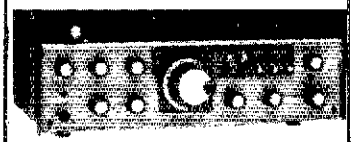

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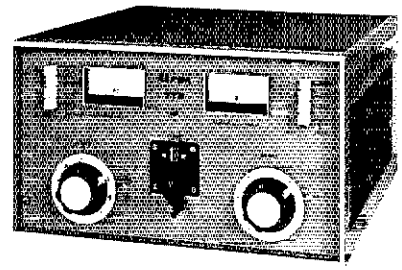

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OMNI-C, FILTERS, 255 Supply, 243 Remote VFO, excellent $650. B&K 1248 Color Generator/Analyst $130. Wanted: PS-75, RV-75. WB4ZCD,606-441-9684.

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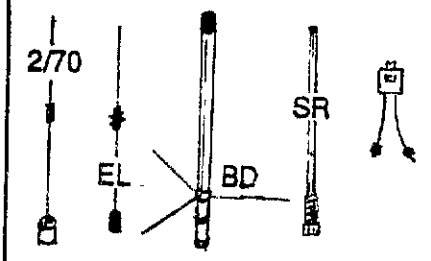

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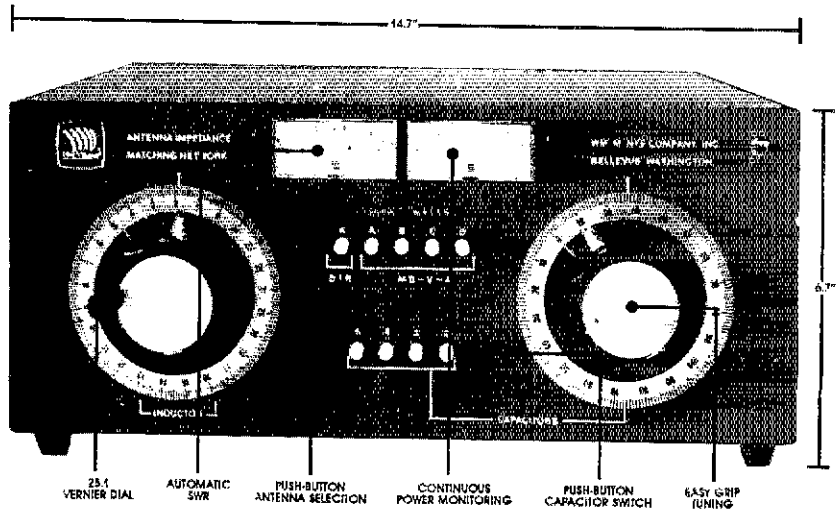

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Discover this durably built, feature packed MB-V-A Antenna Tuner. You'll find operating conveniences that make antenna tuning a snap. The MB-V-A is value engineered to do the job over wide operating ranges. Compare quality, features and the exclusive NYE VIKING TWO YEAR WARRANTY!

Maximize Power Transfer. Match your transmitter output impedance to almost any antenna system for maximum power transfer.

PI Network. Low Pass PI Network tuning — 1.8 to 30MHz. Heavy duty, silver plated continuously variable inductor with 25:1 vernier dial. 7000 volt variable capacitor and 15,000v switch selected fixed capacitors on output side. Tunes 40 to 2000 ohm antennas. Also provides harmonic suppression.

Automatic SWR. Hands free metering of SWR. No reset or calibration needed. Separate power meter — 300 or 3000 watts — automatically switched. Easy to read 2½" recessed, backlighted meters show SWR and power continuously. Precision jewel meters.

Antenna Switch. New!! PUSH-BUTTON antenna switching to 4 antennas (2 coax, single wire and twin lead). Tuner bypass on first coax output. We designed this rugged switch to handle the power.

3KW Balun. Initar wound, triple core toroid gives balanced output to twin feeders from 200 to 1000 ohms and unbalanced output down to 20 ohms.

Model Options. MB-IV-A1 includes all MB-V-A features less antenna switch and balun. MB-IV-A2 is identical to MB-IV-A1 with the addition of a triple core balun.

* 1.8 MHz will not tune on some antennas.

OTHER NYE VIKING PRODUCTS: Straight Keys, Squeeze Keys, Code Practice Sets, Electronic and Memory Keyers, Phone Patches, 2KW Low Pass Filters, Automatic SWR and Power Meters for HF and 2m (plus a model for the blind), 200w PEP antenna tuner, All-Band Antenna and more!

Ask for a free catalog.

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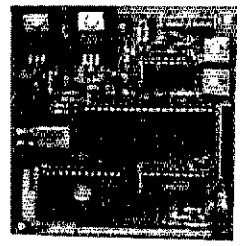
(206) 454-4524

SEE IT FOR YOURSELF AT YOUR DEALER!

MICROCOMPUTER REPEATER CONTROL



$129

Introducing the MICRO REPEATER CONTROLLER RPT-2A, a new concept in LOW COST, EASY TO INTERFACE, microcomputer repeater control. Replace old logic boards with a state of the art microcomputer that adds NEW FEATURES, HIGH RELIABILITY, LOW POWER, SMALL SIZE, and FULL DOCUMENTATION to your system. Direct interface (drop in) with most repeaters. Detailed interface information included. Original MICRO REPEATER CONTROL article featured in QST Dec. 1983.

- *TWO CW ID MESSAGES
- *TIME OUT TIMER
- *PRE-TIMEOUT WARNING MSG
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- *COURTESY BEEP
- *AUXILIARY INPUTS
- *RECONFIGURABLE-COR INPUT
- *HIGH CURRENT PTT INTERFACE
- *SINEWAVE TONE GENERATOR
- *LOW POWER 9-15 VDC @200ma
- *SIZE 3.5" x 3.5"
- *ALL CONNECTORS INCLUDED

RPT-2A KIT ONLY . . . $129 plus $3.00 shipping

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Call us for a quotation,
WE WILL SAVE YOU MONEY!

KENWOOD 430-S w/ all filters $625. Belmore 20A. supply, $65, MFJ 999-c Ant. Tuner $120, all mint. Call Ross KB4OWU - 919-982-3744.

DRAKE FOR SALE: Drake T-4XC XMTR, AC-4 power supply $250, Drake TR-4 xcvr with noise blanker $250. Each unit is proudly made in the USA. Specify ite, and send check or money order to Thomas E. Bryant, 239 east High Street, -305, Lexington, KY 40507.

SELL: HW-101, HP-23A,PS, SP600, CW Filter $225. SBA 104-1 Kit $25. BW 75 ohms Low Pass Filter $25. ART-13 Book $15. Lampkin 105-B with UHF Adapter $100 Monitor Scope HO-10 $35. Elco 378 Audio Generator $75. All mint with books. P. Lelong 5408 Simpson Ave. North Hollywood CA 91607.

SELLING TWO HyGAIN HiTowers. One is Perfect covering 160 through 10. Other requires minor components. Both for $350. K1DL, 603- 448-3864.

R-4C, 500Hz, $205; T-4XC, AC-4, $255; 32S-3, 516F-2, $350; 75S-3B, 312B-3, $620; postpaid. Paul Husby, 1697-C Fulham, St. Paul MN 55113. 612-642-1559.

WANTED: DRAKE MS-4 Speaker. W1KFY, 2 Lake St., Winhtrop, ME 04364.

KENWOOD-TS 940S, SP940 Speaker, Straight key, Commodore-128, Pakratt-64 & HF Modem-$2000 & MC85 Comm. Microphone Heath DX-60B $25. WD6DHL 916-682-3403.

WANTED OHMITE D101-3000, 1000W 300ohm Dummy Liad, also 50K 100W adjustable resistor. Conrad Helber Star Rpute, Middlebrook, MD 63656.

KENWOOD TS-820S with CW Filter, service manual, excellent condition, $450. You ship. W1GD, 201-681-9124.

PRINTED CIRCUIT Boards - low quotes, high quality, and quick service. single, double sided, and multilayered boards. Prototypes through production quantities. Call or writhe for quotes - T.O.R.C.C.C., Box 47148, Chicago, 60647 - 312-342-9171.

ROSS'S USED September Specials: Robot 400 $299.90 Kenwood R-1000 $299.90, DFC-230 $99.90, PS-20 $45.90, ST-1 $39.90, TS-930S $889.90 Yaesu FT-901DE $539.90, FTV-107/W 6M $189.90, FV-101Z $89.90. ICOM IC-37A $279.90, IC-701/701PS $479.90, Phone orsend SASE for used list. Over 200 used. 7,500 new ham items in stock. Mention ad. Prices Cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263 208-852-0830.

MINI-QUAD HQ-1 Modification Kits, Mini-Quads, Butternut Antennas, low prices, free shipping, Stamp for flyer, Hart Eastern Communications, 1444 Darlington, Derby, NY 14047.

TRS80C 'DUP/1' is a great contest aid program. Holds about 1500 calls (32k). About 450 (16k). $6.50. $8.50 outside continental USA. N5II, W. Sale, Rt.1, Box 98A, Springhill, LA 71075.

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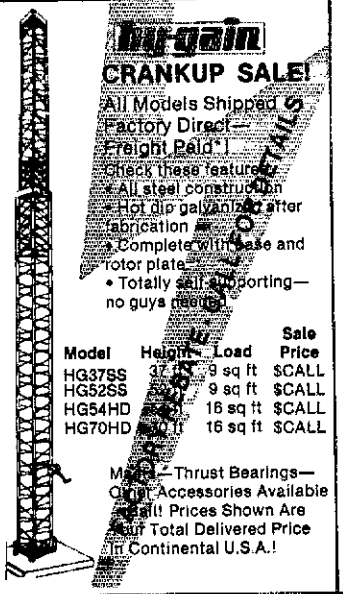
Lee Aurick, W1SE, Advertising Manager
Sandy Gerli, AC1Y, Deputy Adv. Mgr.
Lindy Messmer, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

Index of Advertisers

ANTENNA/TOWER SALE!



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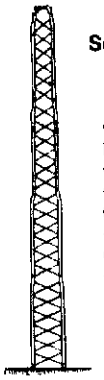
CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!
Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Many—Thrust Bearings—Other Accessories Available
*All Prices Shown Are Our Total Delivered Price In Continental U.S.A.!



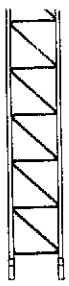
ROHN
Self Supporting Towers On SALE!
FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN
Guyed Tower Packages



- World Famous Rohn Quality and Dependability
- Rugged high wind survival-provides safe installation
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.

Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse. In stock for prompt delivery.

	Model 25G	Model 45G	Model 55G
50'	$ 579	1079	1439
60'	639	1209	1609
70'	689	1329	1759
80'	849	1479	1929
90'	919	1749	2089
100'	989	1899	2259
110'	1189	2019	2639
120'	1259	2179	2819

US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!
Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting—No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!

Model	Min. Ht.	Max. Ht.	Ant. load*	Sale price
MA40 mast	21'	40'	10 sq ft	$ 549
MA50 mast	22'	50'	10 sq ft	800
TX438	22'	38'	18 sq ft	829
TX455	22'	55'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2099
HDX565	22'	56'	30 sq ft	1879
HDX572	23'	72'	30 sq ft	3229

Note - US Towers Shipped Freight Collect From Visalia, CA Factory
**Note-towers rated at 60 mph to EIA specifications*

RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

$.39/ft $390/1000 ft

- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket ..... $.79/ft
½" LDF4-50 Andrew Heliax™ $1.79/ft
⅞" LDF5-50 Andrew Heliax™ $3.99/ft
select connectors below.

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax™	$25	$25	$25	$25
⅞" Heliax™	$49	$49	$49	$49

COAX CONNECTORS

Amphenol Silver PL259 ..... $1.25
UG21B N Male $2.95
9086/9913 N Male Connector $4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga. $.10/ft 16ga. $.09/ft
¼ mile 18ga copper-clad steel wire $30
6 inch heavy-duty end insulator ..... $3.00/ea.

Van Gorden

1:1 Balun ..... $11 Center Insulator $6
Dipole Kits D80 $31.95/D40 $28.95
Short Dipole Kits SD80 $35.95/SD40 $33.95
All-band Dipole w/ladder line $29.95
G5RV all band antenna $49.95

ALPHA DELTA

DX-A 160-80-40 Sloper $49

CUSHCRAFT

A3 3-el Tribander $229
A4 4-el Tribander Beam $299
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea $79
R3 20, 15, 10mtr Vertical $275
AV5 80-10mtr Vertical $109
D40 40mtr Dipole $159
40-2CD 2-el 40 mtr Beam $299
A50-5 5-el 6 mtr Beam $85
215 WB NEW 15-el 2 mtr Beam $85
230 WB NEW 30-el 2 mtr Beam $229
4218 XL 18-el 2 mtr Beam $105
3219 19-el 2 mtr Beam $99
220B 17-el 220MHz Beam $99
424B 24-el 432MHz Beam $85
ARX2B 2 mtr Vertical $39

hy-gain

Limited Quantities purchased at old prices. Call for current prices

Discoverer 2-el 40-mtr Beam
Discoverer 3-el Conversion Kit
EXPLORER-14 SUPER-SPECIAL
QK710 30/40 mtr. Add-On-Kit
V2S 2-mtr Base Vertical
V4S 440MHz Base Vertical
TH5MK2S Broad Band 5-el Triband Beam
TH7DXS 7-el Triband Beam
TH3JRS 3-el Triband Beam
205BAS 5-el 20-mtr Beam
155BAS 5-el 15-mtr Beam
105BAS 5-el 10-mtr Beam
204BAS 4-el 20-mtr Beam
64BS 4-el 6-mtr Beam
12 AVQ 20-10 mtr vertical
14 AVQ 40-10 mtr vertical
18 AVT/WB 80-10mtr Vertical
18HTS 80-10 mtr Hy-Tower Vertical
23BS 3-el 2 mtr Beam
25BS 5-el 2 mtr Beam
28BS 8-el 2 mtr Beam
214BS 14-el 2-mtr Beam
28DQ 80/40 mtr Trap Dipole
58DQ 80-10 mtr Trap Dipole
BN86 80-10 mtr KW Balun W/Coax Seal

$50.00 FACTORY REBATE WITH PURCHASE OF HF BEAM ANTENNA & ROTOR

HUSTLER

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert $109
4BTV 40-10 mtr Vert $89 G7-144 2-mtr Base $119
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10 Mtr. Vertical Antenna $129. Delivered (Cont. USA)

- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

HF2V 80/40 Meter Vertical Antenna $129 Delivered (Continental USA)

- Optional 160 Meter Resonator Kit Model TBR 160 $49

HF6V

HF2V

HF4B "Butterfly" $189. (del. cont. USA)

- Covers 10, 12, 15, 20M
- Compact Beam Design
- Max. Element Length of 12.5'
- Light Weight, Only 17 lbs.
- Use with TV Rotor

Free Shipping On Butternut Accessories Also When Purchased With Antenna

KLM

KT34A 4-el Broad Band Triband Beam	$Call
KT34XA 6-el Broad Band Triband Beam	$Call
2m-14C 14-el 2-mtr Satellite Antenna	$Call
2m-16LBX NEW 16-el 2-mtr Beam	$Call
2m-22C NEW 22-el 2-mtr Satellite Antenna	$Call
432-30LBX NEW 30-el 432 MHz Antenna	$Call
435-18C 435 MHz Satellite Antenna W/CS-2	$Call
435-40CX 435 MHz Satellite Antenna W/CS-2	$Call

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119.95
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR3000 Heavy Duty (25 sq ft rating)	$Call
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Kenpro KR5400 AZ/EL Rotor Package	$319

ROTOR CABLE

Standard 8 cond cables $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWERS

10 ft Stack Sections
20G $39.50 45G $112.50
25G $49.50 55G $149.50

All 20G, 25G, 45G and 55G Accessories in Stock at Discount Prices - CALL!

Foldover Towers	Model	Height	Ant Load*	Price
	FK2548	48 ft	15.4 sq ft	$899
	FK2558	58 ft	13.3 sq ft	$949
	FK2568	68 ft	11.7 sq ft	$999
	FK4544	44 ft	34.8 sq ft	$1199
	FK4554	54 ft	29.1 sq ft	$1299
	FK4564	64 ft	28.4 sq ft	$1399

25G Foldover Double Guy Kit $249
45G Foldover Double Guy Kit $269
*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.
All Foldover Towers Shipped Freight Prepaid Continental USA! Foldover Prices 10% Higher West of Rockies

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3/16 EHS Guywire (3990 lb rating)	$ 15/ft
1/4 EHS Guywire (6650 lb rating)	$ 18/ft
5/16 EHS Guywire (11,200 lb rating)	$ 29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$ 45
1/4 CCM Cable Clamp (1/4" Cable)	$ 55
1/4 TH Thimble (fits all sizes)	$ 45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2 × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
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500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
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Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	$29	$49	$69	$89
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Power Supply
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• RS12A $68
• RS20A $88
• RS20M $105
• VS20M $125
• RS35A $133
• RS35M $149
• VS35M $165
• RS50A $189
• RS50M $215
• RM50A $219
• VS50M $229
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BUTTERNUT
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HF2V $110.00
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QUATRON
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RG-8 Superflex .28/ft.
9913 Type .39/ft.
Rotor Cable .18/ft.
H.D. Rotor Cable .31/ft.
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TELEX. hy-gain
$100.00 on HG37SS or HG52SS Towers
$200.00 on HG54HD or HG70HD Towers
Take an additional $50.00 when you purchase a Hy-Gain HF Beam Antenna with Ham IV or T2X or HDR300 rotator
• MOST ORDERS SHIPPED SAME DAY •

Announcing the HF/VHF/UHF base station you'll hear about on the air.

Listen for Yaesu's FT-767GX everywhere you might hear it: HF, 6 meters, 2 meters and 70 cm.

You'll hear operators calling it the ideal HF/VHF/UHF base station for small ham shacks and apartments.

And they'll rave about its full-featured performance and highly attractive price.

You see, the FT-767GX continues the price/performance tradition of our popular FT-757GX. But with even more features.

When you're ready to expand beyond HF coverage, just plug in optional modules for 6-meter, 2-meter, and 70-cm operation.

As standard equipment, you get a built-in HF automatic antenna tuner, AC power supply, digital SWR meter, digital power output meter, electronic keyer, and CW filter.

And operation is smooth and intuitive with keyboard frequency entry. Dual VFOs that tune in 10-Hz steps. A digital display in 10-Hz steps. And ten memories that store mode, frequency, and CTCSS tone information.

The FT-767GX is ready to operate full duty cycle at full rated power output for up to 30 minutes. And it listens from 100 kHz to 30 MHz.

Plus your station is really complete with full CW break-in, our patented Audio Peak Filter for CW operation, a CW TX offset variable 500/600/700 Hz, IF shift, an IF notch filter, a Woodpecker noise blanker, a VFO tracking system for slaved A/B VFO tuning, and optional CTCSS unit for repeater operation. And that's just a partial list!

But the best way to discover its full-featured performance is to visit your Yaesu dealer today.

Yaesu's FT-767GX. The affordable way to be heard on HF, VHF and UHF.

YAESU

Our 30th Anniversary.

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Customer Service: (213) 404-4884
Parts: (213) 404-4847

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Prices and specifications subject to change without notice.

KENWOOD

...pacesetter in Amateur radio

Now TM-3530A 220 MHz

Power-Full...70 Watts!

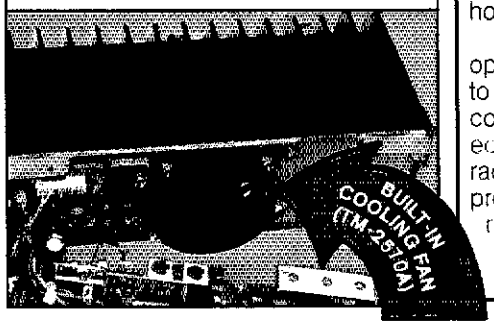
TM-2570A/2550A/2530A/3530A

Sophisticated FM transceivers

Kenwood sets the pace again! The all-new "25-Series" brings the industry's *first* compact 70-watt 2-meter FM mobile transceiver. There is even an *auto dialer* which stores 15 telephone numbers! There are four versions to choose from: The TM-2570A 70-watt, TM- 2550A 45-watt, TM-2530A 25-watt and the TM-3530A 220 MHz, 25-watt.

- **First** 70-watt FM mobile (TM-2570A)
- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit phone numbers)
- Direct keyboard entry of frequency
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Extended frequency coverage for MARS and CAP (142-149 MHz; 141-151 MHz modifiable)
- 23 channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz** (optional)
- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- Frequency lock switch
- **New** 5-way adjustable mounting system
- **Unique** offset microphone connector —relieves stress on microphone cord

Large heatsink with built-in cooling fan (TM-2570A)

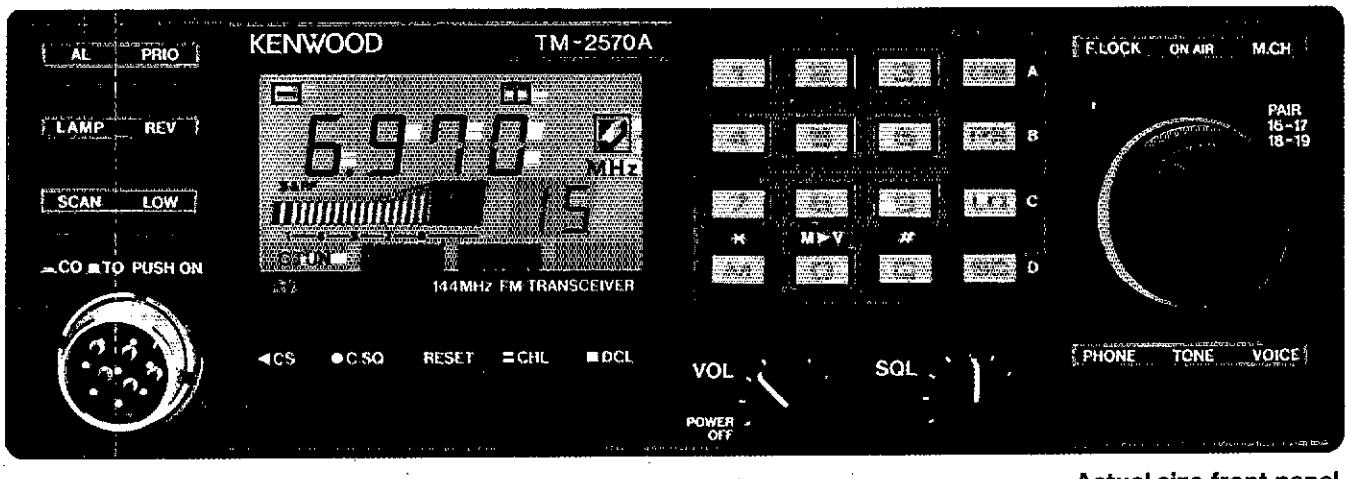


- High performance GaAs FET front end receiver
- HI/LOW Power switch (adjustable LOW power)
- TM-3530A covers 220-225 MHz
- Digital Channel Link (optional)

DCL Introducing... Digital Channel Link

Compatible with Kenwood's DCS (Digital Code Squelch), the DCL system enables your rig to **automatically** QSY to an open channel. Now you can automatically switch over to a simplex channel after repeater contact! Here's how it works:

The DCL system searches for an open channel, remembers it, returns to the original frequency and transmits control information to another DCL-equipped station that switches **both** radios to the open channel. Microprocessor control assures fast and reliable operation. The whole process happens in an instant!



Actual size front panel

Optional Accessories

- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply for TM-2550A/2530A/3530A
- **PS-50** DC power supply for TM-2570A
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DWN switch
- **MC-42S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200A/SW-200B** SWR/power meters
- **SW-100A/SW-100B** compact SWR/power meters
- **SWT-1** 2m antenna tuner

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.
Specifications guaranteed on Amateur bands only.

KENWOOD

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