

TS-930S

"DX-traordinary"... superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

A superlative, high-performance, all solid-state HF transceiver, that covers all Amateur HF bands, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.

TS-930S FEATURES:

- · 160-10 Meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC, on SSB, CW, FSK, and AM. UP conversion digital PLL circuit.
- Excellent receiver dynamic range. Typical two-tone dynamic range, 100 dB (20 meters, 50-kHz spacing, 500 Hz CW bandwidth).
- · All solid-state 28 volt operated final amplifier. Lowest IM distortion. Power input 250 W on



SSB/CW/FSK, 80 W on AM. SWR/ Power meter.

- Available with AT-930 automatic antenna tuner built-in, or as an option. Covers 80-10 meters, including WARC bands.
- CW full break-in. CMOS logic IC, plus reed relay. Switchable to semi break-in.
- Dual digital VFO's, 10-Hz steps, includes band information.
- · Eight memory channels. Stores frequency and band data. Internal battery memory backup, est. I yr. life. (Battery not Kenwood supplied.)
- · Dual mode noise blanker. NB-1. with threshold control, for "pulse" noise. NB-2 for "woodpecker."

HE TRANSCEIVER ON AM

TS-4305

FLOCK

MODE

IL TER

USS

CW

FM

MA AM

- SSB IF slope tuning, allows independent adjustment of the low and/or high frequency slopes of the IF passband.
- · CW VBT and pitch control. VBT tunes out interfering signals. CW pitch control shifts IF pass-band and beat frequency. "Narrow-Wide" filter switch.
- Tuneable, peak-type audio filter for CW.
- AC power supply built-in.
- · Fluorescent tube digital display (100 Hz resolution, modifiable to 10 Hz) with digitalized sub-scale. in 20-kHz steps.
- RF speech processor.

142 150

· One year limited warranty.

SSB monitor circuit.

Optional Accessories:

- AT-930 Auto, antenna tuner.
- · SP-930 External speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455 kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83 MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83 MHz IF.
- SO-1 commercial grade TCXO.
- MC-42S UP/DOWN hand mic.
- MC-60A deluxe desk mic.
- MC-80 desk top UP/DOWN mic.
- MC-85 multi-function desk mic.

TS-430S

"Digital DX-terity"... General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch, COMPACT!

Combines compact styling with state-of-the-art circuit design and performance.

TS-430S FEATURES:

- 160-10 meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC. UP-conversion digital PLL circuit.
- . USB, LSB, CW, AM, and FM (optional) all mode.
- · Compact lightweight design. Only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm): only 14.3 lbs. (6.5 kg.).
- Superior receiver dynamic range with Dyna-Mix high sensitivity direct mixing system.
- 10-Hz step dual digital VFO's. Operate independently, include band and mode information. Dial torque adjustable. Step switch for 10-Hz or 100-Hz steps. A=B switch shifts "B" VFO to "A" VFO frequency and mode, or vice versa. VFO LOCK switch. RIT for VFO or memory, UP/ DOWN manual scan with
- · Eight memories store frequency, mode, and band data. 8th memory stores RX/TX frequencies independently.

optional UP/DOWN microphone.

- Lithium battery memory back-up.
 All-mode squelch circuit, built-in.
 MC-42S UP/DOWN hand mic. (Est. 5 yr. life.)
- · Memory Scan.
- · Programmable automatic band scan width.

- IF shift circuit for minimum QRM.
- · Tuneable notch filter, built-in.
- · Narrow-wide filter selection on SSB and CW (filter optional).
- · Speech processor, built-in.
- All solid state. Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Operates on 12 VDC or on 120 VAC, or 220/240 VAC with optional PS-430 AC power supply.
- Fluorescent tube digital display indicates frequency to 100 Hz (10 Hz modifiable).
- · Built-in noise blanker.
- RF attenuator (20 dB).
- · VOX circuit, plus semi break-in with side-tone.

Optional accessories:

RIT - IF SHIFT

M.CH

MR

M.IN

DOWN BAND BUR

ANB

LOCK

STEP

MS

PG.S

HOLD

- PS-430, PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket. · AT-250 automatic antenna
- tuner, 160-10 m, incl. WARC.
- · AT-130 compact antenna tuner. 80-10 m, incl. WARC.
- FM-430 FM unit.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) SSB filter.
- YK-88A (6 kHz) AM filter.
- · MC-55 (8P) mobile mic.
- MC-60A deluxe desk mic.
- MC-80 desk top UP/DOWN mic.
- MC-85 multi-function desk mic.

TRIO-KENWOOD COMMUNICATIONS 1111 West Walnut, Compton, California 90220

TR-2500

BIG performance, small size, smaller price!

The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.

TR-2500 FEATURES:

- Weighs 540 g, (1.2 lbs). 66 (2-5/8)
 W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches).
- · LCD digital frequency readout.
- Ten memories includes "MO" for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- · Memory scan.
- Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
- · Repeater reverse operation.
- 2.5 W or 300 mW RF output. (HI/LOW power switch).
 Built-in tunable (with variable)
- resistor) sub-tone encoder.

 Built-in 16-key autopatch encoder.
- · Slide-lock battery pack.
- · Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz.



CONVENIENT TOP CONTROLS



- Optional MS-1 mobile or ST-2
 AC charger/supply for operation while charging.
- · Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

Optional accessories:

- ST-2 Base station power supply/ charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/ charger/power supply.
- VB-2530 2-M 25 W RF power amps., (TR-2500 only).
- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- · DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- · SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.



TR-3500

70 CM FM Handheld

- Covers 440-449.995 MHz in 5-kHz steps.
- Hi-1.5 W, Low-300 mW.
- TX OFFSET switch, ±5 kHz to ±9.995 MHz programmable.
- Auto/manual squelch control.
- Tone switch for opt, TU-35B
- Other outstanding features similar to TR-2500.
- BH-2A Belt hook.
- RA-3 2 m 3/8 λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap.
- EP-1 Earphone.

TR-7950/7930

Big LCD, Big 45 W, Big 21 memories, Compact.

Outstanding features providing maximum ease of operation include a large, easy-to-read LCD display, 21 multi-function memories, a choice of 45 watts (TR-7950) or 25 watts (TR-7930), and the use of microprocessor technology throughout.

TR-7950/TR-7930 FEATURES:

- New, large, easy-to-read LCD digital display. Easy to read in direct sunlight or dark (backlighted). Displays TX/RX frequencies, memory channel, repeater offset, sub-tone number, scan, and memory scan lock-out.
- 21 new multi-function memory channels. Stores frequency,

- repeater offset, and optional sub-tone channels. Memory pairs for non-standard splits. "A" and "B" set band scan limits. Lighted memory selector knob. Audible "beep" indicates channel 1 position.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- 45 watts or 25 watts output.
 HI/LOW power switch for reduction to 5 watts.
- Automatic offset. Pre-programmed for simplex or ±600 kHz offset, in accordance with the 2 meter band plan. "OS" key for manual change in offset.
- Programmable priority alert.
 May be programmed in any memory.
- Programmable memory scan lock-out. Skips selected memory channels during scan.
- Programmable band scan width.
- Center stop circuit for band scan, with indicator.
- Scan resume selectable. Selectable automatic time resumescan, or carrier operated resume-scan.
- Scan start/stop from up/down microphone.

- Programmable three sub-tone channels with optional TU-79 unit (encoder).
- Built-in 16-key autopatch encoder, with monitor (Audible tones).
- · Front panel keyboard control.
- Covers 142.000-148.995 MHz in 5-kHz steps.
- Repeater reverse switch. (Locking)
- "Beeper" amplified through speaker.
- · Compact lightweight design.

Optional accessories:

- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.



KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

WELZ



SP-600

SP-600

Select 1 of 3 sensors by soft touch switch. Three wide bandwidth sensors cover 1.6-500MHz. \$159.00 RS-1: 1.6-60MHz RS-2: 1.6-150MHz RS-3: 130-500MHz

0-2kW

-2: 1.6-150MH 0-200W

0-200W

SP-200

Two position antenna switch and indicators. Three power ranges to 1kW, 1.8-160MHz. \$107.00

SP-400

Three band sensors (2m, 220, 450MHz), 10 percent accuracy, 0-150W CW, LED power range indicators. \$109.00

Distributed by

Encomm, Inc.

2000 Avenue G, Suite 800, Plano, Texas 75074 Phone (214) 423-0024 TLX 79-4783 ENCOMM DAL

WELZ

SP-250



SWR & POWER METERS

SP-250 Low-profile, economy 2kW wattmeter. 1.6-60MHz bandwidth. 3W SWR sensitivity. Three ranges. A Best Buy! \$75.00

SP-15M

1.8-150MHz, 200 watt, low-profile wattmeter. VSWR, FWD
PWR, REF PWR, 1.5W SWR sensitivity. Great for mobile HF.
\$60.00

SP-45M

VHF-UHF to 100 watts. 3W sensitivity for SWR, 10 percent accuracy. All metal shielded construction. \$85.00

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CIRCLE 4 ON READER SERVICE CARD

WELZ

DUMMY LOADS

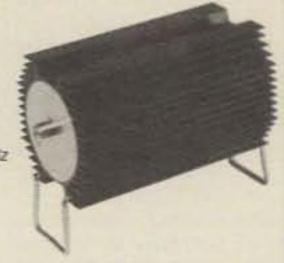


CT-300
Oil-less aircooled,
1kW peak for 3 min.,
300W avg. DC-250MHz

\$68.00

CT-150

Oil-less aircooled, 400W peak for 3 min., 150W avg. DC-250MHz \$46.00





CT-15A

50W peak, 15W avg. S0-239 Screw-on dummy DC-500MHz, VSWR<1:1.2

\$12.00

CT-15N

50W peak, 15W avg., Type N Dummy Load, DC-500MHz, VSWR <1:1.1 \$21.00



SURGE SUPPRESSOR



CA-35A

Contains replaceable, chip-type surge voltage protector. Low loss, low VSWR. DC-500MHz, 350V breakdown. \$22.00

COAXIAL SWITCH

CH-20N

Two-way coaxial switch. \$0-239 type connector. DC-900MHz, 1kW power. \$54.00



TERMINATION POWER METERS



TP-05X

BNC connector, 5W talkie checker. Field calibratable, 3W avg. Dummy Load, 1W center. 50-500MHz. \$21.00

TP-25A

25 watt version of TP-05X for mobile use. Larger Dummy Load. 50-500MHz

n of oile use. Load.

All prices are suggested retail and subject to change.

Distributed by

\$40.00

Encomm, Inc.

2000 Avenue G, Suite 800, Plano, Texas 75074 Phone (214) 423-0024 TLX 79-4783 ENCOMM DAL

MASTHEAD

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Gail M. Schieber Associate Editor

Lew McCoy, W1ICP **Technical Representative**

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John A. Attaway, K4IIF Chairman, CQ DX Committee

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Larry Brockman, N6AR

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Adrian Weiss, K8EEG/0 **QRPp** Editor

Bernie Welch, W8IMZ **Contest Advisor**

Bill Welsh, W6DDB **Novice Editor**

Billy Williams, N4UF CQ DX Awards Manager

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Dorothy Kehrwieder General Manager

Jack M. Gutzeit, W2LZX **National Advertising Manager**

Herb Pressman Asst. Advertising Mgr.

Arnold Sposato

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Elizabeth Ryan **Art Director**

Pat Le Blanc Phototypographer

Hal Keith Illustrator

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The Radio Amateur's Journal

ON THE COVER: CQville decorates for the holidays. John Rogers, W2ADC, transports us once more to this idyllic community during winter. May your holidays be as happy and joyous as the folks in CQville experience each year.



DECEMBER 1983

VOL. 39, NO. 12

ATLIBEC

EAIURES	
CQ INTERVIEWS: DR. FRED W. DECKER, W7ANX, DEPUTY ASSISTANT SECRETARY, OFFICE OF EDUCATIONAL RESEARCH AND IMPROVEMENT (OERI), U.S.	
DEPARTMENT OF EDUCATION Dr. Theodore J. Cohen, N4XX	11
CQ REVIEWS: THE HEATHKIT HW-5400 TRANSCEIVER Lew McCoy, W1ICP	18
HOW TO BUILD A MINI KW ANTENNA TUNER John J. Schultz, W4FA	26
THE EVOLUTION OF THE FOUR-ELEMENT DOUBLE-DRIVEN QUAD ANTENNA	30
HOW TO ADD 30 METERS TO THE YAESU FT-901 TRANSCEIVER Bob Alexander, W5AH	40
CQ REVIEWS: THE RADIO AMATEUR CALLBOOK, A TRADITION IN AMATEUR RADIO FOR 63 YEARS Alan M. Dorhoffer, K2EEK	48
RESULTS OF THE 1983 CQ 160 METER C.W. AND PHONE DX CONTESTS Donald McClenon, N4IN	52
CQ REVIEWS: A TRIO OF STATION CLOCKS FROM MFJ John J. Schultz, W4FA	62
CQ SHOWCASE: NEW AMATEUR PRODUCTS	66
A DXER'S LOG BOOKBob Locher, W9KNI	68
COMMUNICATIONS AND ELECTRONICS AT THE SMITHSONIAN INSTITUTION	77
QRP: THOSE WHO HAVE GONE BEFORE—N6HY Adrian Weiss, WØRSP	84
NOVICE: HISTORY OF THE NOVICE LICENSE, CONCLUSION Bill Welsh, W6DDB	92
ANTENNAS: READER REPORTS Karl T. Thurber, Jr., W8FX	94
DATELINE WASHINGTON, D.C.: THE INS AND OUTS OF THE WASHINGTON SCENE Dr. Theodore J. Cohen, N4XX	102
THE WORLD OF IDEAS: AMATEUR COLLECTIBLES OF RECENT TIMES	123

DEPARTMENTS-

AWARDS: STORY OF THE MONTH—WILLIAM M. SMITH, W7GHT Dorothy H. Johnson, WB9RCY	106
CONTEST CALENDAR: CONTESTS FOR DEC. AND EARLY JAN. Frank Anzalone, W1WY	113
DX: DE EXTRA, NEWS FROM THE DX CLUBS AND FOUNDATIONS John A. Attaway, K4IIF	116
PROPAGATION: DX PROPAGATION CHARTS George Jacobs, W3ASK	126
ZERO BIAS 4 ANNOUNCEMENTS	8
OUR READERS SAY 6 HAM SHOP	130

Lero Bias an Editorial

ur tower is festooned in holiday ornaments this year as CQville shapes up for the festivities. Gifts and packets of zone 23 cards have to be delivered by sleigh this year, as the snow came a bit early. The delivery man is a ham, too (everyone in CQville is), and he lets those ahead on the route know that WAZ is just around the corner. John Rogers, W2ADC, ushers us once more into the holiday season via his watercolors and imagination. We at CQ join with John to wish all of you a very joyous Holiday Season and a Happy New Year.

For all of us 1984 is shaping up to be a good year, and judging by the manuscripts I've been receiving lately, we're going to have some pretty terrific issues of CQ in the months to come. Participation in our Contests and Awards Programs seems to be ever increasing, and that just means that more of you are enjoying amateur radio and really getting more fun out of it. This is a happy and enthusiastic time of year for most of us, so let's try to keep that feeling going throughout the year and make the most of it.

Travels With CO

We arrived at Mundelein, Illinois, for Radio-Expo on Friday afternoon. Radio-Expo weather sort of parallels Dayton in that it's either very good or rotten. This year we got a bit of both. Saturday was a great day and Sunday was cold and rainy. We had the good fortune to have our CQ booth next to the prize booth, where prizes were given out on the hour throughout the weekend. Needless to say, it was a heavily trafficked, busy spot.

CQ's USA-CA Award Custodian and Awards Columnist Dorothy Johnson, WB9RCY, and her husband spent time at the booth, where they met many active County Hunters. I brought out a quick synopsis of the Volunteer Examiner Program, which had just been settled by the FCC the previous afternoon, and that caused a stir of activity by people who hadn't expected the form and substance of the decision.

Herb Nelson of the Radio Amateur's Callbook came by, and after talking to him for a while we came up with the idea of reviewing the Callbook. After all, we were already in the Chicago area. We pushed the review through in order to have it in this issue.

Fleamarket aficionados had a great time here, as there was "stuff" of every vintage and every technology, and the ever-popular "stuff" that defies use or description. This translates into some-



thing for everyone, and everyone came home with something.

The next day Dick was off to Spain for the celebration of the first issue of CQ Radio Amateur, the Spanish-language edition of CQ. We were all fortunate to have His Highness, King Juan Carlos (EAØJC) grant an interview for our first issue. A picture of him at his station graces our first cover. The magazine was officially launched at a technical exposition in Barcelona. An amateur radio station was set up, and the government allowed a special call, ED3CQ, to be used for the duration of the show. Dick managed to get in some operating time, and one of the first people he worked was Wayne Green, W2NSD/1. For the record, Wayne does QSL.

Two weeks later Dick, Jack, and I were in Houston for the ARRL National. Due to the airline situation, we arrived about 20 minutes before closing on Friday evening. However, Lew McCoy, W1ICP, saved the day by setting up a quick display of magazines earlier in the afternoon. He had the foresight (and time) to get there earlier.

There was a lot to see and buy if you were so inclined, and lots of folks seemed inclined, notwithstanding the state of the local economy. Ade Weiss, K8EEG/WØRSP, our resident QRP expert, flew down to give a talk on QRP (what else) and managed to come away with an award. Rev. George Dobbs, G3RJV, the Editor and prime mover of SPRAT (the British journal of the G QRP Club), finally made it official, and Ade was presented with a DXCC Milliwatt trophy. Don McClenon, N4IN, was there to speak on 160

meter contesting and operating, and Lew was persuaded to fill in a vacancy in the schedule and give a talk on antennas. CQ was indeed well represented at the forums.

Earlier in the month I had worked out a swap with Lew. I traded some old gear for his Unimat lathe, the little German lathe. I shipped the gear to him, and he brought the lathe along with the accessories down to Houston. All I needed was a micrometer. If you believe in positive thinking, everything is possible. I managed to find a 1 inch and a 2 inch micrometer at the fleamarket at extremely good prices.

While we had a hectic weekend in Houston, Arnie and Herb held the fort at the Virginia Beach Convention. This one is held at the new Convention Center about six blocks or so from the beach. The facilities are excellent, and the people there are extremely friendly, so I'm sorry that I couldn't be there this year. Arnie and Herb reported an enthusiastic crowd and, of course, a great fleamarket (Herb is hooked on them, too).

This weekend sort of closed the official plans for the CQ travelers for 1983. Most of you seem to enjoy these reports on what is going on in amateur radio throughout the country. For those of you who don't really care about who we saw, where we were, or what we ate, then I urge you to find out for yourself how much fun and excitement can be generated in a hamfest weekend. Part of that enjoyment is the recounting of it to someone else.

Another Stocking Stuffer

If you have a large stocking hung up by the fireplace, you may have room for this item. There's a new book out called The First 50 Years, A History of Collins Radio Company and the Collins Division of Rockwell Collins. It is a large-format, hard-cover, beautifully produced book that traces the complete history of Collins Radio Company. The text is easy to read, and there is a treasure trove of illustrations from the early years in Art Collins's attic to the latest equipment being produced. It is easy to see how the Collins mystique originated and continues today. For all of you Collins owners and fans, the book is a great buy. It sells for \$10.00 (plus shipping and handling as follows: \$2.75 domestic, \$16.60 Far East, \$11.80 Europe, \$7.00 Central America). You can order a copy from Spectrum Association, Attn: Judy R. Jourdan, 105-161, 400 Collins Road, N.E., Cedar Rapids, Iowa 52498.

73, Alan, K2EEK

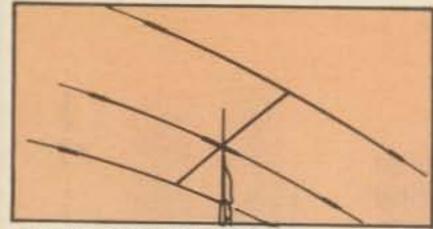
F BROADBAND VERTICALS Hy-Gain broadband vertical antennas load the new auto-tune solid state rigs, require minimal space and provide low angle radiation without the expense or the problems of support structures. 18AVT/WBS (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is do grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included. 14AVQ/WBS (40-10 meters) Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low SWR angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel 18 HTS (80-10 meters. 160 meters with optional loading coil) The superb reliability of the 18 HTS is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which Vertical effectively isolates various sections of the antenna so that an electrical ¼ wavelength (or odd multiple ¼ wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended 1/4 wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware. WARC kits to be available. Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware. PHASE FOR GAIN Any two identical Hy-Gain verticals can be phased for excellent gain and directivity. A great system for beam performance on 40, 80 and 160 meters or for 10, 15 and 20 meters where space is limited. Send for our free technical report "Phased Verticals". 4AVQ/WBS 18' (5.5 m) AVT/WBS 25' (7.6 m) HTS 50 (15.2 m) SBW/TVA81 SBW/QVAP1 Hy-Gain Verticals that work the world at better Amateur Dealers. TELEX. hy-gain. TELEX COMMUNICATIONS, INC. 9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A. Europe: Le Bonaparte-Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

Tribander Beams For 10-15-20 Meters

"WESTERN PENETRATOR"

DX-33 3-element tribander

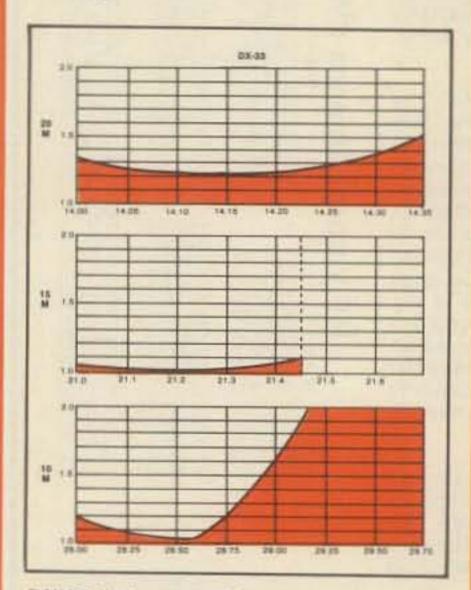
DX-34 4-element tribander



- Expertly engineered.
- Outstanding performance.
- Wider bandwidth.
- · High strength tubing.
- Each trap individually sweep frequency tested.
- Reinforced center sections.
- Stainless steel "U" bolts.
- Competitive price.
- Low SWR.

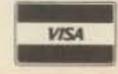
The Western Penetrator is a new force to be reckoned with! It will help you penetrate the four corners of the earth and will provide years of maintenance free operating pleasure.

Outstanding design and strict quality control combine to produce a superb contest winning antenna.



DX-33 3-element tribander • \$219+UPS
DX-34 4-element tribander • \$299+UPS

Write or call today for complete specifications and exact UPS charges to your home. Send for FREE catalog describing the Western Penetrator, and our complete line of Noise Bridges, SWR Meter, Baluns, VLF equipment, Antennas and more.





Palomar Engineers

1924-F W. Mission Rd., Escondido, CA 92025 Phone: (619) 747-3343

Our Readers Say:

Corrections For Parallel Vertical Article

Editor, CQ:

Many sharp-eyed readers of the article on parallel verticals in CQ, August 1983, have called in or written asking about some errors in the article. Most of them are mine, and I apologize for them. I'm sorry that I didn't get a chance to proof-read the copy before it was published.

The corrections that I know about, so far, are:

- 1. Fig. 8—The 4'9" segment at the base of the 30 and 10 meter element should be 3'8".
- 2. Fig. 8—The number of capacity loops shown here is wrong. The photo, fig. 1, and the text have it right. The B&W ad on page 98 also shows the loops clearly and correctly.
- 3. Table I—72'3" of EMT are needed, not 90'.
- 4. Table I—576' of wire are needed for the radial system of fig. 10, not 560'.
- 5. Table I—No sheet-metal or self-tapping screws are listed, but two of them are needed for connecting the coil wire to the adjacent EMT. Holes for these aren't shown in fig. 8 either. Number 6 or 8 sheet-metal screws, ½ " long, will do fine here (see fig. 3).

Several people have asked about alternatives to guying the vertical. I'm sorry, but I can't predict whether a particular installation will work or not. There are too many unknown quantities. Good luck with the antenna!

Robert H. Johns, W3JIP Huntingdon, PA

Another Correction!

Editor, CQ:

I wish to point out an error in the Basic program for the article "Latitude and Longitude Calculations" by Thomas R. Sundstrom, W2XQ, in the August 1983 issue of CQ. Line 1390 of the listing gives a formula for converting latitude/longitude from degrees/minutes/seconds to decimal degrees, and the line reads:

1390 C(X) = D + (M/60) + ((S/60) * .001)this should read:

1390 C(X) = D + (M/60) + (S/3600)

To illustrate the differences, the decimal values for 48°59'64" (which is an alternate method of writing 49°00'04") are tabulated below:

old new 48°59'64" 48.9844177 49.001111 49°00'04" 49.0000666 49.0011111

I also wanted to tell you that I enjoy your magazine very much.

William W. Wilson Anacortes, WA



Now and Then

Editor, CQ:

The accompanying photo was taken in about 1963 when K9YNB was a Novice and then a Technician in Chicago. Today N7ETP is a General in Phoenix, Arizona, and my gear is altogether different. Can you identify the gear in the photo?

My present station equipment includes a Kenwood TS-130SE transceiver (80–10 meters), PS-30 power supply, MC-50 microphone, TR-2500 2 meter handheld, Dentron tuner, Dentron SWR, Azden PCS-300 transceiver, B&W 4-band trap dipole, Isopole 2 meter, and Isotron 2 meter.

Howard Halperin, N7ETP Phoenix, AZ

Quite An Achievement

Editor, CQ:

No code license! If you ask David, NJ5S, of Duncanville, Texas, he would reply, "You gotta be kidding." David is a new amateur Extra class, which is not unusual. However, in his particular case it was quite an accomplishment in that David is only 12 years of age, 12 March 83. He received his Novice ticket 11 April 83, General class 21 June 83, and amateur Extra class 19 July 83.

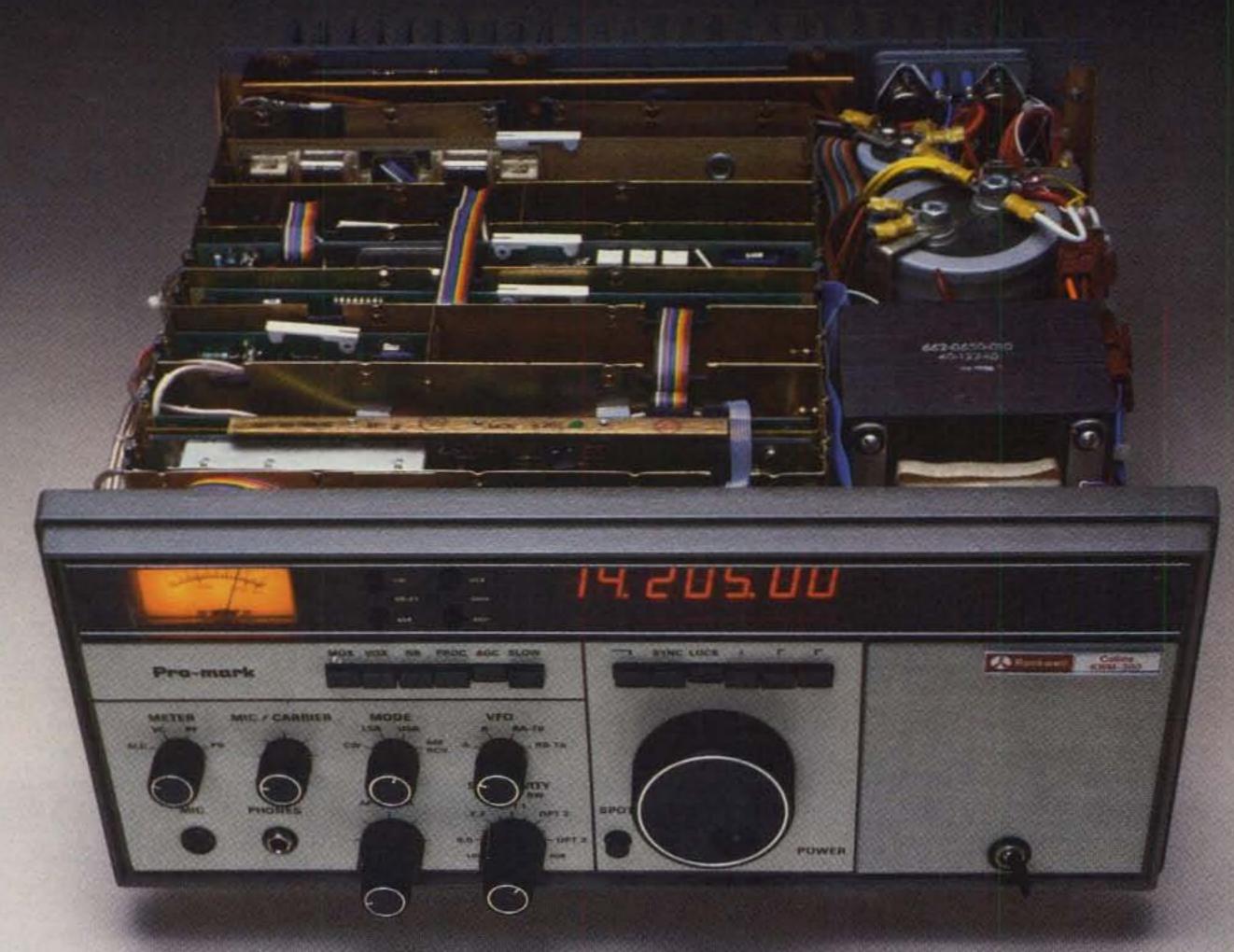
He is a well-rounded and busy young man who works on his grandfather's ranch and maintains lawns in the neighborhood to earn money for ham gear. He enjoys fishing, sports, and is an avid reader. He is also an accomplished pianist and plays the saxophone in his school band.

David has a Ten-Tec 544 transceiver with remote v.f.o. running into a ground mounted vertical antenna. David enjoys c.w. and phone, and he can be found on the lower end of the 20 meter phone band at about 14.160 MHz.

He is extremely interested in electronics. However, David's plans are to pursue a medical career. He entered the 7th grade this August at Byrd Junior High School, Duncanville I.S.D. David is the eldest son of Royce and Dorothy Bonsal, Duncanville, Texas.

Russ Brookover, NB5Z Duncanville, TX

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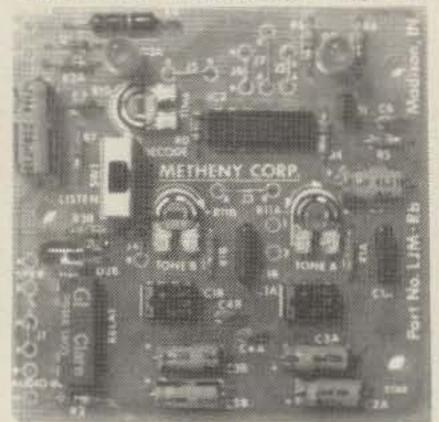
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Amnouncing

- North American Teleconference Radio Net The Honeywell Amateur Radio Clubs have announced the December 1 North American Teleconference Radio Net (T.R.N.) with Vern "Rip" Riportella, WA2LQQ, Executive V.P. of AMSAT, speaking on the amateur space program. It is expected that amateur satellites, space technology, and space missions will be discussed during the net. NCS for the net will be Jeff Brennan, WB4WLW, of the Honeywell and AMRAD Amateur Radio Clubs, Washington, D.C. The net starts at 7:30 p.m. Central Time (local nets may begin earlier). For a complete list of stations and locations participating in the net check the Compuserve "Hamnet" X10 Database or contact the Net Manager, Rick Whiting, W@TN, at 4749 Diane Drive, Minnetonka, MN 55343 (s.a.s.e. please). Most areas in the U.S. and much of Canada are covered by the net, with 2-way contact even for mobiles and hand-held radios. (On March 8, 1984, the T.R.N. subject will be "Amateur Radio and the Law" with the top ham lawyers as speakers.)
- Handi-Ham Winter Hamfest The Annual Handi-Ham Winter Hamfest will be held Saturday, December 3, at the Eagles Club in Faribault, Minnesota, starting with registration at 9 a.m. There will be a handi-ham equipment auction, dinner at noon, program, and prize drawing. Talk-in on 19/79. For more information, contact Don Franz, WØFIT, 1114 Frank Avenue, Albert Lea, MN 56007.
- Connecticut DX Association's K01R The Connecticut DX Association will operate KO1R from 1300 to 2000Z on Saturday, December 3, from the home of Mark Twain, The Mark Twain Memorial, in Hartford, CT. The frequencies for both phone and c.w. will be the lower portion of the General and upper portion of the Advanced bands. For full color QSL send your QSL and s.a.s.e. to Connecticut DX Association, P.O. Box 181, Columbia, CT 06237.
- Special Event Station W4SVI Homestead Florida Everglades ARC will operate W4SVI between 1300 UTC December 3 and 2200 UTC December 4 to celebrate the 36th anniversary of the dedication of the

Everglades National Park. Frequencies: 10 kHz up from lower edge of the 40 to 10 meter General class phone bands and 10 kHz up from lower Novice band edges; also 20 meters c.w. and 146.52 MHz. Certificate for QSL and large s.a.s.e. to W4SVI, c/o Dick Dowst, WB4HZK, Everglades ARC, 14511 S.W. 287 Street, Leisure City, FL 33033.

- Bethlehem, West Virginia, Expedition The Triple States Radio Amateur Club will operate from Bethlehem, West Virginia, December 16 and December 17, from 1400 to 0200 UTC daily. Operating frequencies for WD8DDL/8 will be 7.275, 14.325, 21.425, and 28.550 MHz on s.s.b.; 7.110, 14.075, 21.110, and 28.110 MHz on c.w.; and 14.095 MHz on RTTY. A special holiday certificate will be sent to all those contacted who send an s.a.s.e. to TSRAC, 26 Maple Lane, Bethlehem, Wheeling, WV 26003.
- Christmas Florida: Coronado Wireless Association will operate station K4HML from 1400Z to 2200Z each day, December 17 and 18. Frequencies up 10 kHz from the low end of the General band. Special QSL available for s.a.s.e. to: K4HML, P.O. Box 1, Edgewater, FL 32032.
- Thompson, Ohio, Special Event The Burn family will operate B-N8EVE, U-KD8EO, R-N8EVF, N-KD8EV during Seasons Greetings from "The Little Town of Thompson." You must work all four hams to receive your certificate. Operation will be on December 17 from 1400–2000 UCT and December 18 from 1400–2000 UCT on 40 meters in the General class band. Send an s.a.s.e. and QSL to 6215 Clay Street, Thompson, OH 44086. Certificate size is 8½ " x 11".
- Midwinter Swapfest The 12th Annual Midwinter Swapfest sponsored by the West Allis Radio Amateur Club will be held on Saturday, January 7, 1984 at the Waukesha County Expo Center Forum. Starting time is 8:00 a.m. and admission is \$2.00 in advance or \$3.00 at the door. Tables are \$3.00 reserved until 11:00 a.m. or \$4.00 at the door (first come first served). For tickets or information write with s.a.s.e. to WARAC, P.O. Box 1072, Milwaukee, WI 53201.

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A CQ EXCLUSIVE

CQ Interviews:

Dr. Fred W. Decker, W7ANX Deputy Assistant Secretary, OERI U.S. Department of Education, Washington, DC

BY DR. THEODORE J. COHEN*, N4XX

A native of Portland, Oregon, Dr. Decker received his B.S. degree in physics from Oregon State University, an M.S. degree in meteorology from New York University, and a Ph. D. in physics, meteorology, and mathematics from Oregon State University. His wartime service and reserve activity in the Air Weather Service led to his present status as a Lieutenant Colonel, U.S. Air Force Reserve-Retired.

Dr. Decker joined the Oregon State University faculty in 1946 and served until 1981. Here he taught courses in engineering physics, astronomy, climatology, and theoretical and applied meteorology. He also appeared in court on a frequent basis as an expert witness in his active role as a forensic meteorologist. During his career, Dr. Decker has published over 80 papers, reports, articles, and books on meteorology and science.

Dr. Decker has served in the U.S. Department of Education in his present post as Deputy Assistant Secretary, Office of Educational Research and Improvement, since 15 September 1981.

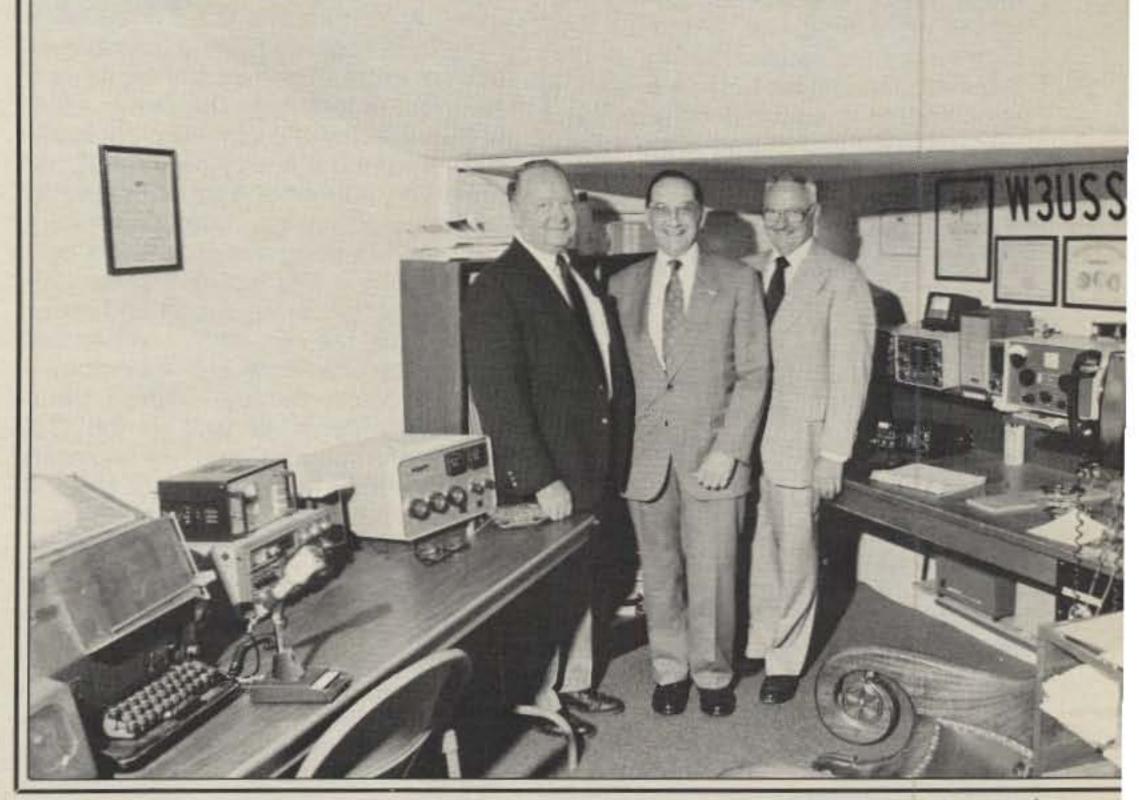
It is with extreme pleasure that we now present this exclusive CQ interview with Dr. Fred W. Decker, W7ANX.

CQ: Fred, tell us a little about the charter of the Department of Education. What are its responsibilities to the Congress?

Decker: The Department of Education Organization Act, Public Law 96-88 of October 17, 1979, established the Depart-

ment headed by the Secretary of Education. The Department's stated purposes are providing equal access to educational opportunity, encouragement of increased involvement of people in Federal educational programs, improved quality and usefulness of education, coordination of Federal education programs, management and efficiency of Federal education activities, and accountability for Federal education programs.

CQ: And the Office of Education Research and Improvement? What is its job? Decker: The Office of Educational Research and Improvement (OERI) adminis-



Dept. of Education officials visit Capitol Hill Ham Station W3USS. Left to right: Dr. Lee E. Wickline, K3HOU, Director, National Dissemination Programs; Dr. Fred W. Decker, W7ANX, Deputy Assistant Secretary of Education, Office of Educational Research and Improvement; and Dr. Marshall L. Schmitt, WA4PNP, Senior Program Officer, Installation Branch, NDN.

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ters functions delegated by the Secretary in areas of research, development, demonstration, evaluation, and assessment.† At present the principal components include the National Institute of Education, the National Center for Educational Statistics, and a center which administers programs for libraries, educational technology—including TV—and dissemination.

CQ: As the Deputy Assistant Secretary, could you tell us a little about your responsibilities?

Decker: Well, Ted, I support the Assistant Secretary's efforts and deal with internal management of the Immediate Office of the Assistant Secretary. This often involves representing him when meetings occur simultaneously or when he must travel.

CQ: In the area of education, what area or areas concern you the most today and why?

Decker: My personal areas of concern focus on the crisis in mathematics, science, and technology education. We as a nation seem to have relatively few people as a percentage of our population with prowess and confidence in these fields. Yet we need people as citizens, workers, homeowners, parents, consumers, employers, defenders, and in many other capacities who know more about the technical or scientific matters that affect the choices and decisions they must make. However, too few students take math and science courses, and their number is declining. Our needs as a nation call for more students to meet the challenges of these "hard" courses and for more effective ways to provide help to the striving learners. Rather than deplore the deficiencies, for instance, I have tried to encourage my scientist colleagues to help people-young and old alike-to

†As a result of the mission and structure prescribed by Congress in the Department of Education Organization Act of 1979, the Office of Educational Research and Improvement (OERI) assumes responsibility for the administration and coordination of the Department's major programs for research, dissemination, and improvement programs. Also assigned to OERI are the Library and Learning Technology Programs. The program activities delegated to OERI include the following: National Institute of Education; National Center for Education Statistics; Public Service Library Programs funded by Titles I and III of the Library Services and Construction Act; College Library Program, Research Library Resources and Library Research and Demonstrations, all authorized by the Higher Education Act of 1980, as amended; National Diffusion Network (NDN), and Technology Demonstration Projects, both authorized by the Secretary's discretionary account.-ed.

work towards more widespread literacy in science and math.

CQ: What steps are you—that is, the Department—taking to address these concerns?

Decker: The R&D activities of OERI provide information on the condition of education, and conduct research to identify improved instructional techniques. The R&D activities also foster demonstrations of promising educational techniques and instructional units. This Department serves, but it does not seek to dominate or direct, the educational enterprise of the nation. The latter task gets its direction from the states and localities. We simply address the missions which seem truly national in scope so that unnecessary duplication of R&D in the various states will be avoided.

"The U.S.S.R.'s output of engineering graduates is five times that of the U.S."

CQ: From what we read, the Soviet Union is producing significantly more scientists and engineers each year than are graduating from U.S. universities. Could you give us some idea of the magnitude of the problem and its possible consequences? Decker: One estimate places the U.S.S.R.'s output of engineering graduates at five times that of the U.S., but of course, the raw numbers cannot take into account the caliber of the instructional content. Still, with that many more basically prepared engineers, the U.S.S.R. certainly has a larger pool of aspiring graduate engineers to draw upon for staffing its technological enterprises. The ramifications of this disparity of engineering education between the U.S.A. and the U.S.S.R. can prove very fearsome. A nation like the Soviet Union, which has "extra" engineers, can, for example, assign them to decision-making posts not exclusively engaged in engineering design and operations. Thus, the very kind of widespread knowledge of science and technology-"technological literacy" -- which we increasingly seem to lack in the U.S. among non-scientists and non-engineers will work to the advantage of the U.S.S.R. by their having graduate engineers available for these related posts in industry. We have allowed ourselves to feel satisfied when we have enough engineering and science graduates to staff the positions requiring high expertise in science and technology, and we must suffer as a nation from the contrast with a system that has scientific and technological literacy much more widespread among the professional work force.

CQ: With specific reference to the fields of science and technology, colleges and universities are finding it increasingly difficult to hold staff at a time when indus-

"I believe we simply have to increase the range of incentives available to attract and motivate the people needed as faculty members in the universities and colleges of this country."

tries' facilities and salaries look so attractive. What can be done to ensure that schools are able to retain the personnel they need in order to provide a quality education?

Decker: As my friend, Professor Milton Friedman, observed: "People do things because of incentives." I believe we simply have to increase the range of incentives available to attract and motivate the people needed as faculty members in the universities and colleges of this country. Moreover, as my former chief, Professor Athelstan F. Spilhaus, has commented: "The higher education institutions need first-rate minds functioning as the faculty." Thus, our universities should consider using the services of really fine people who seek shorter-term duty on campus than that associated with longterm tenured appointments. Adjunct faculty should be brought to our campuses so that students are exposed to a wider range of professional skills and current state-of-the-art knowledge.

CQ: It is our understanding that university electronics and physics labs across the country have inadequate or dated equipment. Would you comment on this, on its consequences, and on what is being done to correct the problem?

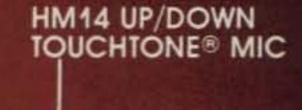
Decker: Without knowing the precise standing of the equipment in labs and lecture halls, we can surmise that this equipment will not "wear out" as a result of hard service in universities. Therefore, the equipment will last much longer than its standing as "current state-of-the-art." This problem does not fall within the direct concerns of OERI, but as a physicist, I do see a concern which universities must address. Whether the universities lease the most modern equipment and always keep only the most modern apparatus in use, or whether they systematically sell superseded equipment to buy modern replacements, the financial problem will be defined by market conditions. The price for not coming to terms with the market must be obsolescence of the academic equipment used. However, this problem devolves upon academic administrators and leaders rather than on Congress or the Administration.

CQ: What is the National Diffusion Network?

Decker: The National Diffusion Network, or NDN, is a federally funded system that makes exemplary educational programs

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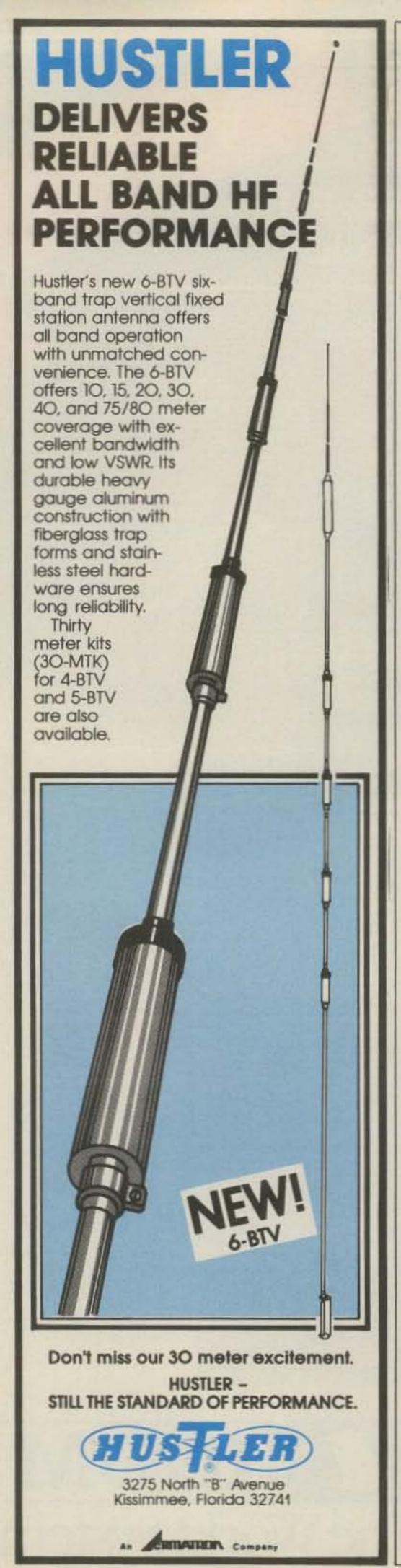
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CIRCLE 132 ON READER SERVICE CARD





"The National Diffusion Network, or NDN, is a federally funded system that makes exemplary educational programs available for adoption by schools, colleges, and other institutions."

available for adoption by schools, colleges, and other institutions. It does so by providing dissemination funds to these programs for two purposes: (1) to enable the programs to make public and nonpublic schools, colleges, and other institutions aware of what they offer, and (2) to enable the programs to provide in-service training, follow-up assistance, and, in some cases, curriculum materials to schools and others that want to adopt them. NDN also provides funds to persons known as facilitators, whose job is to serve as matchmakers between NDN programs and schools and organizations that could benefit from adopting the NDN programs.

CQ: Is this a new program?

Decker: The NDN started in 1974, Ted. It provided a way for the Federal government to identify successful educational programs developed by local educational agencies, and a way to help schools learn about successful projects and adopt these projects as their own. In NDN's first year, 60 projects were designated as "exemplary." Now NDN has over 330 approved projects.

"The NDN is interested in programs that teach computer literacy and/or use technology to improve basic skills in science, mathematics, and technology."

CQ: Where is the emphasis being placed today in the NDN?

Decker: The highest percentages of NDN projects available for adoption in 1981–82 were in Reading, Writing, Language Arts, and Mathematics. Over 30% of the projects are currently in these areas. Other areas include, for example, Gifted and Talented, and Health and Special Education; about 24% of the projects fall into these categories. The emphasis today is on increasing the number of projects in science, mathematics, and technology. For example, the NDN is interested in programs that teach computer literacy and/or use technology to improve the basic skills.

CQ: Could you give us some idea of specific NDN projects that stand a good chance of being funded this year?

Decker: The Secretary of the U.S. Department of Education selects the "general intent" areas for funding each year. For this year, seven general content areas were identified: (1) Technology; (2) Science; (3) Mathematics; (4) Reading for grade six and above, and for language arts; (5) Gifted and Talented; (6) Preservice or In-service training in the above areas, including utilization of technology in education; (7) Alternate programs for teaching English to students whose dominant language is not English.

"Hams who are educators do have expertise in radio technology as well as with other subjects of interest to the NDN."

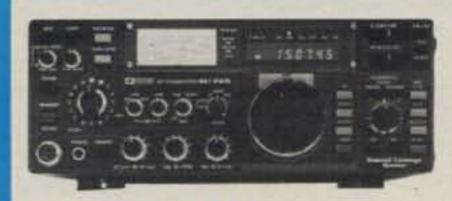
CQ: Fred, are there any NDN projects that are linked to amateur radio . . . perhaps to OSCAR?

Decker: At present there are no NDN projects linked to amateur radio. Since amateur radio deals in the application of science and mathematics to electronic communications, including the use of computers, educational programs that help future engineering students understand computers and other electronic devices could be a part of the NDN. However, only projects that have demonstrated their effectiveness are eligible to compete for NDN funds. Each exemplary program in the NDN has had data presented on its effectiveness to a U.S. Department of Education panel. This panel reviews the data for its statistical and educational significance. Various types of comparison data are usually provided to the panel to ensure a comprehensive review of the project's worth. By the way, NDN programs directly or indirectly involving amateur radio could gain standing for listing by the NDN and could also compete for grant support. Hams who are educators do have expertise in radio technology as well as in other subjects of interest to the NDN. I would therefore welcome inquiries from those who might have especially effective teaching units or programs involving amateur radio; I would also like to hear from those who seek to develop such programs for educational improvement.

"I would welcome inquiries from those who might have especially effective teaching units or programs involving amateur radio; I would also like to hear from those who seek to develop such programs for educational improvement."



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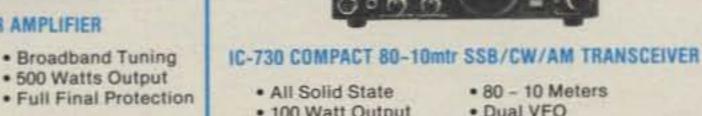
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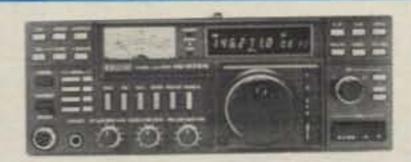
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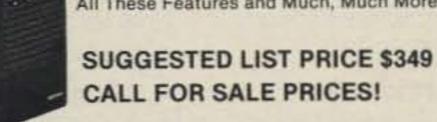
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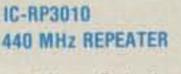
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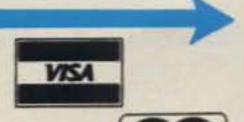
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© 1983 N2NY Productions, Inc. CIRCLE 31 ON READER SERVICE CARD CQ: On a lighter note, Fred, when were you first licensed?

Decker: I was first licensed in 1931, as a freshman at Benson Polytechnic School in Portland, Oregon. I have managed to hold W7ANX ever since. My hamming began under the tutelage of Tom B. Wagner, W7AMS, when he sent me code practice before he went off to high school each morning and I went off to grade school.

CQ: What was it that interested you in amateur radio?

Decker: Ham radio fascinated me as an extension of the very elementary electrical experiments I worked on as a grade school kid and Boy Scout. Tom Wagner saw my interest and proceeded to show me the much larger arena of ham radio. I read avidly, and discussed amateur activities with nearby hams. In those days articles telling you how to build breadboard rigs appeared even in the daily paper. I became adept at salvaging various materials for tank coils and other parts. Hamming became both a challenge and an inspiration. As a result, my first college major was engineering because I expected to become a radio engineer, or, perhaps, even an "R.I." (Radio Inspector-ed.) someday.

CQ: Are you still active today?

Decker: My activity went totally dormant on coming to Washington, DC, since our apartment-house management doesn't permit the stringing of antennas. My principal activity was on 40 and 80 meter c.w. Today my interests run toward the use of computers, but I may compromise simply by getting on 2 meters with a handheld or mobile rig.

CQ: Has your interest in amateur radio had an effect on your professional life? If so, how?

Decker: Ted, ham radio really started me off in engineering studies. Even when I fell into a weather observer job in 1937, my ham background helped me immensely. Anyway, most of the people with whom I worked at Pendleton, Oregon, were hams or would-be hams. Later I served at stations which had the radiosonde, something which I, as a ham, could understand. During the early years of WW II, I had charge of the instruments and observations training of Aviation Cadets at New York University. Ham radio provided the base for my later duty as Director of Training of a Weather Equipment Technicians School at Fort Monmouth, New Jersey. It enabled me to deal with radio direction finders and weather radar, as well as with the "sferics" receptors used for mapping lightning strikes. After WW II, when I joined the faculty at Oregon State University, my ham background supported my weather radar program activities, and I introduced current weather reports into the program through the use of NPG RATT broadcasts.

CQ: I won't ask you to comment on the "no-code" proposal now before the FCC, but as an educator, what do you think it will take to interest the younger generation in amateur radio?

Decker: The attraction of ham radio for many young people was always the fascination with emerging new technologies. Thus, I suspect that we will recruit young people today most readily if we can link amateur radio with computer technology.

Brass-pounder that I am at heart, I can see that the low cost and high performance of c.w. against QRM appealed to us as "high technology" many years ago-as indeed it was. Perhaps today, a different form of c.w., facilitating computer communications, will provide the same kind of "high-tech" appeal. I'll admit to feeling attached to the Morse code while, at the same time, having a fascination with the idea of "high-tech c.w."

CQ: Any other comments before we close, Fred?

Decker: Just a few, Ted. Those of us who are using satellites and semiconductor technology offer youth a chance to engage in activities on the cutting edge of innovative technology. We ought to carry this message along with more conventional communications applications into the public arena to attract more people to amateur radio. The greatest lesson for anyone in this or other such activities to learn is that we indeed can master the

"I suspect that we will recruit young people (into amateur radio) today most readily if we can link amateur radio with computer technology."

technique of learning new material without requiring a classroom setting. Henry James said about education: "They know enough who know to learn." In ham radio activities, even including the Morse code test, we have a means for any person to prove that learning requires an inner drive, without which learning will not happen.

I'd also like to underscore my appeal to hams who are educators to consider their best teaching programs for submission to NDN. Let others know of those successful techniques and experiences you provide your students, whether in close connection with hamming or in quite remote subjects. That "tide of mediocrity" we hear so much about today obviously hasn't engulfed you, and your program might, through NDN, help a colleague to improve upon past programs for teaching any of the subjects for which students come to school.

CQ: Fred, it was truly a pleasure to have you with us today!

Decker: The pleasure was mine!

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CIRCLE 83 ON READER SERVICE CARD

BEW MCCOY*, W11CP

The Heathkit HW-5400 Transceiver

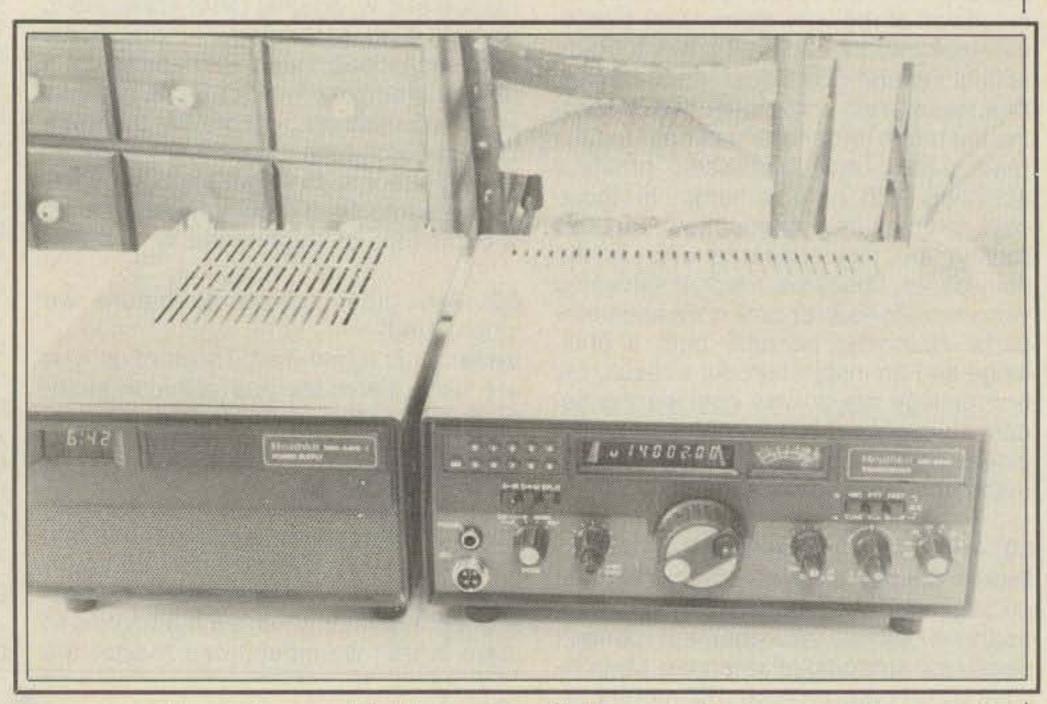
The new Heathkit HW-5400 is a 100-wattplus output, computer-controlled transceiver that covers all the amateur bands from 80 through 10 meters, including all the new bands. The preceding sentence contains the basic information about the 5400, but as you quickly will see, it takes many sentences, many paragraphs, and many photographs to detail the story of the new transceiver.

Before going into details about the unit, I would like to make a few pertinent remarks about transceivers in general. The last 10 to 15 years have seen a tremendous change in the technical and transmitting sides of amateur radio. With the advent of solid-state design and the introduction of microprocessors into amateur radio we have seen a revolution in the design of equipment. From my own point of view, these advances have been wonderful. Unfortunately, many manufacturers believe that they must put all these advances into a single transceiver, whether the amateur needs them or not. Many features will do little but adorn the front panel and probably will be used only once or twice, and then never again. Therefore, it is very refreshing when a group of knowledgeable amateurs designs a piece of equipment to do the basics, and do them well. Don't misunderstand me; bells and whistles are fine if you want them, but if they lack the ability to be functional on a day-to-day operating basis, then I don't want them. So what is my point? Simple. You can be paying for a lot of stuff you'll probably never use.

This now brings us to the Heathkit HW-5400 review. Mindful of what I just said about a better unit, the Heath engineering staff deserves a real compliment on coming up with a transceiver that eliminates a lot of extraneous gimmicks, but still has some very outstanding features. To me, it is an operating amateur's transceiver. For example, how many times have you wished for a high-speed tuning dial so you could move across the band quickly but still be slow enough to fine-tune a signal? The Heath designers have come up with an electronically controlled two-speed tuning knob which has two depressions in it. You put your finger in one of the depressions and you have a slow tuning rate. The other depression provides high-speed tuning. Now that is a useful operating feature!

Still another feature is the ability to shift the i.f. passband for better selectivity. A front-panel knob that allows one to move the i.f. passband is available, and this improves already excellent selectivity. Both of these features are examples of what I stated above—useful day-to-day operating devices that will see plenty of use.

Technical consultant, CQ, 200 Idaho St., Silver City, NM 88061



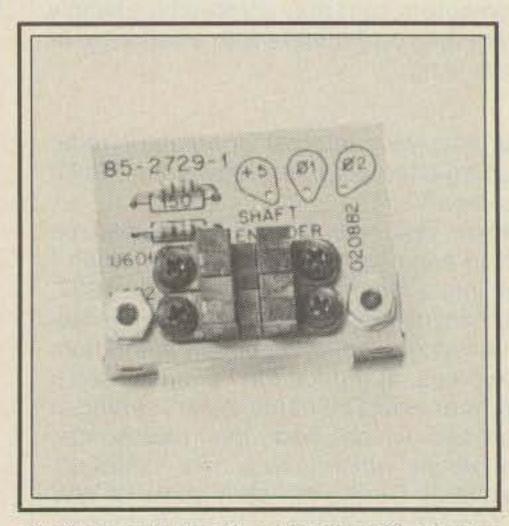
Here is the completed transceiver with its companion power supply.

The Kit

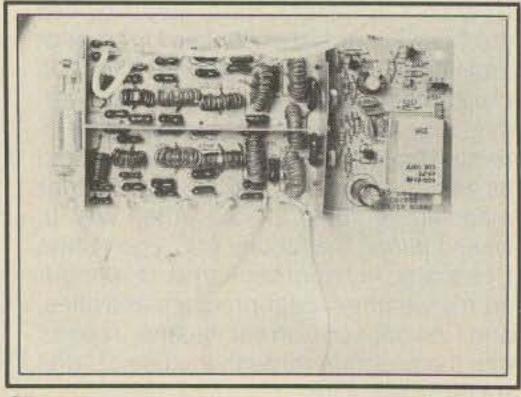
Maybe this is a good place to make one point very clear. This is no project for a beginner! In fact, one should have a fair amount of knowledge about construction practices and just general "know-how" before tackling a kit of this magnitude. I have built many Heathkit projects, including some rather complicated ones, such as the Heath H8 computer system. The 5400 is much more complex than any project I previously have completed. As you can see from the photos, the transceiver is packed into a rather small package. Construction is not a weekend or week-long project by any stretch of the imagination. There are 14 different circuit boards to be wired, installed, and cabled together, plus the usual chassis work. Many hours are needed to finish the 5400. I don't know about you, but I enjoy wiring kits, so the hours passed pleasantly.

As usual, the Heath Co. does an excellent job of packaging. The instruction manual tells you which package to open first, even providing drawings showing the packing and opening order. It has always fascinated me how "exact" Heath is in their packaging. For example, the audio board has 295 components (yes, that's right, 295!), and when I finished the board, the parts came out exactly right. This held true throughout the kit, with the exception of one potentiometer that was missing, but I probably lost that myself!

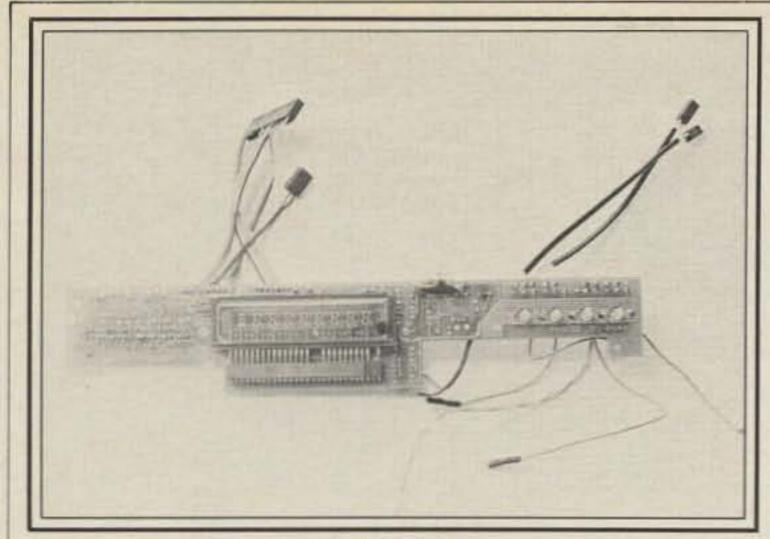
The instruction manual is 259 pages long (!) and the operational manual is another 74 pages. As always with Heath manuals, this one is very detailed and well illustrated. My

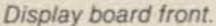


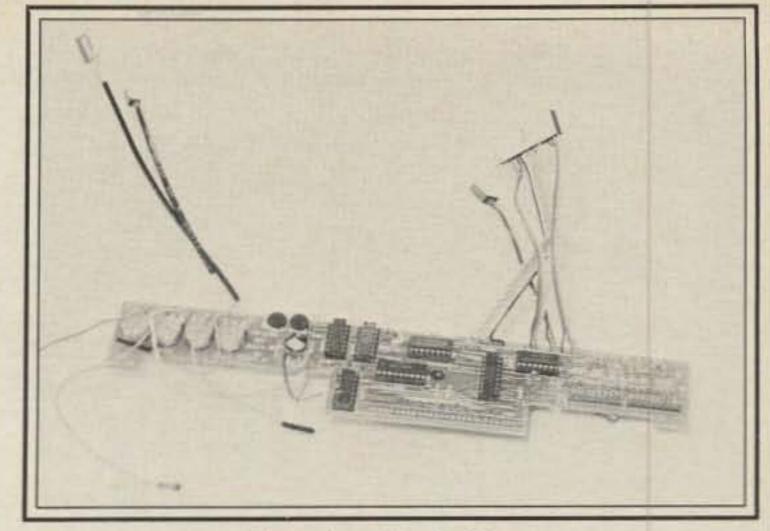
Shaft encoder board, wiring time 30 minutes.



Filter circuit board, wiring time 1 hour 50 min.







Display board back, 5 hours.

only criticism would be the desire to have oscilloscope patterns shown at the various stages on the circuit diagrams. On a project this complicated it would be very helpful to have some idea of what a properly operating unit looks like. However, this desire probably comes from using Sams' *Photo Facts* for trouble-shooting.

Transceiver Description

The transceiver is housed in a tan-colored cabinet measuring 11½ inches wide, 5 inches high, and 14 inches deep. It weighs 24 pounds complete. The size is small enough so that the transceiver can be used mobile. A d.c. supply from 11 to 16 volts at 18 to 20 amperes is required. Heath makes a companion a.c. power supply, the HWA-5400-1, which will be described in this review.

The frequency readout is a vacuum-fluorescent, seven-digit display using ¼-inch high numerals of soft-green color. Readout accuracy is 50 Hz. In addition, there are several readout symbols which appear on the left of the display. There is a "—" to indicate when you are in "split" operation mode. An arrow is shown to indicate you are out of the band (!). A letter "M" indicates split-memory access, and more about that later. The letters "U", "L', and "C" indicate upper and lower sideband, and c.w., respectively. A shorter line "—" indicates transmit mode.

The actual frequency coverage of the 5400 is shown in Table I. Frequency control is synthesized, and the slowest tuning rate is 50 Hz per step, 1.25 kHz per knob rotation. As mentioned earlier, the tuning knob has a two-speed function. When the faster tuning rate is used, it translates to 1 kHz per step, 25 kHz per knob rotation. There is no tuning backlash. Frequency stability is less than 50 parts-permillion drift from turn on.

Continuing with the front-panel description, the meter indicates S units for receiving, and in the transmit mode it indicates ALC action. The VOX GAIN, VOX DELAY, ANTI-Vox controls are mounted on the front, along with SIDE TONE gain. These controls are hidden behind a small sub-panel which lifts to obtain access to the controls. Immediately below this sub-panel are three pushbutton switches. The first is the REC/TUNE switch which is used to lock the transceiver in the tune mode, and the other position is receive mode. Next is the PTT/VOX switch which is used to select either mode. Last is the FAST/SLOW AGC switch.

Just below these three switches is a combi-

3.450-4.050 MHz 18.018-18.218 MHz 6.950-7.350 MHz 20.950-21.500 MHz 10.000-10.200 MHz 24.840-25.040 MHz 13.950-14.400 MHz 28.000-29.750 MHz

Table I- Frequency coverage of the Heathkit HW-5400.

nation RF and AUDIO gain control. Next to it is another combination control, one for RIT which can vary the receive frequency 350 Hz either side of the displayed receiver frequency. The other part of the control is the IF SHIFT, which varies the center frequency of the i.f. filter. To the left of the main tuning knob is the combination control for CW/MIC GAIN. On c.w. the control is used to adjust the transmitter output (from 0 to 100 watts), and the other part of the control is used to adjust the output on s.s.b. To the left of this control is the MODE switch, a four-position control, CW wide or narrow, SSB upper or lower.

The upper-left corner of the front panel is devoted to the keypad pushbuttons (the keypad is an option). By entering a desired frequency (such as a net or roundtable frequency), the receiver will jump to that frequency. Just below the pushbutton pad are three more pushbuttons. The first switch D to M will place the displayed frequency into memory, and the next switch, which is D to M/M to D, will recover that frequency from memory and store the displayed frequency in memory. This is one of the operating features which I find extremely useful. Too many times one will be tuning a band and find a QSO of interest. It is easy to tune away from that frequency and then wish to find it again. With the Heath 5400 system just press the D to M switch and the desired frequency is stored to be recalled simply by pressing the second switch. If you are a contest or DX operator, you quickly can see how useful this circuit would be. If you spot someone you want to work but he is tied up, simply put his frequency into memory to be restored when you need it.

The third switch is for split operation. To operate split you use the main tuning knob to select the desired transmitting frequency. You then hit the D to M switch to store that frequency into memory. Next you push in the SPLIT switch, and whenever the microphone PTT, VOX, or CW is used (the transmitter is turned on), the stored frequency is used (and displayed). The system is very easy to operate, and it only takes a few minutes to become familiar with it.

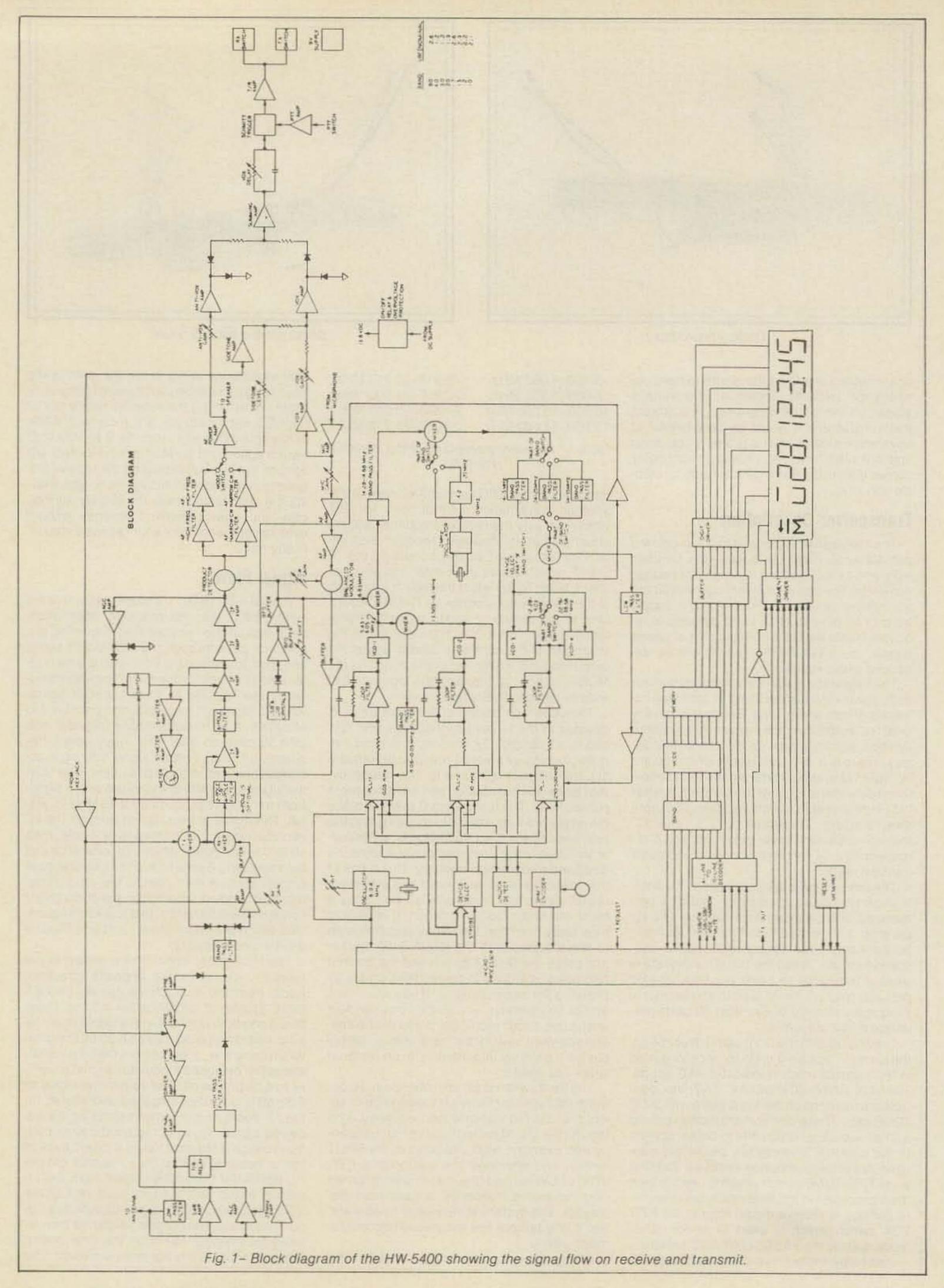
Another very unique feature while in the

split mode is the ability to use the main tuning knob to again change your transmit frequency while not affecting the receiver frequency or the QSO with which you are in contact. While in the split mode just push the D to M/M to D switch again, and an M (memory) symbol will light on the display, indicating the receive frequency is now locked into memory. Now moving the main tuning knob, the display will indicate your new transmit frequency without ever losing a word from your received station. Pretty neat!

Signal Flow

Please refer to fig. 1, a block diagram of the Heath 5400, for the following description. Let's look at the receiver first. Incoming signals first pass through the ALC circuit board and then to a low-pass filter circuit which attenuates the high frequencies. The filtered signal is then passed to the r.f. circuit board, where it is passed through a high-pass filter to eliminate any broadcast-band signals, and then through an 8.83 MHz intermediate frequency (i.f.) trap. Further signal filtering is accomplished with a band-pass filter, and then the signal is amplified and mixed with a signal from the VCO to produce an 8.83 MHz i.f. signal. The signal is then routed through the i.f. circuits, where it is filtered by a 4-pole, 8.83 MHz filter (an option which I recommend) and then through a 6-pole filter and three stages of amplification. It then goes to the product detector. A product detector on the audio board converts the 8.83 MHz signal to audio frequencies which are then filtered and amplified to drive a 4 ohm speaker.

The transmitter signal flow is similar to the receiver, except in the opposite direction. Audio from the microphone passes through three stages of amplification on the audio board and then is mixed with a signal from the b.f.o. board and produces an 8.83 MHz signal. When using c.w., a signal from the b.f.o. unbalances the balanced modulator so that a carrier can be produced. The transmitter signal at 8.83 MHz is further amplified and filtered on the i.f. board in the same manner as the received signal. An a.l.c. (automatic level control) voltage is fed from the a.l.c. board back to the i.f. board to control the r.f. output. On the r.f. board the transmitter signal from the i.f. then is mixed with a signal from one of the VCO's to produce the desired transmitted signal frequency. The outgoing signal is then filtered by low-pass filters on the filter board, thereby reducing any harmonics present. The



power amplifier board contains three pushpull amplifier stages to produce the 100 watt transmitted signal. The shielding and filtering on the amplifier board are extremely tight. In fact, this is one of the best shielding and filtering jobs in a piece of commercial gear that I have seen in many years. Certainly with the use of a good low-pass filter the 5400 would pass the toughest harmonic suppression tests in the weakest TV signal area.

The Controller Circuit

Referring to the block diagram, you will see that the heart of the 5400 is the microprocessor, a CPU (central processing unit) which is an MK 3875, a 40-pin chip. It, along with the support chips on the controller board, performs many functions. Some of these are:

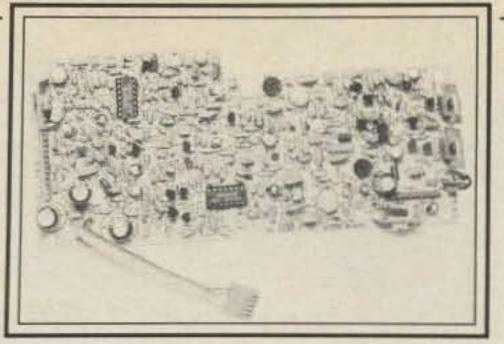
- 1) Refreshes the frequency and function display.
- Programs the synthesizer integrated circuit in each of the three phase-lock loops.
- Receives inputs from the shaft encoder (tuning knob shaft and its encoder) and the keypad to alter the frequency.
- 4) Polls the front-panel switches for desired band, mode, etc.
- Monitors the phase-lock loops for an unlocked condition.
- 6) Allows the transmitter to go into the transmit mode when you request it to do so, but first ensures that the phase-locked loops are locked and the frequency you have selected is within certain limits.
- 7) Stores display and memory frequencies for each band, even when the transceiver is turned off (if the memory keep-alive voltage is present at the rear-panel accessory socket).
 - 8) Mutes the receiver when required.
- Performs diagnostics on itself when the transceiver is turned on (if backup power is lost).

An important function of the controller is via the input from the shaft encoder. The main tuning knob is attached to the shaft encoder. When you tune the 5400, a wheel is rotated. The wheel has alternating clear and opaque areas. These areas pass through two slotted infrared switches. As the wheel rotates, this produces two pulse trains that are in quadrature (they are approximately 90 degrees outof-phase) and produces four unique states. One of the shaft encoder outputs is applied to the external interrupt input of the CPU and it determines which way you are tuning the knob, up or down in frequency. It also determines whether or not you are using the fasttune feature.

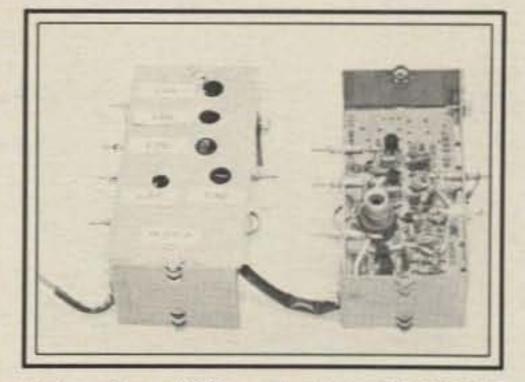
Three phase-locked loops are used in the 5400 ultimately to produce a single injection frequency. Each of the loops uses a frequency synthesizer integrated circuit which contains programmable divide-by-N and reference dividers, plus a digital phase detector with a lock-detection circuit. (When or if the phase-lock loop goes out of lock, the display will indicate such a condition.)

The Power Supply

As mentioned earlier, Heath has a companion a.c. power supply for the 5400. This supply is designated HWA-5400-1. The supply is designed for either 120 or 240 volts, 60 Hz, a.c., and the output voltage is 13.8 v.d.c. Output current is as required by the transceiver with up to 18 (20 peak) amperes during transmit. D.c. output regulation is rated at 7 percent from receiver to transmitter full load at 120 v.a.c. and up to 11 percent if the a.c. changes from 110 to 130 v. a.c. Ripple content is less



Audio board, 9 hours.



High and low VCO boards, 1 hour 30 minutes.

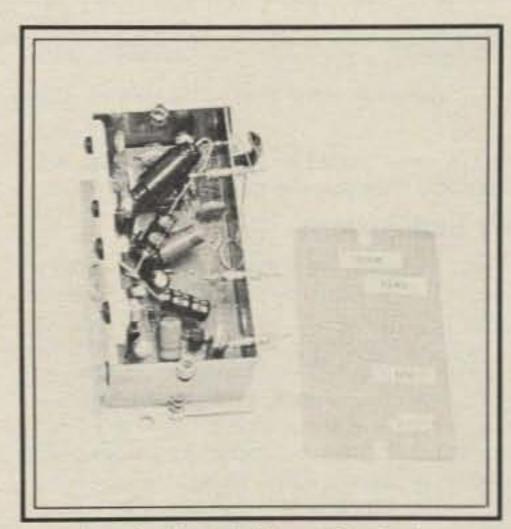
than 50 millivolts at full load. In addition, the supply has a built-in speaker plus a clock.

The speaker is 4 ohms impedance with a 300 to 3000 Hz response at 2 watts peak power output. A vacuum-tube fluorescent display is used for the clock, and it can be set up for either 12- or 24-hour format. The size of the complete supply is 8½ inches wide, 14 inches long, and 4½ inches high, and the weight is 26 pounds.

The power-supply kit goes together quickly; I built mine in an afternoon. As usual, the manual is excellent, consisting of 59 pages.

Tests and Other Data

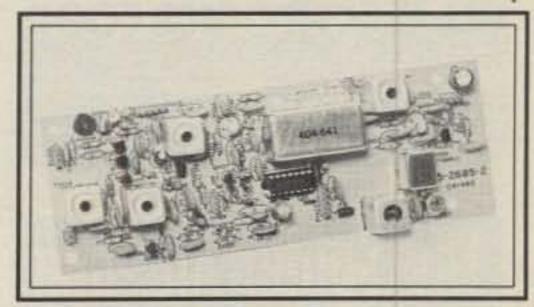
All of the test data on the unit I constructed is shown in Tables II and III. Table II is the receiver information. The sensitivity rating for the receiver as specified is 0.35 microvolts for 10 dB, S plus N/N. As you can see from column two in Table II, the receiver well exceeded these specifications on all bands. Selectivity is rated at 2.0 kHz minimum at 6 dB, 6 kHz maximum at 60 dB with the standard filter. With the optional filter (what I used) the specs are 1.8 kHz minimum at 6 dB. As can be seen from column three, there were only two points where specification was exceeded—7.0 and



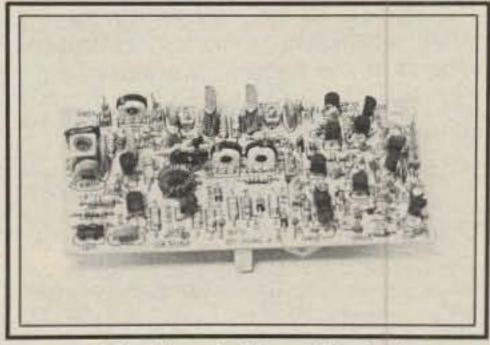
Inverter board, 1 hour 15 minutes.

14.0 kHz. The overall gain specification is less than 1 uV for 0.25 watt audio output, column four. The next important specification is intermodulation distortion, and the 5400 is rated 70 dB minimum at 25 kHz. You will note from column six that the transceiver well exceeds that spec. Column nine shows image rejection, which is rated at 80 dB or better. And last, column 10 shows I.F. rejection, which is rated at 100 dB. There was one detectable "birdie" and that was at 28,139 kHz. It measured 0.38 uV.

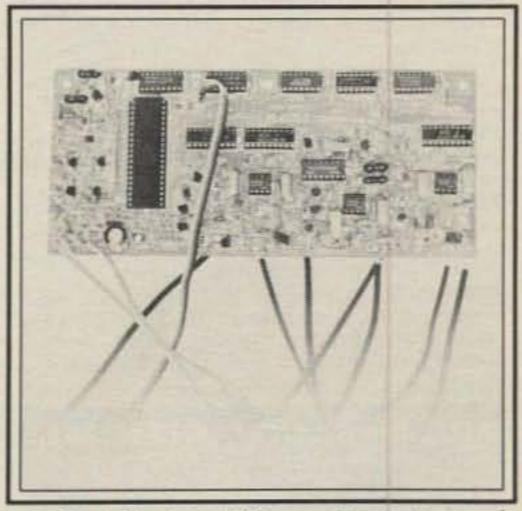
Table III shows the transmitter tests and it is self-explanatory. Transmitter ratings are 100 watts output on all bands, but 10 where it is rated at 80 watts. You can see from column two how close the tests matched the manufacturer's specifications. Harmonic radiation is rated at better than 50 dB down referenced to a 100 watt carrier output. With the circuitry design and the excellent shielding, I expected that the harmonic specifications would be well exceeded, and such was the case as shown by columns three, four, and five. Spurious radiation aside from harmonics is rated at minus 60 dB, and columns six and seven show these tests. Carrier suppression for s.s.b. is rated at minus 50 dB, and column nine shows the unit was well over that figure. Third-order distortion products are listed at minus 30 dB, and again the 5400 beat these figures. Not shown is the information on c.w. selectivity. The 5400 is rated at 250 Hz at 6 dB centered at 700 Hz in



I.f. board, 1 hour 30 minutes.



B.f.o. board, 1 hour 45 minutes.



Controller board, 3 hours 30 minutes.



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1 FREQ	Sens <.35m	3 501	U CVETEL	SOUTH'S AUDIO	IMPE >708	1	1 bods	Y Special training
3.75	0.22			F 12 100		11148	712048	SPACE SEE BOLLOCK LINE
7.0	0.16	2068H2	0.25			>120	>120	
10.1	0.19	3.				>120	113	The same of the same
14.0 14.2 14.35	0.19	2042		3.7W	8118	>120	>120	YMAR @ LOKAL Separation in SSO made
18.048	0.19					94	>120	
21.2	0.26		0.48			116	>/10	
24.980	0.24					84	>120	
28.0 29.75 21.7	0.22		0.64			83	>/20	28.1390 MF2 Lavel = . \$944

Table II— This chart shows the tests on the receiver, including measurements at both the high and low ends of each band. Note that in all cases the tests exceed the manufacturer's specifications for the receiver.

-				Trans	mitter				
1	2	3	ų	5	6	7	8	9	10
Freq.	POWER.	and	13rd	other	Spurious	Spurious	Carrier	Third	Unwarte
1.0	ERTPUT	Harmonic		Harmonic 3	CIMH2	7 Imta	Successia	erder Ire	7 532 m
	wo this	-db 50	-db 50	- db 50	-db 60	-db	1-16 50	- nh30	1 -db5
Xs		11-	V	1		1/		1	1
1 X25	- X	1 X	X	X	1	X	I A	X	1 X
IMN,5	1	1	1					/	1/
3.923	100 W	65	66	> 70	65	>70	770		
3.725	100W	65	66		65	770		-38 18	652
3.995	100W	- 65	66	de .	65	270			
2:093	101 W	> 70	65		22	770			
7.175	101	4	45	*	66	*	1		
7.293	101		65		66	*		7.5	
10-100	102	68	54	At .	66	>70			
10.125	102	68	56	(4)	66	41	770		
10.150	102	48	56.		66				
14.003	105	. 67	56	. 1	770	62		B. 1	
14-17.5	105	67		60	4	64	>70		
14.345	105	67	57		#	64			
18.068	105	4.5	64		60	770			
2.128	105	48	64	14	60	40			
8.168	105	-68	64	4	60		770		
21.003	105	70	> 70	44	770	69	i		
21.225	105	70	**		#	67			
21.445	105	70	*		**	67	-		
14.890	108	57	be .	200	10	>70			
4.940	108	57			60	n			
4.990	108	57	20		60.	80			
29,003	90	70	7 70	11	64	64			
29.025	91	70	**	16 1	61	64		1.	
99.695	90	70	*	h 1	60	64	>70		64
roposed .	100 W	-50db	- 50 db 1-	sodb !	- 50 db 1-	-50db	- 5006 1-	30db 1	-55db
erer .	100 10		- WELLEN	10 14 (d. Ma	T. M. AC. Marine			-	

Table III- Here are the transmitter tests. Note again that all tests exceed specs.

the CW switch position which puts a c.w. active audio filter into the circuit.

My Conclusions

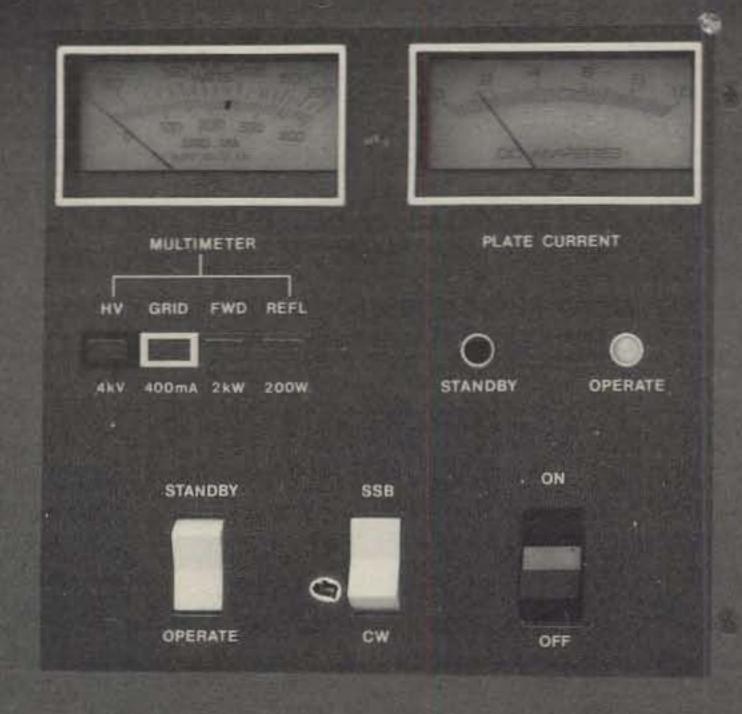
As I stated at the outset, this is no kit for a beginner, and I had my share of headaches in constructing the unit. This is not the fault of Heath, but the built-in problem of an amateur being in a hurry. For anyone seriously interested in the technical aspects of amateur radio—and I am writing about ordinary amateurs, not electronic engineers—there has always been a sense of satisfaction in being able to service one's own equipment. In recent years gear has become so complex that self-servicing is

really tough. One thing about building Heath equipment is that you should be in a position to do a lot more servicing than with other equipment, and I like that.

It is simple enough using test equipment to see if a new piece of gear meets the manufacturer's ratings, but the real test is actually to use the equipment on the air. That is what I have done with the 5400. First, let me state that the receiver is absolutely superb. Sensitivity, selectivity, and tuning ease are just outstanding. I made several A-B tests against other commercial units, one of them being a KWM-2, whose receiver I have always rated highly. There was no doubt at all that the 5400

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- Can be supplied for commercial or military use on frequencies outside the amateur bands.
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- Pi-L tank circuit for optimum reduction of harmonics.
- Heavy duty 7KV rotary band switch with silver plated contacts.

- A high quality dual section 6 KV plate tuning capacitor maintains constant Q over the full frequency range of operation.
- Pi network input provides excellent match of ≤ 1.5:1 VSWR to the exciter.
- · Grid overdrive protection circuit.
- The power supply features a heavy duty continuous rated plate transformer, a separate filament transformer and computer grade filter capacitors.
- Transient protection provided to all transformers.
- · By-pass switch on front panel.
- Adjustable ALC control (up to 30V).
- Dual back-lit meter system monitors all critical circuit parameters.
- Mode switch for optimum operational efficiency.
- Vernier tuning for smooth and accurate settings.
- Safety interlock disconnects AC line voltage when cover is removed.
- Semi break-in. Optional QSK kit available (can be customer installed). CIRCLE 180 ON READER SERVICE CARD



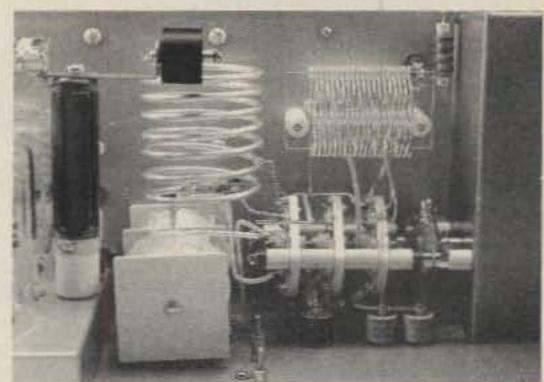
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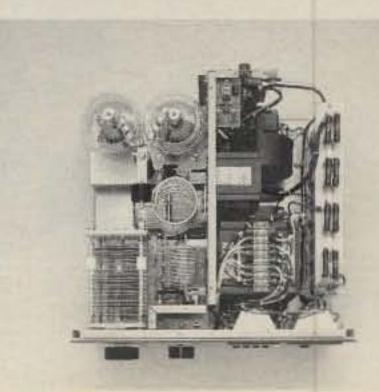
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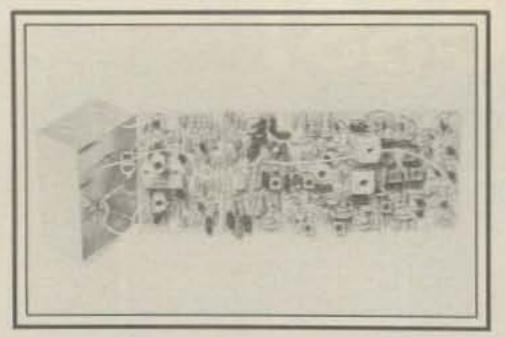
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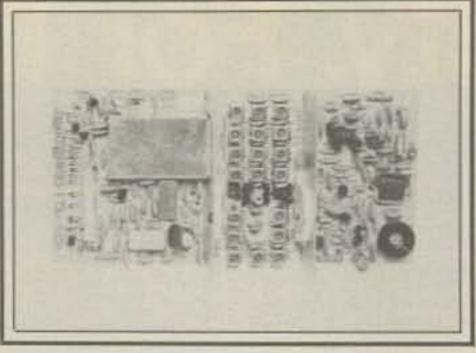




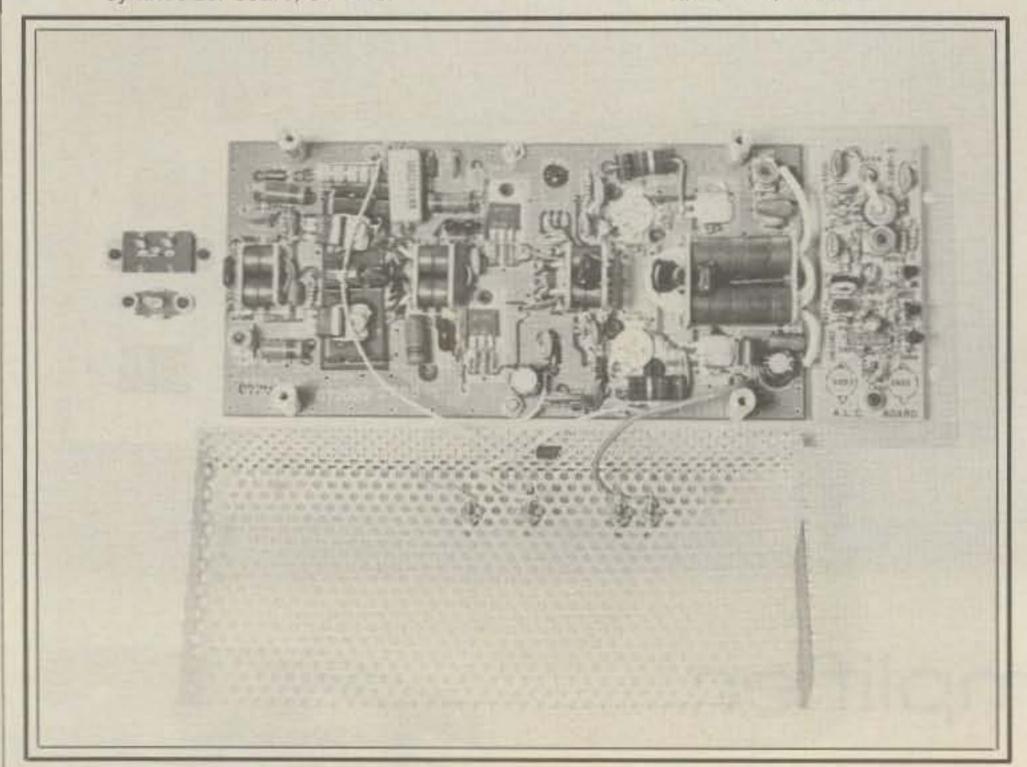




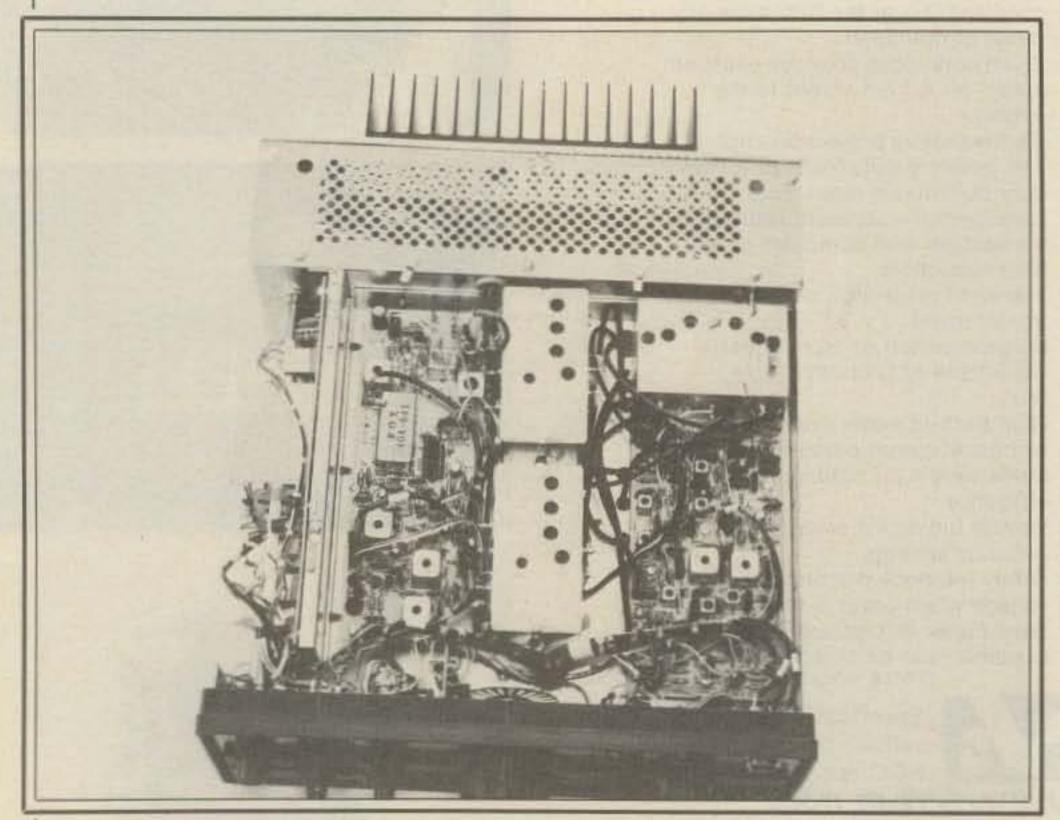
Synthesizer board, 3 hours.



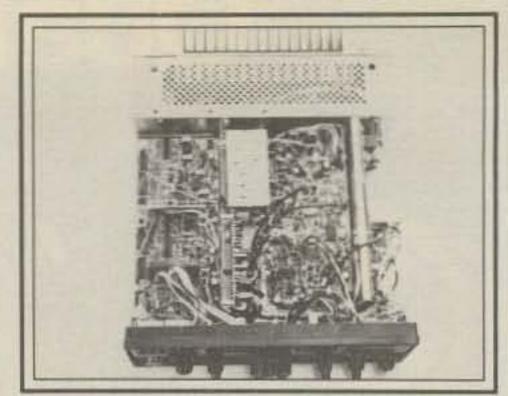
R.f. board, 6 hours.



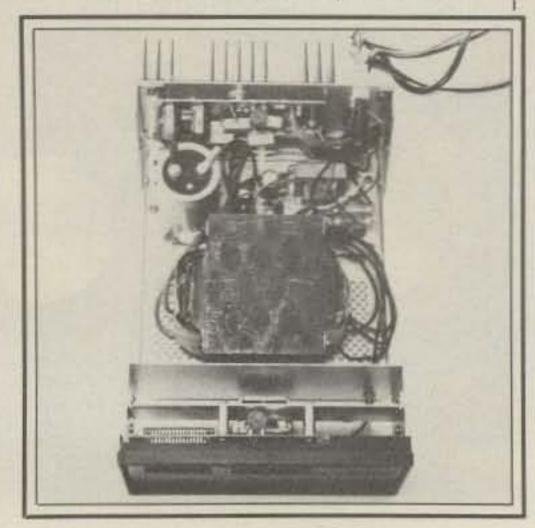
A.I.c. and r.f. power amplifier board, 6 hours, 30 minutes. The total time for all boards is approximately 42 hours. Adding the chassis, board installation, and cabling, another 36 hours, the total time comes to something over 77 hours. This does not include tune-up, testing, and trouble-shooting.



Top view of the completed 5400. Not shown is some additional shielding. Note the tight shielding off the power amplifier at the rear of the transceiver—no TVI here!



Bottom view of the completed unit.



Interior view of the HWA-5400-1 power supply.

was the better performer, and in my mind that is plenty of praise. The i.f. shift tuning is very good for separating stations, plus the fact that the selectivity itself is excellent. I compared the receiver to a much more expensive transceiver that had a notch filter, and the Heath 5400 easily outperformed the notch job when it came to selectivity. As you can gather, I like the receiver.

For the transmitter, I found out one thing about amateur radio: it is almost impossible to get two amateurs to agree on a report when both are listening to the same signal. I got on the air on several bands and asked for "accurate, no punches pulled" reports. I got everything from "badly distorted" to "best audio I ever heard"! One amateur taped my transmission and played it back to me. Assuming I know what I sound like on s.s.b., the tape recording sounded exactly like me (to me). I keep a schedule with an old buddy who has listened to my voice from many different rigs. He says the 5400 sounds more like me than any other s.s.b. transmitter, so you can take that for what it is worth. One of the big problems in amateur radio is caused by the advent of good high-quality 2 meter f.m. This has spoiled us. We forget that communication is the name of the game. S.s.b. provides good communication but leaves something to be desired when it comes to highquality audio as compared to f.m.

Well, there is the review on what I consider an excellent transceiver, modern in every way, and one you can build given the time and patience and a reasonable amount of ability. The Model 5400 is available for \$650. The frequency entry keypad, an option, is \$59.95, and an optional 2.1 kHz filter is \$59.95. The HWA-5400-1 power supply is \$199.95. All items are products of Heathkit Corp., Benton Harbor, MI 49022.

W4FA describes a simple-to-build antenna tuner that is equally applicable to a 10 watt and a 1,000 watt station. Its cost is low, and it can be dimensioned to match any reasonable antenna load on any or all h.f. bands. A minimum of tuning adjustment is required across any given band as compared to many other tuner designs.

HOW TO BUILD AMINI KW ANTENNATUNER

BY JOHN J. SCHULTZ*, W4FA

of flattery," it will have to be admitted from the onset that the tuner described in this article is a direct "take-off" on Ten-Tec's Model 229 tuner. As described, however, it is a bit simpler than the Ten-Tec tuner and designed for relatively simple home-brew construction.

However, why imitate the Ten-Tec Model 229 tuner? The answer is simple enough. The 229 tuner utilizes only two variable components—a variable capacitor and inductor—to match a fairly wide range of impedances on any h.f. band. Therefore, it has only two controls to adjust and only two variable controls need to be purchased. It utilizes a basically simple, reversible LC or CL network as one can discern from the 229 schematic as shown in fig. 1. However, the reason it can perform the same matching func-

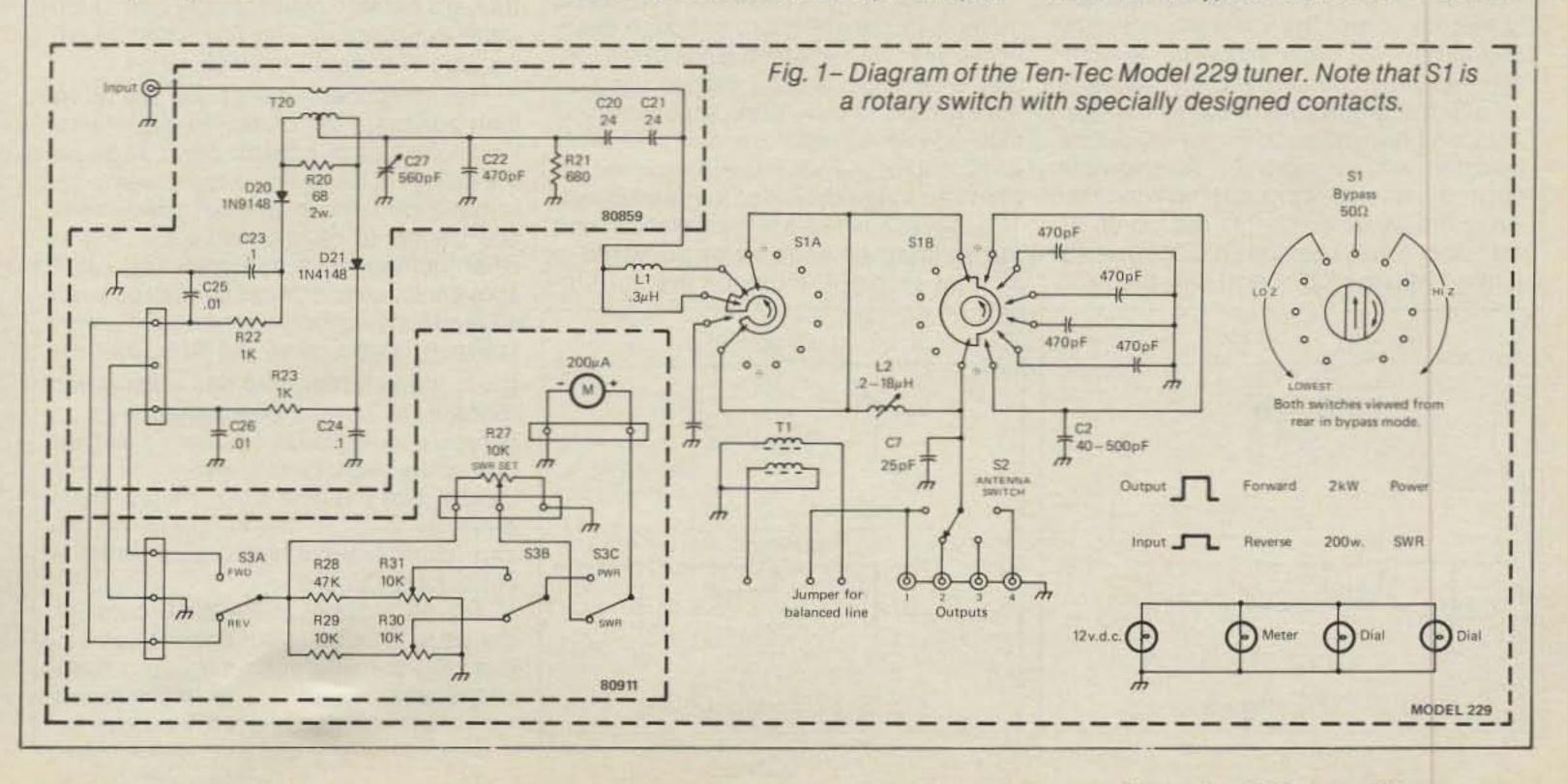
tions normally associated with tuners having three variable elements (e.g., Pi or T networks) is due to the fact that Ten-Tec has found an innovative way to add fixed, compensating components to the LC or CL network configuration such that the "L" and "C" in the configuration act as essentially ideal components without stray capacitance or inductance effects. An electronic textbook exercise will reveal that practically any complex impedance can be translated to 50 ohms resistive by an LC or CL network if the network contains "ideal" L and C components. A bonus that one obtains in using a compensated LC or CL network is that its "Q" is relatively low compared to other matching networks. Therefore, far less readjustment of the network is required as one moves across any given amateur band.

Fig. 2(A) shows the simple, conventional LC network, while fig. 2(B) shows the Ten-Tec variation with a 220 pF compen-

sating capacitor on the output. In a similar manner, fig. 3(A) shows a simple, conventional LC network, while fig. 3(B) shows the Ten-Tec variation with a compensating inductor on the input side and a 25 pF compensating capacitor on the output side. If one tried to use the circuitry of fig. 2(A) and fig. 3(A) alone in a tuner network, it would be found that various complex impedances could not be matched, and one would have to accept less than a 1:1 s.w.r. Interestingly enough, this situation usually does not exist when one is trying to match relatively large mismatches, but rather exists when one is trying to compensate for the relatively small s.w.r. excursions presented, for instance, by a multiband beam when one wishes to operate near the lower or upper band limits of 10/15/20 meters.

The tuner described in this article is basically switchable between the networks shown in figs. 2(B) and 3(B) and also provides for a bypass feature. It is dimen-

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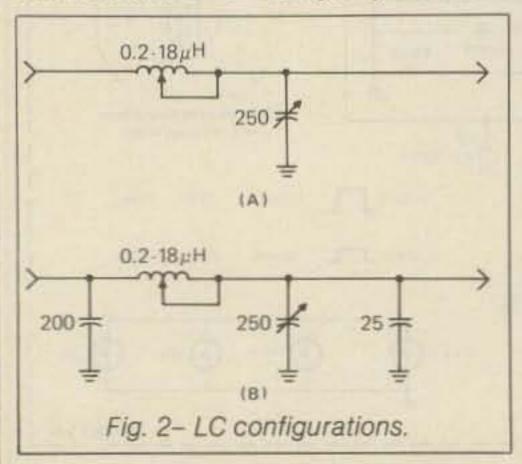
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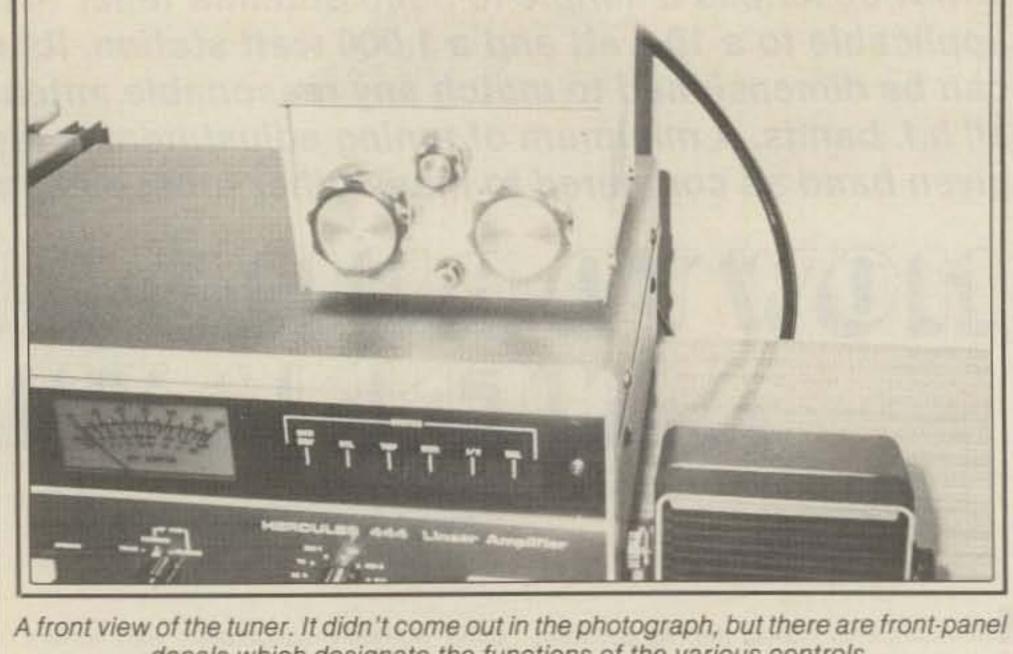
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sioned for operation on 10/15/20 meters, but one can easily modify it to conform to the configuration of fig. 1 so it can be used for 160-10 meter operation. The components used are standard ones: a 200-250 pF variable capacitor, a 10-28 μh variable inductor, and a dual section 3-pole 3-position switch.

Fig. 4 shows the diagram of the tuner in a somewhat unconventional, but hopefully helpful, form. The diagram basically shows how the fixed and variable components would be wired to the contacts on a 3-pole 3-position rotary switch. The "stops" on many such switches can be adjusted, and position "A," as shown in fig. 4, is meant to represent the condition when the wiper contact is resting on its own stop. In this position an LC network is formed with the "C" being only the fixed





decals which designate the functions of the various controls.

25 pF output capacitor. This position is strictly a bonus that may prove useful at times. Switch positions 1, 2, and 3 represent the more conventional switch positions possible with any 3-pole 3-position switch. If one traces out the wiring, it will be seen that switch position 1 forms an LC network with the components arranged as shown in fig. 2(B). In switch position 2, the input line is shorted directly to the output. This position is meant for general reception purposes. The 25 pF compensating capacitor still remains in the circuit, but it has essentially no effect on the h.f. bands, since the capacitance/foot of most coaxial cable is already in the order of 20 pF. In switch position 3, a CL network is formed corresponding to fig. 3(B). An s.w.r. block is indicated in fig. 4, but it is an optional feature that one can include or forget about, as desired.

The photographs show one suggested method of construction, although practically any method which leads to reasonably short lead lengths can be used. In the example shown, the components are mounted in an approximate 9"x6"x 41/2" enclosure with the rotary switch mounted in the center of the front panel. The switch has two identical wafers, and the contacts on each wafer are wired in parallel simply to increase the current-

0.2-18µH 250 🖈 (A) 0.2-18µH $0.3 \mu H$ 25 中 250 7 Fig. 3- CL configurations. handling capability of the switch. The wiring between components is done with plated, No. 14 wire, and the compensating inductance is wound of the same wire with Teflon insulating sleeving being used to insulate the turns of the coil. Regular, inexpensive insulating sleeving can also be used. The variable inductor is a surplus item, while the variable capacitor is a Cardwell 154-9 having about 250 pF capacitance and about 32 inch spacing between meshed plates. The fixed capacitors (two 100 mmF units in parallel to form the approximate 200 mmF compensating capacitor and two 50 mmF units in series to form the 25 pF compensating capacitor) are of the Centralab series 858S "doorknob" types. These capacitor types were used only because they were on hand, but they are by no means necessary. Regular 2 kv disc ceramic capacitors are perfectly satisfactory and much more economical. Ten-Tec uses the latter type of capacitor in their tuner.

The components described are more than adequate to handle the output of a kw linear, but of course, one can scale the ratings of the variable components up or down depending on what power level one wishes to handle and according to what components one can find. Just above the variable capacitor can be seen a directional coupler for remote s.w.r. readout. It was taken out of a low-cost s.w.r. meter which had been discarded for other reasons. If one wishes to incorporate a directional coupler, a similar procedure might be followed, since many inexpensive CB-type s.w.r. meters have perfectly suitable line couplers, or one can follow any coupler design found in various handbooks.

The back panel of the tuner contains the usual SO-239 in/out coaxial connectors, a grounding connector, and some phono-jack connectors for the forward/ reflected voltage cutputs from the direc-

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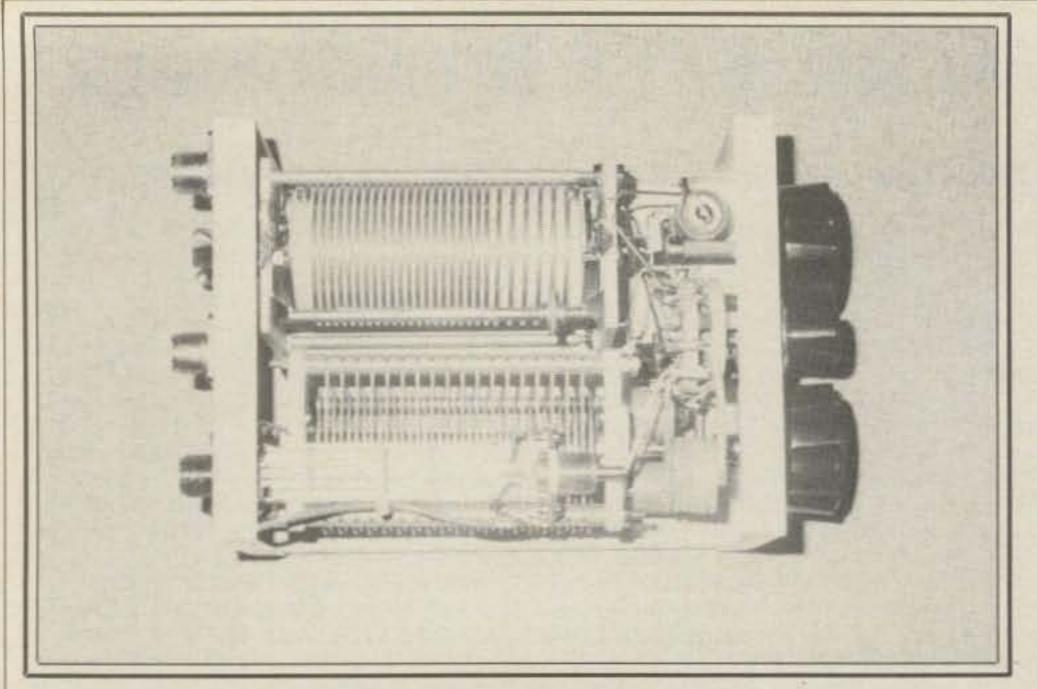
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A top view looking inside the tuner. The compensating coil is in front of the variable capacitor and the s.w.r. line unit is above it. One of the compensating capacitors can be seen in front of the variable inductor.

tional coupler. Provision is made for the selection of two antennas by means of a back-panel-mounted slide switch. The switch itself is a standard (not miniature) slide switch normally used for power-line switching. It is a d.p.d.t. type with its contacts being wired in parallel.

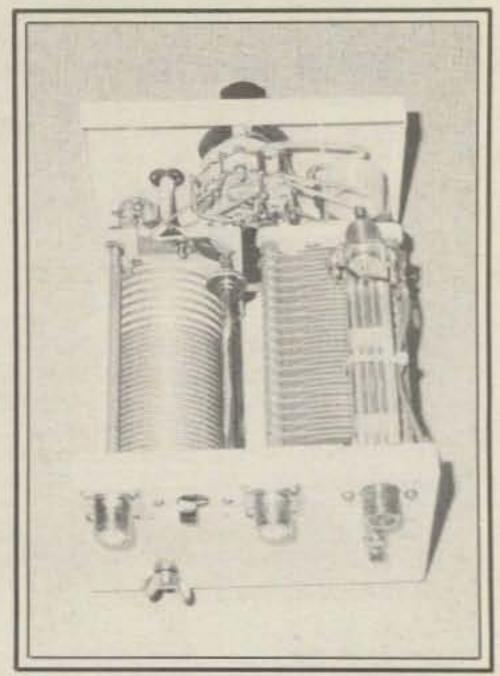
The front panel of the tuner has a straightforward layout and is dominated by the two large knobs used to rotate the variable capacitor and inductor elements. No turns counter is used with the variable inductor mainly because only a few turns, at most, have to be used to cover the usual coupling situation on 10/15/20 meters. Also, care was taken to wire the variable inductor such that the inductance increased with clockwise rotation. Usually, such inductors are wired so that increasing inductance takes place with counterclockwise rotation, so the widely spaced windings on an inductor with taper-spaced windings can be placed towards the rear of an enclosure to minimize lead lengths on the higher h.f. frequencies. With a "compensated" tuner, such as that described, there is no need to follow such a wiring procedure. On the front-panel photograph of the tuner one will note a push-button switch in a lower. center setting. As shown, it is a "do nothing" switch. It was incorporated in the tuner solely to provide a future possibility of adding a parallel capacitor to the variable one for lower frequency operation or of allowing the front-panel selection of two antenna outputs. Considering the relative ease of incorporating such a switch during the construction of the tuner, it is a highly recommended "do nothing" item that will undoubtedly turn into a "do something" item as one uses the tuner and feels the need for some additional switching functions.

The cost of parts for the tuner can vary

over a considerable range, depending upon what parts one has available and how astute one is at acquiring the necessary parts. If one configures the tuner for the kw level and if one obtains good-quality surplus parts, the total cost should be no more than \$40 or \$50. The cost will also depend upon how much, if any, one wishes to embellish the basic tuner with accessory features such as multiple antenna selection, internal dummy load, internal s.w.r. metering, balun for balanced line output, etc.

Using the tuner is every bit as effective and simple as using the Ten-Tec Model 229 tuner. The initial settings for the tuner on any band with a given antenna have to be experimentally determined. The best way to do this is undoubtedly with a noise bridge, since it allows an unlimited amount of time to experiment. But of course, one can use a conventional s.w.r. meter to determine tuner settings. Generally speaking, tuner settings that use a minimum amount of inductance seem to be prefer-

This view shows a bit better the placement of the rotary switch and the connectors mounted on the rear panel.



able to minimize internal losses. The "broadband" nature of the tuner, corresponding to the original performance of the 229, is quite amazing. Compared to tuners with three or more variable elements which have to be readjusted for any minor frequency excursion within the band, the tuner has to be readjusted only for major frequency excursions within a band. An example of what constitutes "minor" and "major" frequency excursions can be drawn from some personal experience in which a 20 meter antenna required tuner adjustment every 50 kHz or so to maintain less than a 1:1.5 s.w.r. using a conventional tuner, while adjustment of the tuner described in this article was only necessary twice to achieve a similar s.w.r. situation across the entire 20 meter band.

If you have need for a tuner and don't mind a bit of simple construction work in return for a significant costs savings as compared to the purchase price of a commercial tuner, I'd heartily recommend the tuner idea described herein.

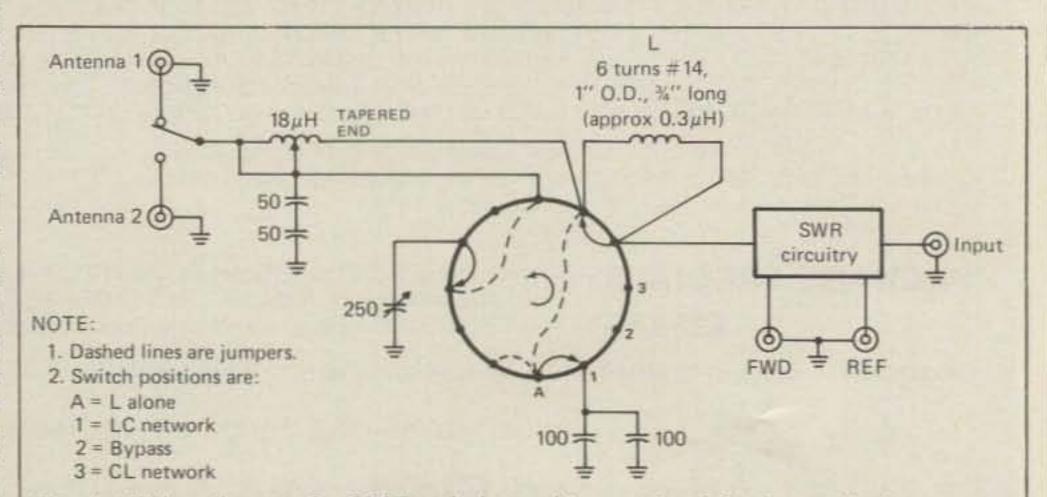
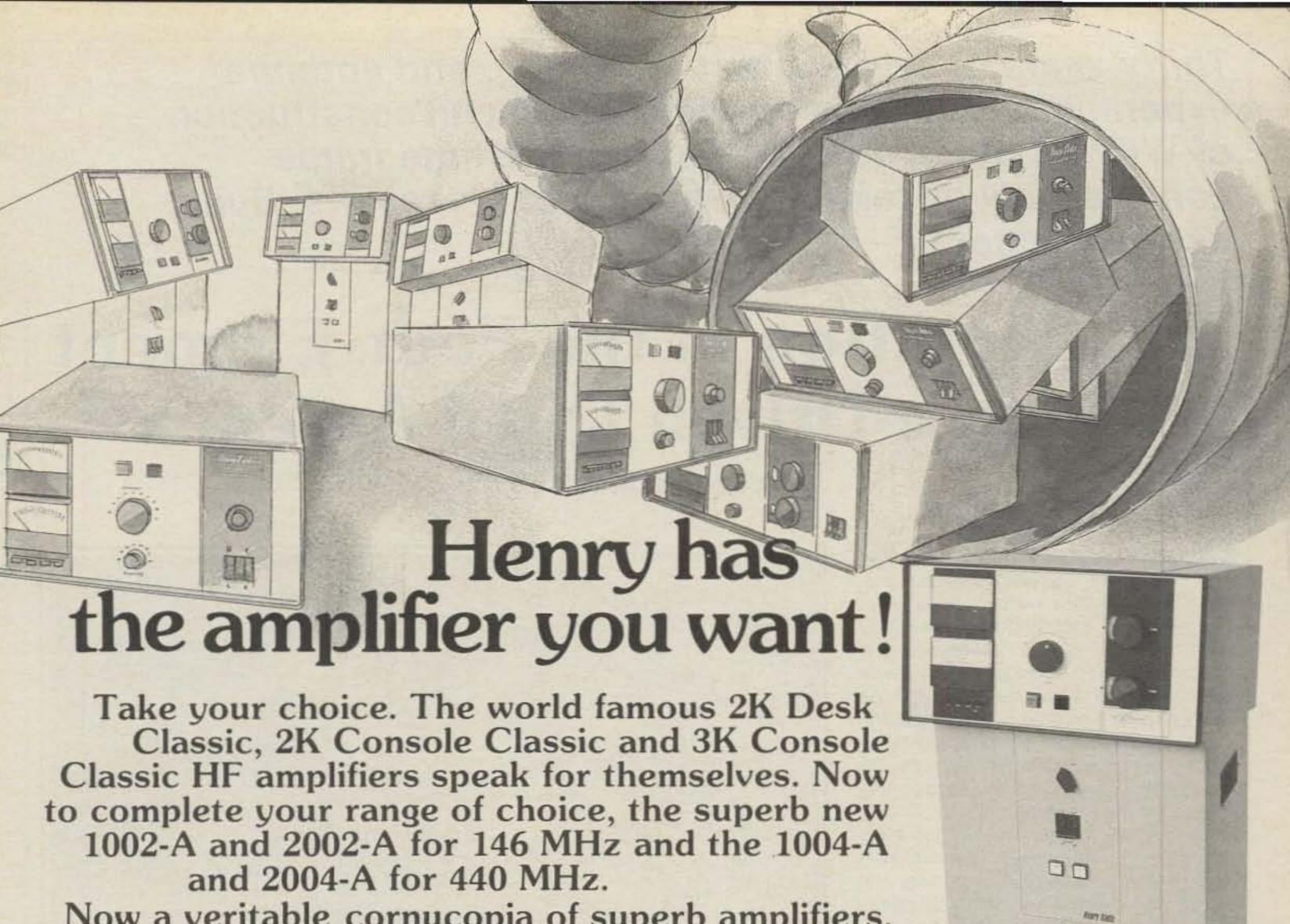


Fig. 4- Wiring diagram for 3P3T switch used to construct the tuner. Various components are discussed in the text.



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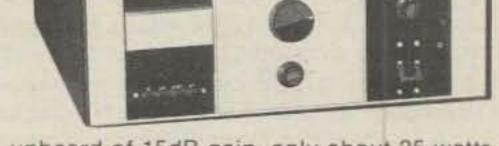
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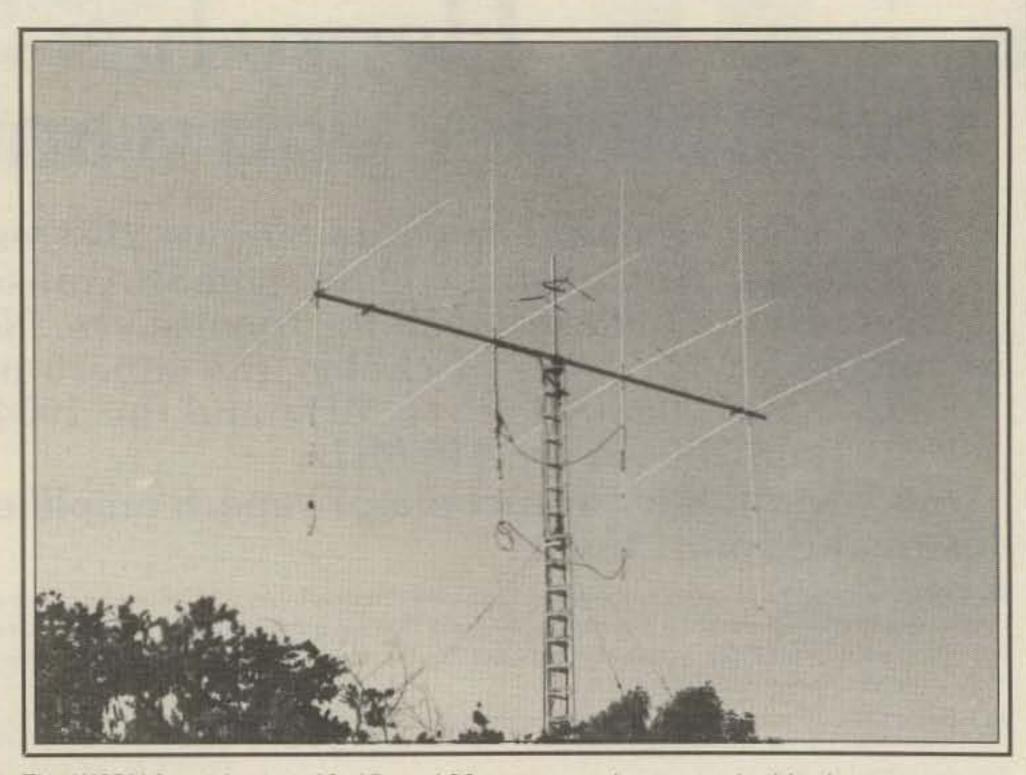
Thirty years of avid contesting, DXing, and antenna experimentation went into the design and construction of W6PU's quad. You can shorten the time frame considerably by taking advantage of his results. Build, use, and enjoy!

The Evolution of the Four-Element Double-Driven Quad Antenna

BY ROBERT MARTINEZ*, W6PU

Ver the years I have become limited to small plots of land and therefore it became necessary for me to discover how I could design a high-performance rotary antenna for 20, 15, and 10 meters on the smallest possible boom using low tower heights and still remain competitive in the pile-ups. All this had to be confined within the boundaries of one-quarter acre! From my past experience, I chose the four-element quad in the diamond configuration for the following reasons. I could stack three or more bands on one array without any appreciable interaction. could do this on a 25 or 30 foot tower and still be very competitive. The Yagi had to be a minimum of 65 feet to be competitive on the long haul, and it suffered from rain or snow precipitation static, which the quad did not. The quagi was also plagued by this nuisance!

I have tried to understand the reasons for the quad's unique performance, and after having experimented with them for over a quarter of a century and having read everything about them I could find, I have arrived at some conclusions that I feel are interesting and may shed light on the subject. Consider the following. If you draw a picture of the one wavelength of wire that comprises the quad loop and form it into a diamond shape, and then on paper horizontally bisect that full-wave diamond, you will observe (fig. 1) that this quad diamond is in reality two half-wave "inverted vees" vertically stacked and separated by approximately 0.39 wavelengths. If you then were to go out and build this diamond, you would find that it contained two points of maximum current, concurrent with maximum radiation. These are in phase. If the feedline were to be placed at the bottom point of the diamond, the other maximum point of radiation would occur at the upper point of the diamond. What we then have is two half waves in phase vertically stacked!



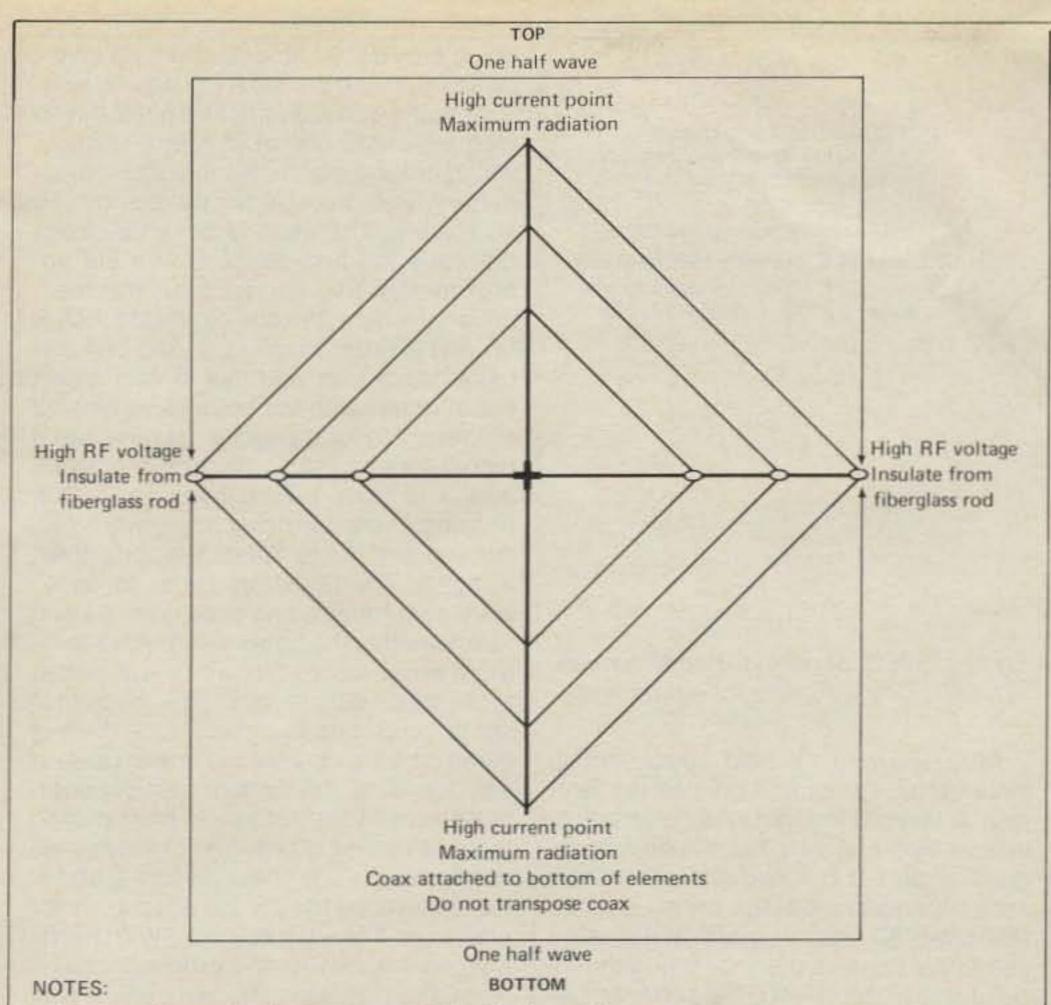
The W6PU four-element 10, 15, and 20 meter quad antenna. In this view you can see the 10 and 20 meter phasing lines. The 15 meter phasing line was installed a week after this picture was taken.

Twenty-five years ago the "experts" claimed that you must stack two halfwave antennas at least one wavelength apart in order to realize a worthwhile gain of 3 dB (one-half S unit, equivalent to doubling your transmitter power). In the last five or ten years, however, computer studies and actual experimentation have demonstrated that the quad loop has from 2.0 dB to 2.5 dB gain over a single half-wave element. The greater gain figures lean toward the diamond-shaped quad loop as opposed to the square loop. It is quite obvious that the maximum current nodes of the square quad are not spaced as far apart as they are in the diamond configuration. In practical use, diamond quad loops produce amazing results at elevations as low as one-quarter wavelength center height from ground. I

feel that this is due to the following reasons. The single quad loop has twice the receiving capture area as does a simple half-wave element. This results in greater input to your receiver, facilitating hearing those weak DX signals.

Since our quad loop is actually two half-waves vertically stacked, a trip through our antenna handbooks shows that the effect of using vertical stacking is to lower the vertical angle of radiation for both receiving and transmitting. The fact that we may receive 2 or 2.5 dB more gain doesn't hurt either. This would certainly explain the outstanding performance of a quad loop when used at low heights above ground. If you look at low vertical transmitting and receiving angles in your antenna reference books under propagation, you will readily under-

*229 Lilac Dr., El Cajon, CA 92021



1. Driven elements showing insulators at high RF voltage points.

2. All wire elements are #14 Formvar. DO NOT USE STRANDED WIRE!

Fig. 1– The basic triband quad configuration. This antenna is essentially two half-wave inverted vees stacked vertically. See the text for details.

stand why this lower radiation angle from the quad loop can result in as much as 20 dB difference in signal strength in favor of the quad loop as compared to the single half-wave element at the same center height above ground. It easily can make the difference on the long haul or long path between hearing a weak DX signal loud and clear or not hearing it at all!

For many years I was content with my two-element and four-element parasitic rotary quad arrays for 40 through 10 meters. However, as the ranks of amateur radio began to grow, I realized that I was no longer competing with three-element tribanders and four-element Yagis at 40 and 50 feet in DX chasing and in contests. Enter the era of the six- and seven-element 20 meter "Monoband Monster Yagi" on individual 100-foot-plus, rotary, self-supporting, "Big Bertha" masts! There was lots of money invested in those systems, and I had to find a way to remain competitive without driving myself and my family into the poor house. I began to stay awake nights scheming to get more forward gain and better front-to-back ratio, while limiting myself to a 35 foot boom length. As it was, when my two-element 40 meter quad with its 25 foot boom was pointing towards the four-element 20, 15, 10 meter quad's boom end, the separation was only 50 feet. I didn't get any noticeable interaction, and I didn't

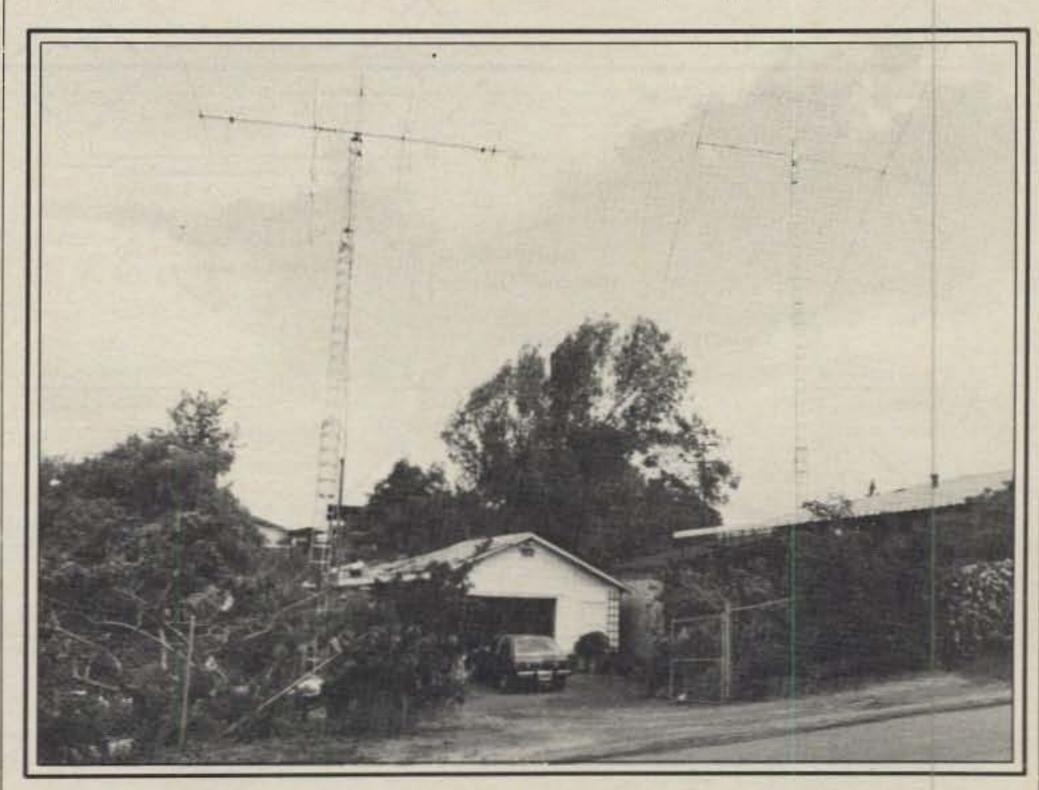
stand why this lower radiation angle from the quad loop can result in as much as 20 dB difference in signal strength in favor of the quad loop as compared to the single care to press my luck. I knew that a quagi would give me more forward gain, but when I tried that, back came the phantom of precipitation static to haunt me. Obvi-

ously, the quagi or Yagi was not the solution to my dilemma.

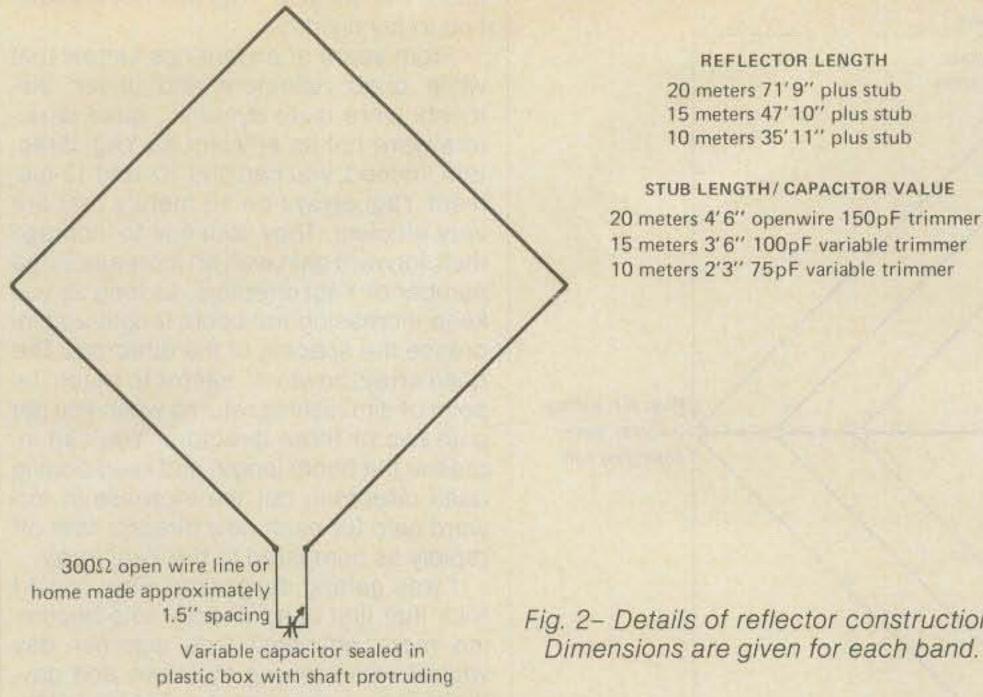
From years of experience I knew that while quad reflectors and driven elements were quite dynamic, quad directors were not as efficient as Yagi directors. Indeed, you can find 10- and 12-element Yagi arrays on 10 meters that are very efficient. They continue to increase their forward gain with an increase in the number of Yagi directors, as long as you keep increasing the boom length and increase the spacing of the directors. The quad array, however, seems to reach the point of diminishing returns when you get past two or three directors. You can increase the boom length and keep adding quad directors, but the increase in forward gain for each new director falls off rapidly as compared to the Yagi array.

I was getting desperate. How could I trick that first quad director into becoming more efficient? One summer day while I was mowing the lawn and day-dreaming, it came to me. Eureka! Why not combine the best aspects of the driven "End Fire" array with those of the Yagi parasitic array, all on one 35 foot boom? I began pouring through my voluminous notes of 30 years of antenna experimentation. Here were all my beloved dog-eared reference books dealing with phased and driven arrays of all types and spacings.

I immediately set to work planning a strategy. First I would need a "near field" reference measurement from my existing four-element parasitic quad array to verify how many dB increase of forward gain I would see, if any, from my new double-driven four-element quad. Having earned my living for over 20 years in elec-



The not-so-mini antenna farm at W6PU. On the left is the four-element 10, 15, and 20 meter quad. On the right is the two-element 40 meter quad. These antennas have made W6PU a formidable contester and DXer.



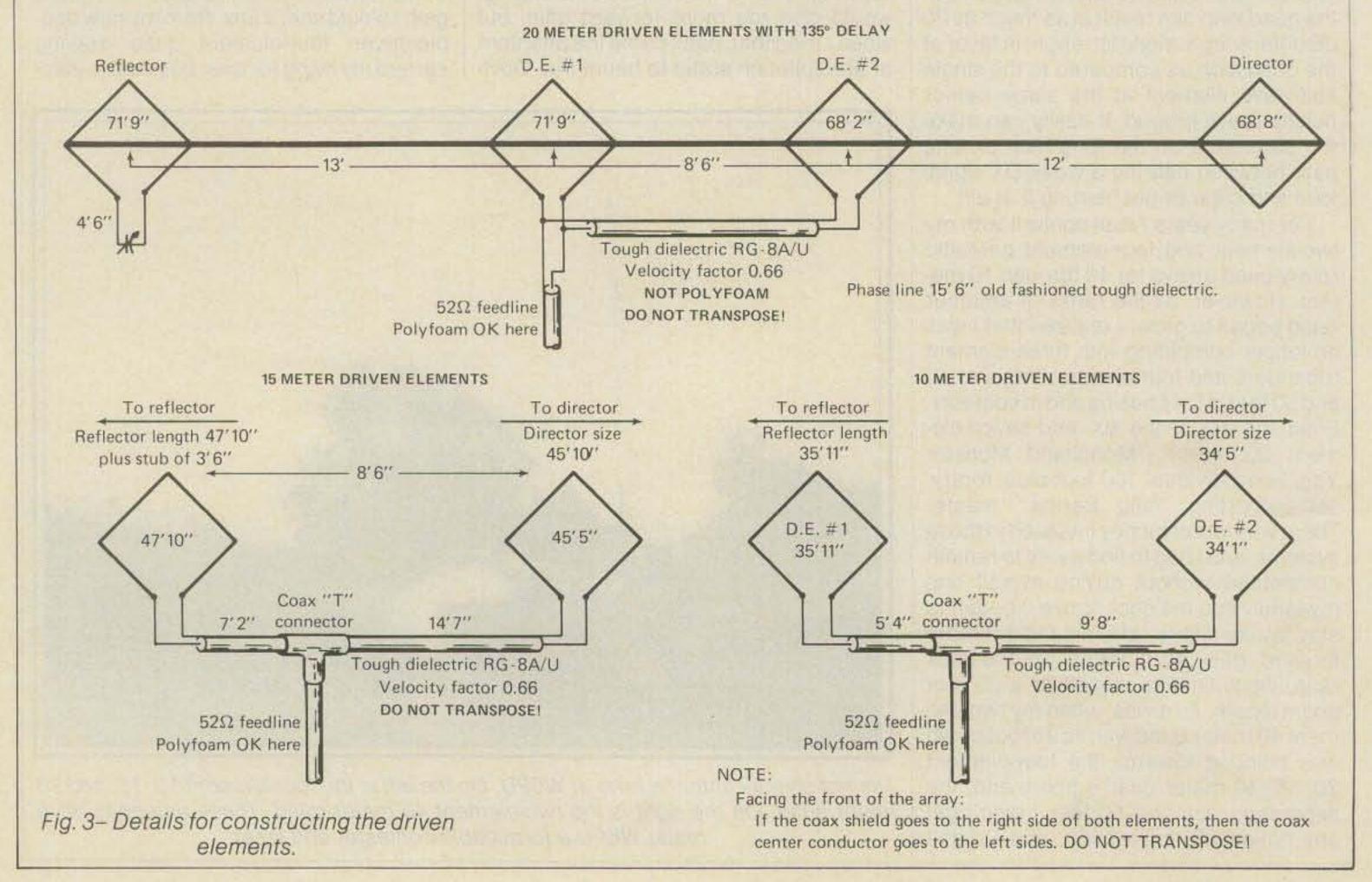
tronic research and development labs as well as on commercial antenna test ranges, I was in a good position to borrow the necessary test equipment. I already owned an antenna noise bridge, which I believe every serious antenna builder should have. From my sympathetic employer I obtained, on loan, an Empire Devices NF-105 commercial logarithmic field-strength receiver, a Hewlett Packard 608E commercial research-grade signal generator, and Hewlett Packard 355C and 355D calibrated researchgrade variable attenuators.

Fig. 2- Details of reflector construction.

After allowing the test equipment to stabilize for 48 hours, I pointed my fourelement parasitic quad array at my pickup test dipole, which was the driven element of an old but perfect Telrex Monarch tribander, mounted on my second test tower 80 feet away and at the same height as the boom of my four-element quad array. The NF-105 field-strength receiver and the H.P. variable attenuators were connected to the test dipole. The H.P. 608E signal generator was connected to the four-element parasitic quad array, and a reference level of 0 dB was set up on the NF-105 field-strength receiver. I was now ready to start my experiment.

Spacing between the two quad driven elements was set at 8 feet 6 inches. which is one-eighth wavelength on 20 meters, and one-quarter wavelength on 10 meters. The second driven element (formerly the first director) was cut approximately 5% shorter than the main driven element (the one closest to the reflector) in order to mimic a "log cell" for extra bandwidth, and then it was driven out of phase with the hope of increasing efficiency and therefore developing a higher forward gain, sharper directivity, and a greater front-to-back ratio. The phasing sections (delay lines) were calculated and cut to the dimensions given in fig. 3. The reflectors (refer to fig. 2) were stub-tuned using open wire line and terminated at the bottom end with a miniature variable capacitor which was sealed in a small plastic box. The capacitor shafts protruded in order to tune them in place on the stub which is drawn upward and taped to the bottom vertical fiberglass arm of the reflector. After cutting the quad wires, stubs, and phasing lines to the dimensions shown in figs. 2 and 3, we were ready to tune the quad array for maximum front-to-back ratio. With the dimensions shown in this article, for all intents and purposes this will concur with maximum forward gain!

placed my towers alongside of my house and garage so that by using a home-built 5 foot test stand and a guyed 15 foot aluminum step ladder I could easi-



ly reach the boom of my 40 meter, or 20-15-10 meter, quad when the towers were cranked down. Most modern-day transceivers are small and light enough so that you can easily bring them up on the roof. If you cannot do this, then disable your receiver a.v.c. and turn up the gain loud enough for you to hear the receiver from the roof. Your neighbors should get a big bang out of this! Connect the feedline from the quad you are tuning to your receiver and tune-in either a local signal source or a distant source coming from the rear of the array. If you are using a local signal source, it is of critical importance that it be horizontally polarized and located at least one-half wavelength from the back of your reflector. If it is a close source such as a signal generator, be certain that the horizontal radiating antenna is at the same height as your quad's boom. If the band is in stable condition, tune into a distant ragchew and use that as a source. From several hundred miles or more away, it doesn't matter what kind of antenna the other guy is using.

With the received signal coming from the back of the beam, slowly tune the reflector stub capacitor for minimum signal strength using a frequency at the low end of the c.w. band (i.e., 14.010). Next measure the v.s.w.r. at this frequency. If it appears to have risen to a much higher value than it was before you tuned the reflector, try backing off a bit on the capacitor. I had to do this on my 20 meter section, and I backed off from an F/B of 50 dB to the present 40 dB.

Upon completion of final tuning, I saw a forward gain increase of from 5.5 dB to 6.0 dB, the higher gains occurring on 10 and 15 meters. This is equivalent to increasing your transmitter power approximately four times! In the receiving mode I immediately noticed that this new double-driven quad had a much sharper horizontal beam width than the previous parasitic array. For example, when I turned my beam from a ZL at a heading (at this QTH) of 225 degrees toward a VK at a beam heading of 240 degrees, the ZL would drop off by a full S unit, or 6.0 dB. This was about twice as sharp as the old four-element parasitic quad array! In DX pile-ups on the long haul or on the long path I observed that certain local stations that usually beat me out almost every time were no longer doing so. Some of these stations use wide-spaced six- and seven-element Yagi monoband arrays at heights above ground of 80 to over 100 feet. After having used this fourelement double-driven quad array for six years in DX contests and hundreds of pile-ups, I feel confident that it is indeed highly competitive and can give those monster monoband Yagis a real run for their money!

The story of the double-driven quad didn't end with its completion. I wanted to try to understand why it performed so

well, so I began trying to reason it out. It is interesting to consider that two dipoles spaced between one-eighth and onequarter wavelength apart and driven in the out-of-phase "End Fire" configuration produce approximately 4.5 dB forward gain, with a front-to-back ratio of about 30 dB, as I personally have measured. Add to this another 2.5 dB, which is the stacking gain that I have measured from the diamond-shaped loop, and you find that two diamond-shaped loops spaced properly and driven in the correct out-of-phase mode for their spacing will give you 7.0 dB forward gain at low vertical-wave angles and a front-to-back ratio of at least 30 dB on the long-haul DX for a correctly designed phasing line. Now add to this 7.0 dB figure another 3.0 dB for a wide-spaced diamond quad director, and then add a conservative 3.0 dB for a properly tuned diamond quad wide-spaced reflector, and we are looking at 13.0 dB forward gain at low verticalwave angles and at an actual boom length of 33.5 feet. I really feel that the 3.0 dB figure I show for a properly tuned wide-spaced quad reflector is low, but I am allowing for something less than "perfect tuning," as many amateurs have never before tried tuning a multi-element quad array.

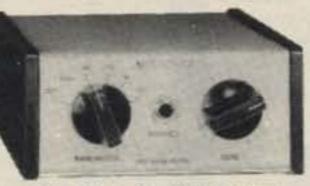
At this point I cannot stress too strongly the importance of gain measurement evaluation. Such measurements of h.f. arrays made at near-field distance are academically interesting, but many of these measurements fail to state at what vertical-wave angle the 14.0 MHz gain is occurring. Such measurements will not tell you how loud two different antennas will be at 6,000 miles distance! Tests of 20 meter beams scaled down to u.h.f. or

microwave frequencies over a "perfect" ground simulation can be very misleading, as they are subject to many unknown variables when performed with full-size beams over non-perfect ground using the ionosphere as a reflecting source.

There is no substitute for long-haul onthe-air tests between two antennas at nearby QTHs. it is enlightening to note in the ARRL Antenna Book under "Wave Propagation" that measurements made on a path from England to the New Jersey coast of the United States at 14.0 MHz show that for 99% of the time the vertical wave angle at which signals were propagated and received was below 17°! Looking once again at our antenna books, we find that the vertical lobe pattern for a horizontal dipole one-half wave above ground shows that a major portion of energy is being radiated at a vertical angle of approximately 30°-very poor for 14.0 MHz DX work. Looking at the vertical lobe pattern for a horizontal dipole (or a ground-plane vertical) with a center height, or, in the case of a ground-plane vertical, base height, of only one-quarter wavelength, we see that a major portion of energy is being radiated below 12°. This is why a vertical ground-plane antenna mounted on the roof of a 17 foot tall house and using a reasonable radial system at 14.0 MHz can beat out a three-element Yagi at the same height on the long haul, even though the Yagi may have a forward gain of 8.5 dB and the vertical may have no gain!

In the building of the four-element double-driven quad, or any quad for that matter, it is wiser to use extra-heavy construction and have it stay up rather than to save a few dollars cutting corners and have it come down in the first wind storm.

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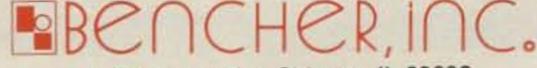
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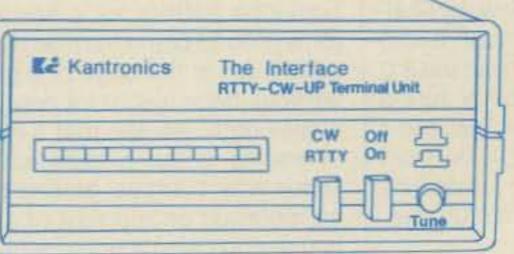


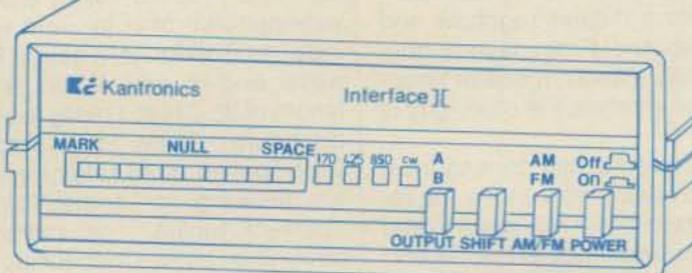
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G. SAVE HOLDING BUFFER

H. LOAD HOLDING BUFFER

I. SET TIME

00:00:00 KANTRONICS AMTORSOFT COPYRIGHT 29 JUNE 1983

CHOOSE

S (AMTOR SLAVE) M (AMTOR MASTER) L (AMTOR LISTENER) P (PROGRAM OPTIONS) T (T/R OPTIONS)

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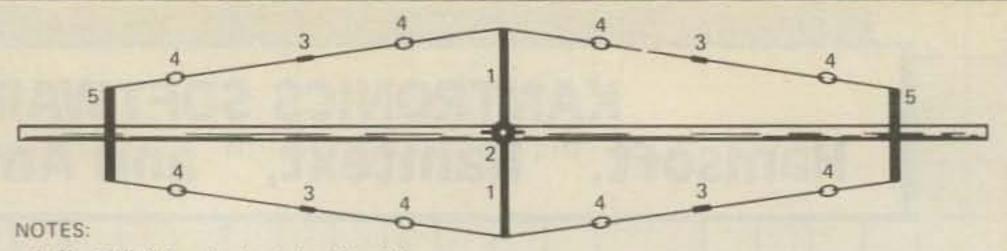
Suggested Retail*89.95

For more information see your Kantronics dealer, or contact: Kantronics 1202 E. 23rd Street Lawrence, KS 66044

The quad arms are made of "delux"-grade fiberglass, which comes in single pieces about 13 feet long for three-band arrays. Do not use the telescoping type, or PVC pipe, or metal insulated tube sections. Contrary to popular belief, fiberglass is not always a good r.f. insulator. Under conditions of high air pollution and high humidity, fiberglass rods may become coated and could break down at the highvoltage points occurring at the horizontal corners of the diamond quad driven loops. I have had this happen to me with only 500 watts of transmitter input during a very heavy fog. For this reason, it is a must to use high-quality porcelain insulators at these points on both of the driven elements (refer to fig. 1). You can wire and then tape these insulators to the fiberglass rods using a good-quality highvoltage electrical tape. This is not necessary at the two low-voltage high-current points at the top and bottom of the diamond, where you may pass the wire directly through the fiberglass rods.

Any of the fine commercial aluminum quad arm holders available on the market may be used, but you will want those which are designed to fit on a 3 inch O.D. boom. An alloy aluminum 6061T6 3 inch O.D. 35 foot boom should be used. Such booms are available from commercial metal supply houses, or you may inquire at any of the firms manufacturing quad kits. The aluminum arm holders should be drilled through once the array is assembled, and a good-quality, plated 1/4 inch bolt with a plated lock washer and nut should be used to pin the arm holder to the boom, thus preventing rotation of the arms in high winds.

The mast can be a 2 inch O.D. section of ordinary galvanized water pipe. It should be approximately 15 feet long. Ten feet is lowered into the top section through a thrust bearing and clamped to the rotator. Both the mast-to-rotator point and the mast-to-boom should be drilled and secured with high-quality 3/8 inch plated bolt, lock washer, and nut. The assembled array is mounted at its balance point about 6 inches above the tower. If you are using a guyed tower, you will



- 1. 2' x 11/4" O.D. galvanized pipe (2 req'd).
- 2. Quad arm holder with 2" hub.
- 3. Turnbuckles (4 required).
- 4. Egg insulators to break up any resonance.
- 5. 2' steel angles clamped to boom with auto muffler U-bolts.

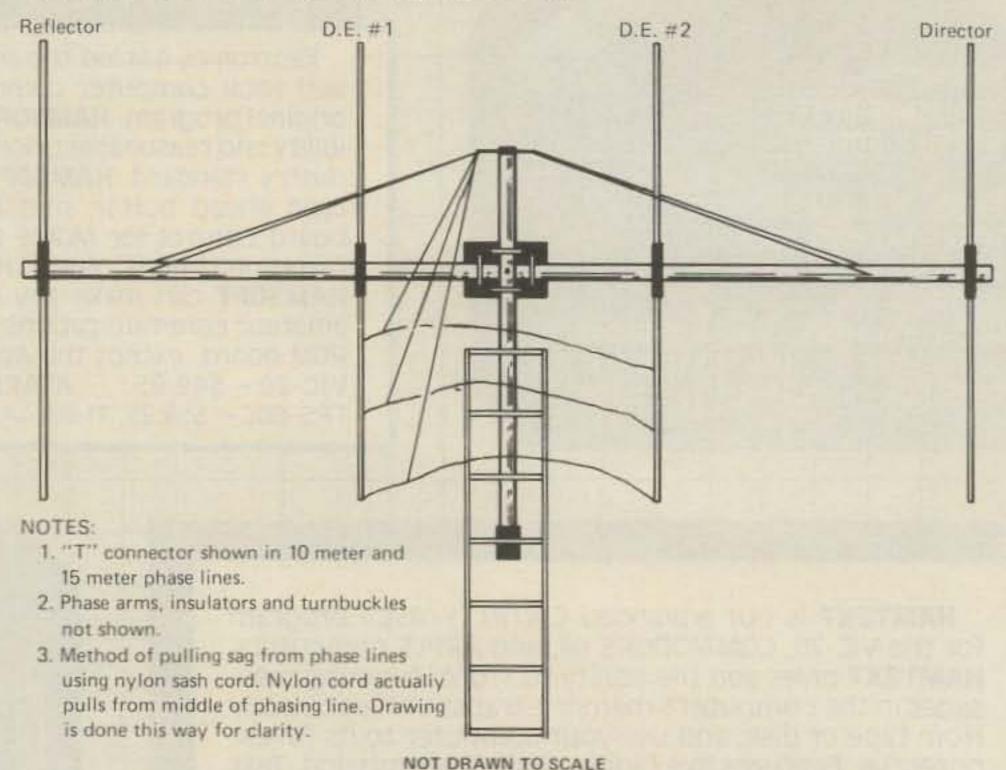
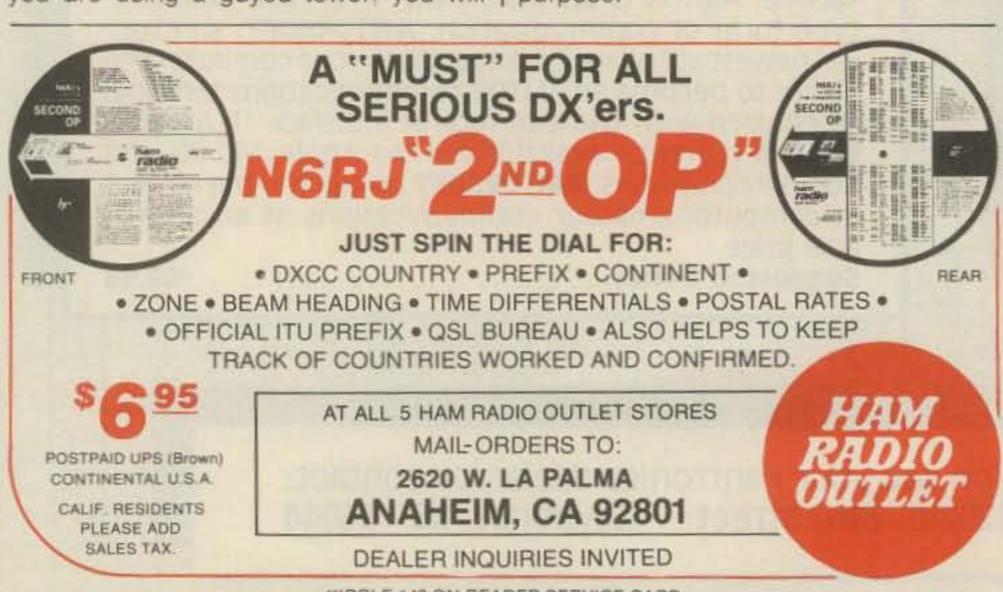


Fig. 4- Mechanical and stress considerations for supporting the triband quad.

have to lower the guying point of the top section so that the lower vertical quad arms will clear the top-section guy wires. In any event, you will want about 5 feet of mast to extend above the boom for a double-truss boom guy (refer to fig. 4.). You should also place a cross bar at the top of the mast to take up the slack of the phasing lines. You will find that nylon rope or window sash cord is very useful for this purpose.

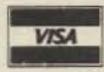
Unless you are fortunate enough to have a foldover tower or a high stand and 15 foot step ladder on your roof, it is not wise to place the array too high above the top of the tower. The extra few feet of height won't do much for your signal, but it will make reaching the antenna for tuning purposes that much more difficult. If you insist on placing the array 10 or more feet above the top of the tower, you should order one of the special stacking masts furnished by some of the leading manufacturers of steel towers, such as Tri-Ex, Triasto, Rohn, etc. Such masts are expensive, heavy, and will increase the wind-load factor, which can be disastrous unless you happen to own a brute of a tower. My array is approximately 60 feet to the boom. I don't find performance at this height much different from the performance at 25 feet, but at the greater height the array appears a lot smaller to my XYL and my neighbors. The doubledriven quad will also work very well in a three-element version using a 21 foot boom with a wide-spaced reflector. It has been my experience that wide spacing of quad reflectors and directors is desirable. The performance of this four-element double-driven quad bears this out III



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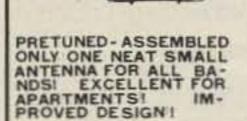
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December 1983

Attention FT-901 owners: For about \$20.00 and a few hours of time you can now add 30 meters to your rig. W5AH literally walks you through the mods to get you on amateur radio's newest band.

How To Add 30 Meters To The Yaesu FT-901 Transceiver

BY BOB ALEXANDER*, W5AH

Since its introduction in 1978, the Yaesu FT-901 has been a very popular transceiver. However, it does not provide for the new WARC bands. Now that 30 meters is open for use, FT-901 owners have been unable to use the new band.

Thirty meters can be added to the FT-901 by using the (unmarked) Auxiliary position of the band switch, and the WWV/JJY sections of the XTAL Unit and VCO Unit. The megaHertz portion of the frequency display is programmed by a diode matrix IC and must be modified to read correctly. The project can be completed in a few hours for a cost of about \$20. A v.t.v.m. with r.f. probe and a frequency counter are needed for alignment purposes.

The WWV/JJY position of the band switch will be inoperative after completion of the modification. Ten MHz WWV and 30 meters will be on the Auxiliary position of the band switch. The Auxiliary position must be used in order to obtain enough capacity in the transmitter pi network for proper loading.

The PLL Unit operates 8.9875 MHz above the transceiver operating frequency. For 10.000 to 10.500 MHz operation, PLL output must be 18.9875 to 19.4875 MHz. The changes to be made in the XTAL Unit and VCO Unit permit operation over this frequency range.

The first production lot of the FT-901 had 5 MHz WWV installed, and all later units had 15 MHz WWV. Japanese versions all had 5 MHz WWV. Some of the modification steps depend on which version is being modified.

XTAL Unit (PB1711)

There are two different board layouts for the XTAL Unit. The newer boards have

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ALC MARK

JECT - WIDTH

TA - MR - RX VFO EXT M

MR TX - MR - RX VFO EXT M

AND TX - MR - RX VFO EXT M

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The transceiver, front view.

an Auxiliary section silk screened on the board, but no parts installed. Parts are numbered the same way on both boards and only the layout is different.

Remove the XTAL Unit from the transceiver and make the following changes. Replace X1310, the 29.4875 MHz crystal (19.4875 MHz in units with 5 MHz WWV), with a 24.4875 MHz crystal. The crystal is available from Yaesu. Replace C1337 with a 120 pF capacitor. Unsolder and remove cable connector pin 11 from the circuit board. On the foil side of the board, connect a jumper wire from pin 12 of the connector to the hole at pin 11. Reinstall the XTAL Unit.

Remove the VCO Unit from the transceiver. Connect a jumper wire between pin 10 and pin 18 of the edge connector. The even-numbered pins are on the component side of the board and are counted from left to right. In units with 5 MHz WWV, MJ12 (VCO edge connector) on the main chassis has pin 10 grounded. Unsolder pin 10 from the ground connection. A wire from the band switch will be connected to it later. Next reinstall the VCO Unit.

Counter Unit

Remove the counter unit from the transceiver and install the components as shown in the illustration. In units with 15 MHz WWV, connect a wire from the Auxiliary feed-through capacitor to the new parts as shown. In units with 5 MHz WWV

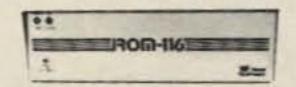
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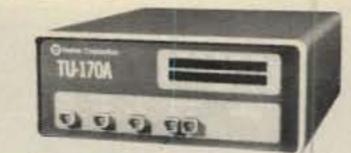
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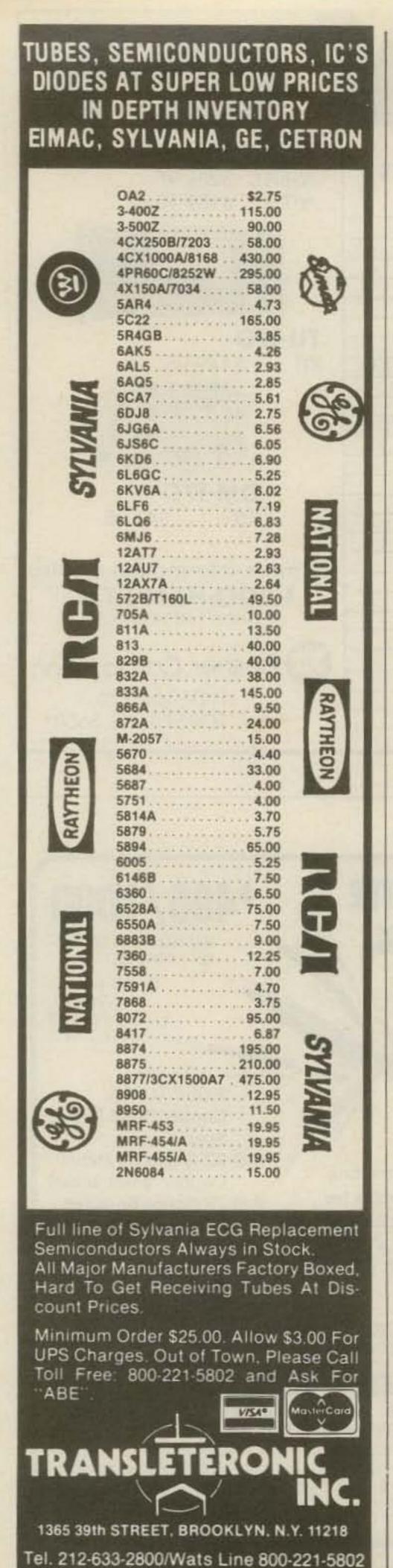


Fig. 1-(A) Counter unit PCB showing placement of new components. (B) Counter unit top front cover. 1N914 022 020 2SC1815 (3.3K 021 (A) WHT/GRN 000**ರ**ರ ರರ ರರ ರರ ರರ ರ WHT/BLU Auxiliary 0 160 10B WWV 20 80 Aux 10C 10A (B) a blue/white wire is connected between the feed-through capacitor and the main

board. Cut the wire at the board and connect it to the new parts as shown in the illustration. Reinstall the counter unit.

Band Switch (S1)

The band-switch wiring for units with 15 MHz WWV differs slightly from those with 5 MHz WWV (see illustration). The band switch wafers are designated A through O beginning at the front of the transceiver. Trimmer boards A, B, and C must be folded out of the way for access to the Auxiliary terminals of the wafers.

Rewire the band switch as follows for units with 15 MHz WWV. On S1E and S1G connect a jumper wire between the Auxiliary terminal and the 20 meter terminal. On S1I locate the gray or gray/white wire going from the Auxiliary terminal to coil L10. The wire may connect to S1J and then to L10. Cut the wire at the coil and connect it to the 20 meter terminal of S11.

Rewire the band switch as follows for units with 5 MHz WWV. On S1A connect a wire to the Auxiliary terminal. Connect the other end to pin 10 of MJ12 (VCO Unit). On S1E, S1G, and S1I connect a jumper wire between the Auxiliary terminal and the 20 meter terminal.

The remaining band-switch wiring is the same for all transceivers. On S1K the 160 through 15 meter terminals are tied together. Connect a jumper wire between the Auxiliary terminal and the 160-15 meter terminals.

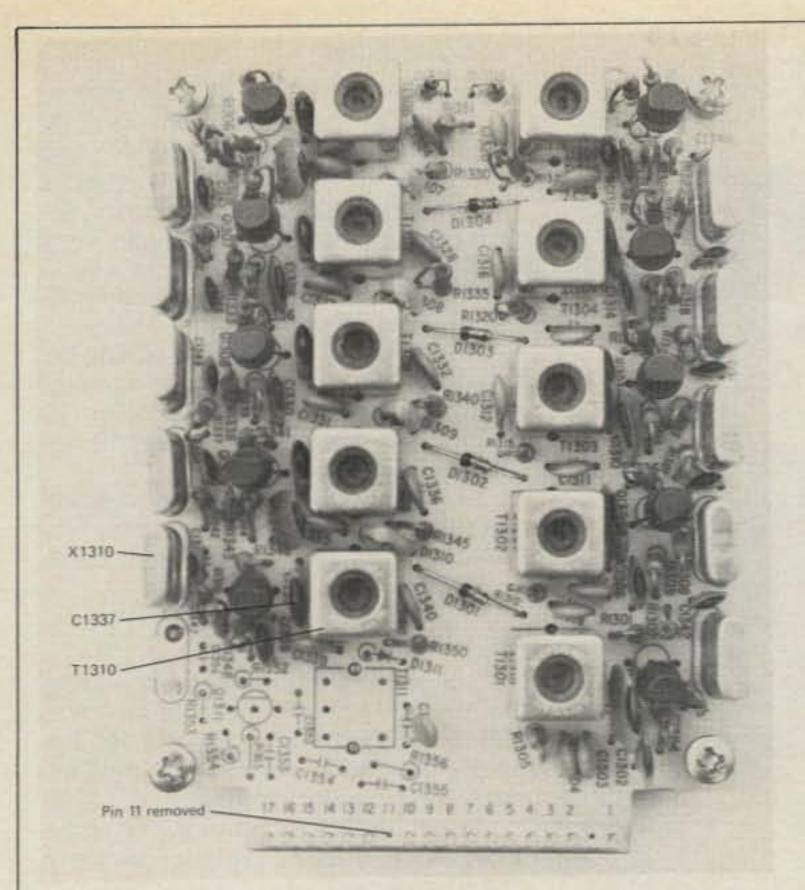
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TWX710-584-2460 ALPHA NYK.

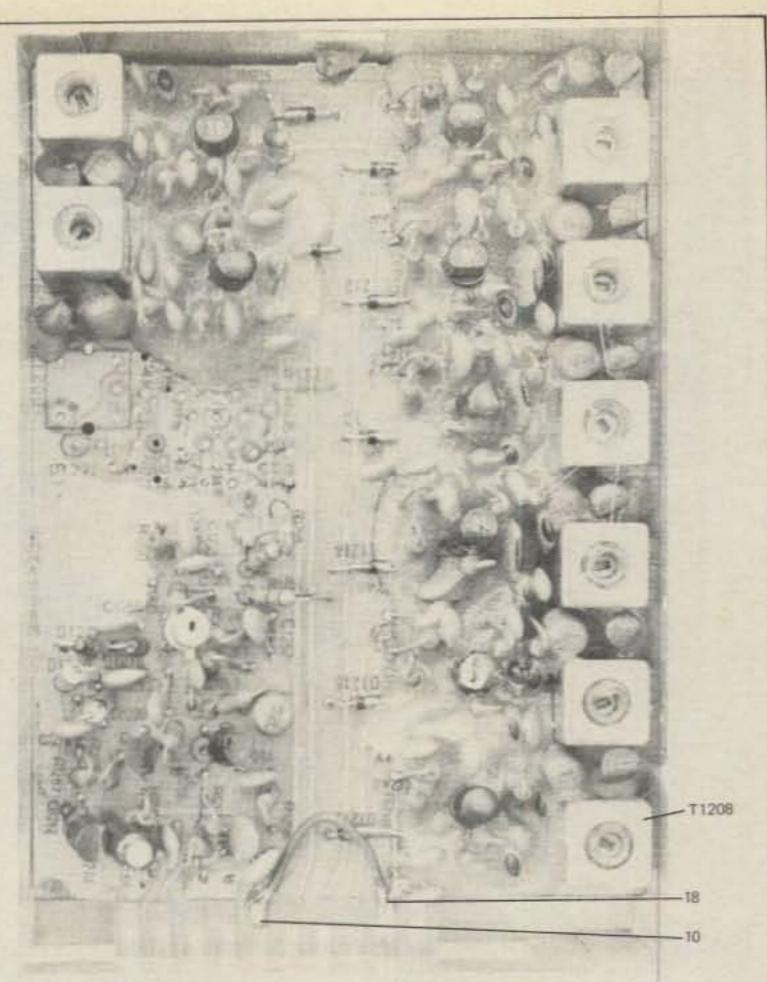
To auxiliary

feed-through

capacitor

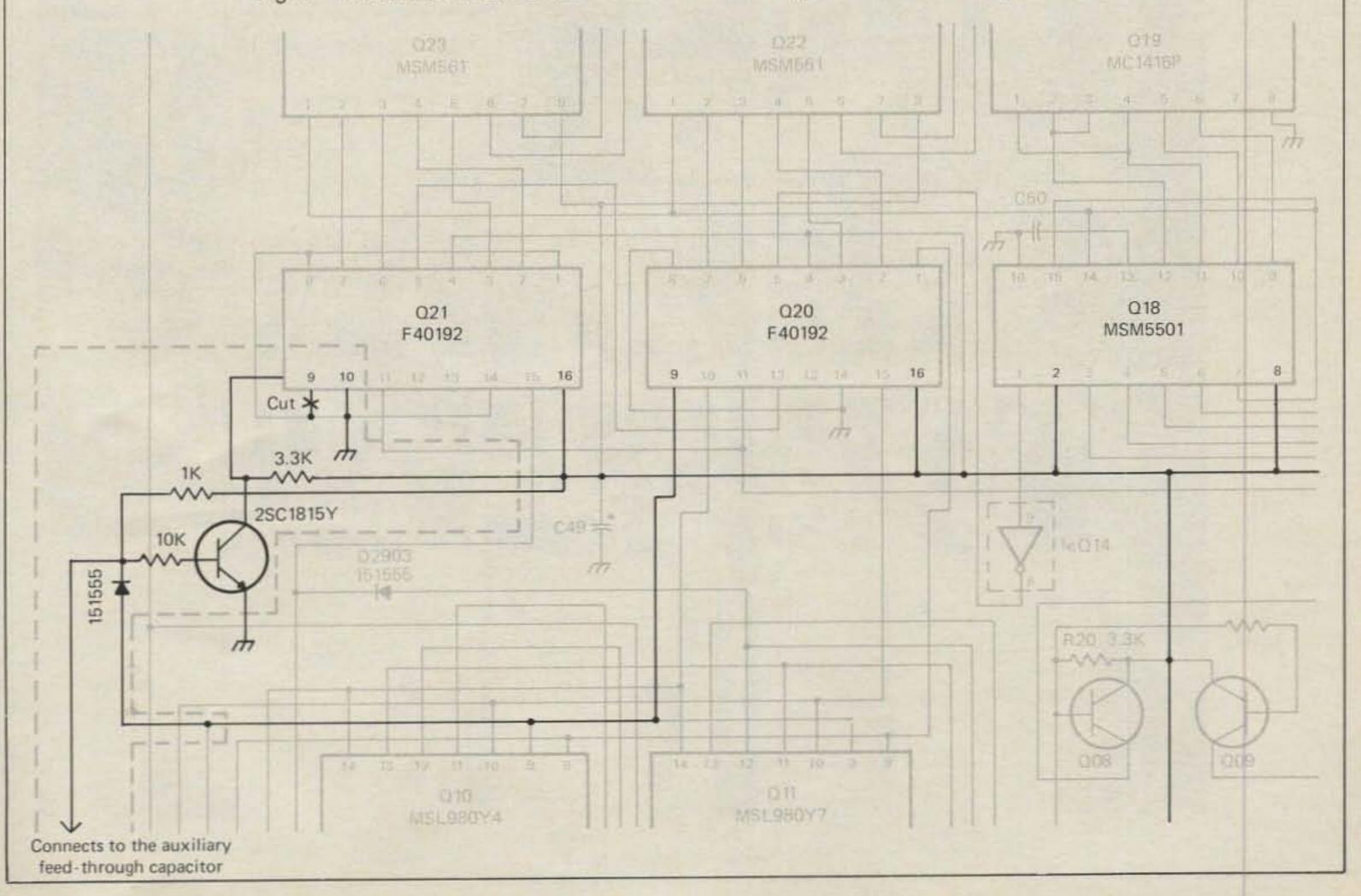


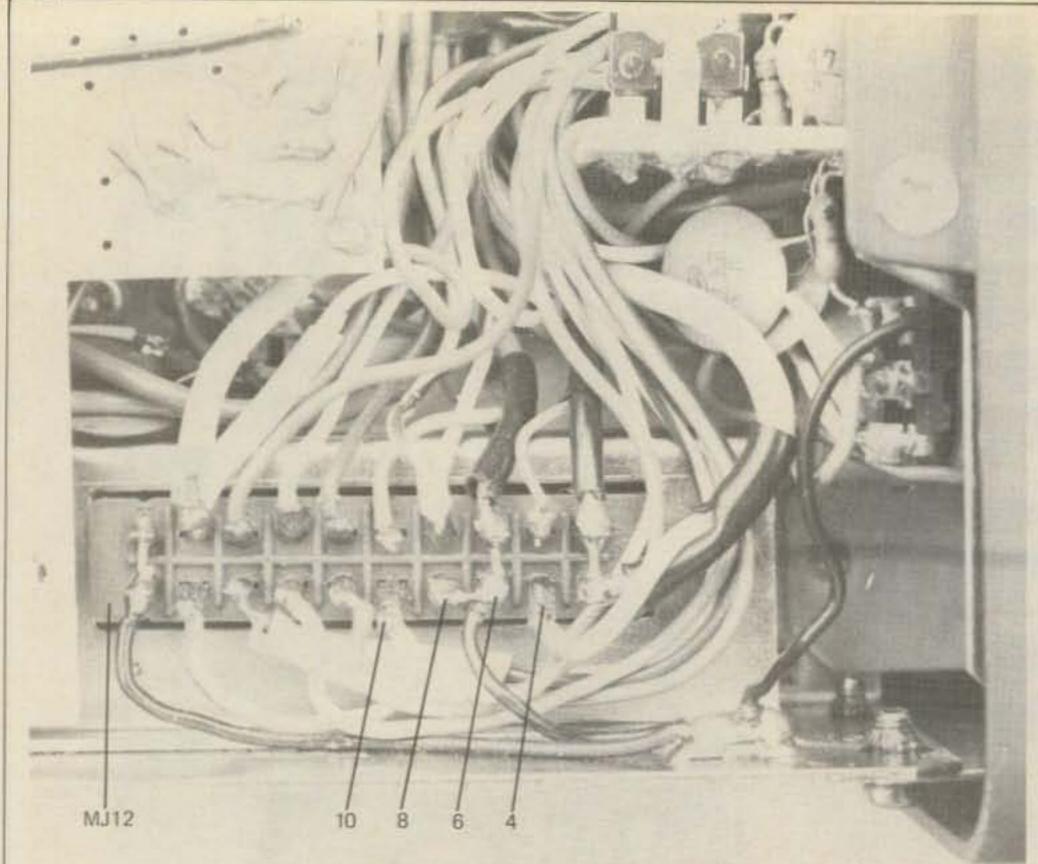
The XTAL Unit (PB1711). Pin 11 is removed from the edge connector. X1310 is at the lower left.



The VCO Unit (PB1710). Jumper wire is connected between pins 10 and 18 of the edge connector.

Fig. 2- Partial schematic of the counter unit showing the additional components.





MJ12 (the VCO Unit).

Final Amplifier

S1L, S1M, S1N, and S1O are located inside the final-amplifier enclosure. S1M is the front side of the middle wafer, and S1N is the rear side. On S1N connect a jumper wire between the common terminal and the one immediately above it. On S1O connect a heavy jumper wire to the Auxiliary terminal. The other end will be connected later.

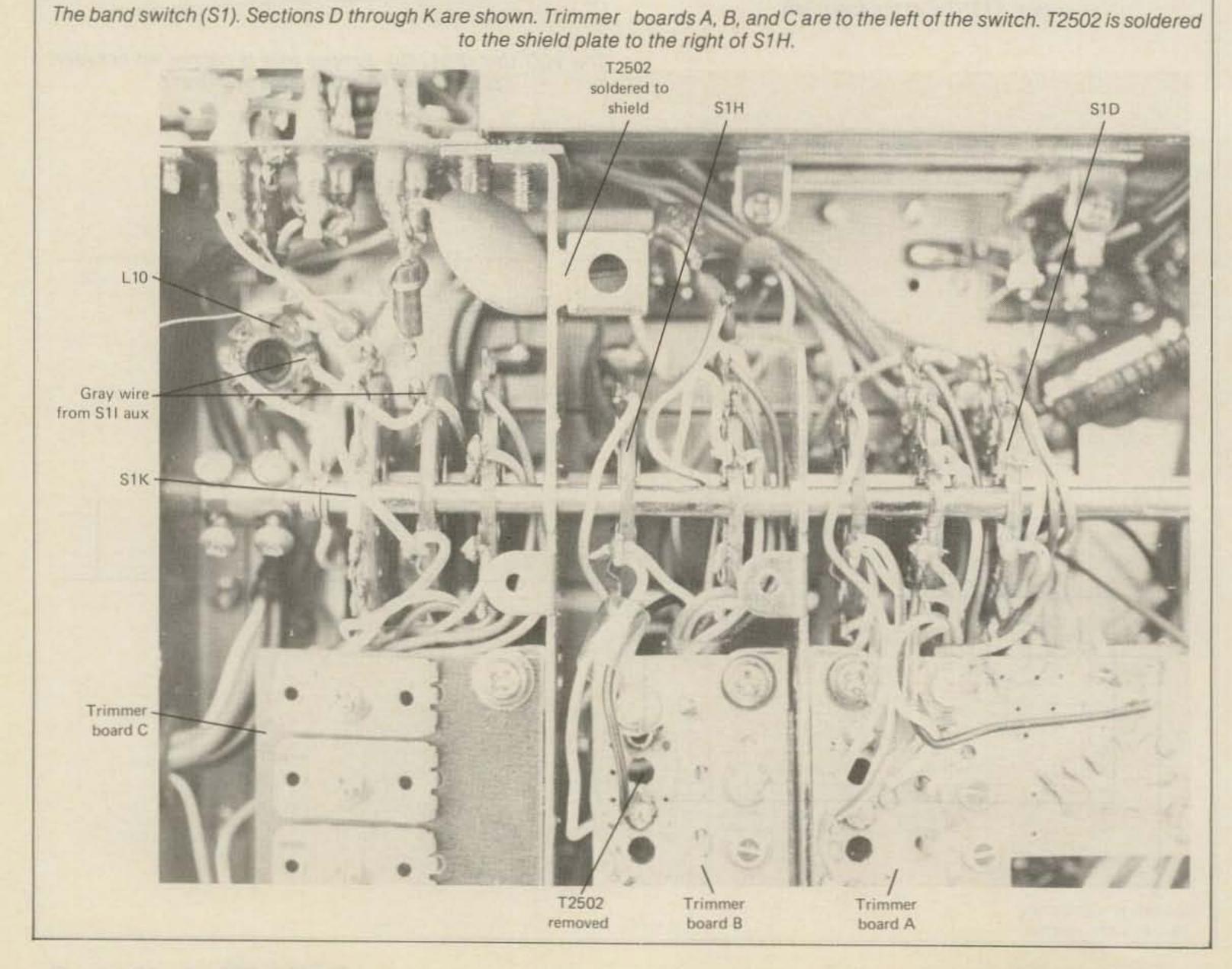
On loading coil L1 carefully scrape the enamel off the coil between the 40 meter tap (orange wire) and the 20 meter tap (yellow wire) three turns from the 40 meter tap. Tin the wire.

Connect the free end of the wire previously connected to S10 to L1 at the prepared position. This completes the bandswitch wiring.

Alignment

Apply power and set the band switch to the Auxiliary position, the MODE switch to USB, and the VFO dial to 10.000 MHz. The frequency display will be flashing, indicating an out-of-lock condition.

Connect an r.f. probe to pin 16 of the XTAL Unit and adjust T1310 for an output of 150 millivolts.



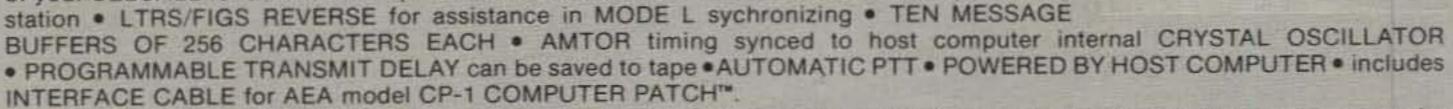
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Shown with optional AMT-1 Console Stand, COMM-64 with CRT Monitor and cassette recorder (Not included)

Applications software for C-64 or VIC-20

AEA also offers an applications software package for the Commodore VIC-20 (model AMT-1/VIC20-1) or 64 computer that is resident on a plug-in PROM CARTRIDGE and includes the INTERFACE CABLE to go between the computer and the AMT-1. KEYBOARD OVERLAY instructions are also included for easy operation without the instruction manual. The COMM-64 program (model AMT-1/C64-1) offers SPLIT SCREEN OPERATION with ten MESSAGE BUFFERS. It also offers UNATTENDED OPERATION with automatic MESSAGE RECORDING and AUTOMATIC STATION INDENTIFICATION.

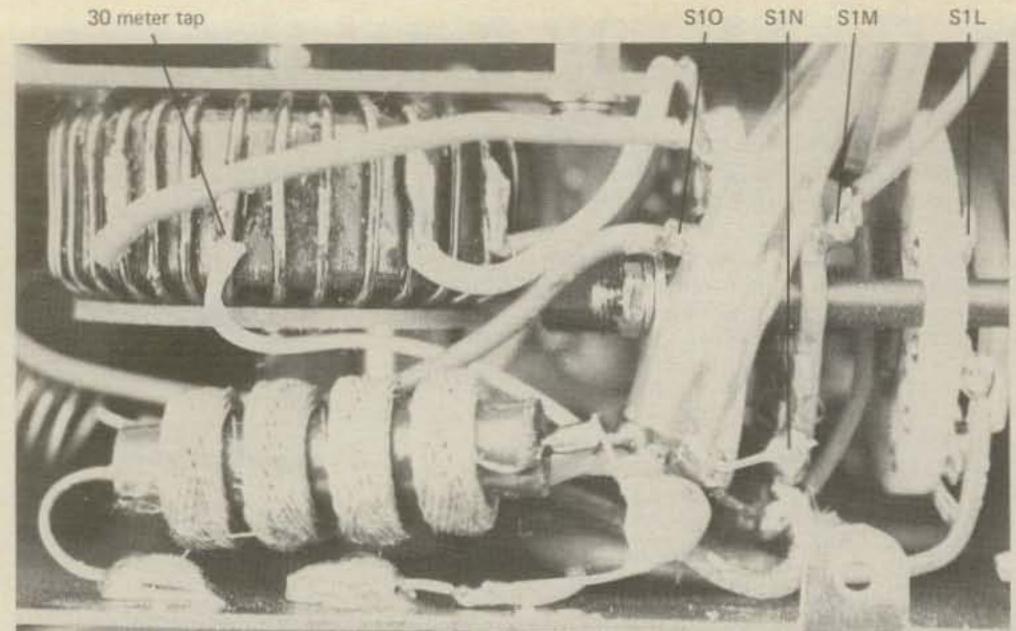
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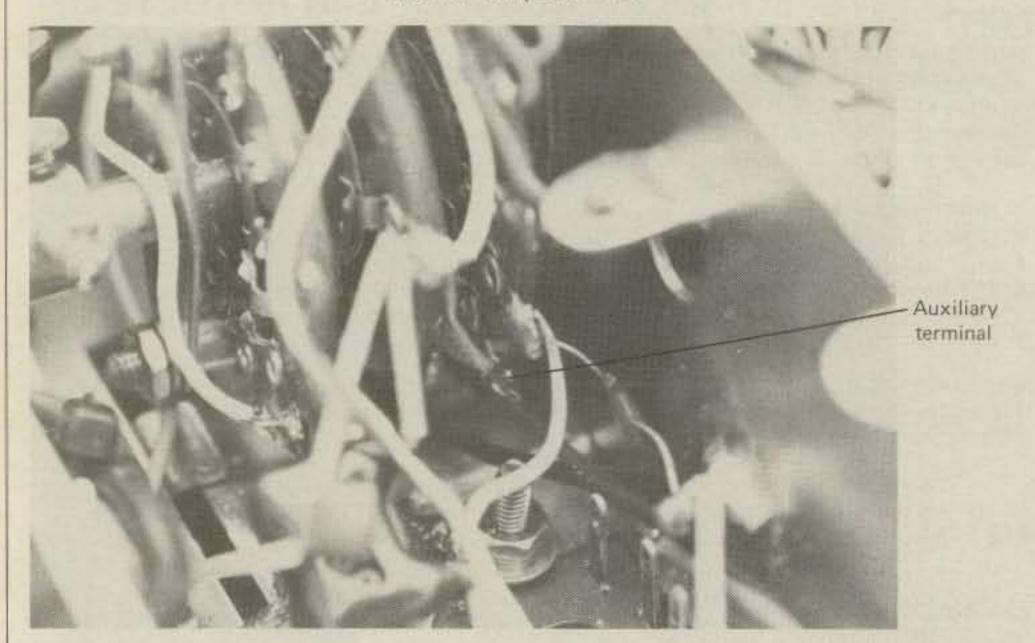
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The PA compartment.



Side view of the band switch showing location of the Auxiliary terminal.

Connect a frequency counter to pin 4 of MJ12 (VCO Unit). Adjust T1208 for a reading of 18.9875 MHz on the counter. The frequency display should no longer be flashing.

Connect the transceiver to a dummy load and tune up the transmitter in the normal manner. The **PRESELECTOR** control will peak between 4 and 5 on the inner scale. The plate tuning control will be near the 20 meter mark. Transmitter output should be at least 100 watts.

Note: The loading control settings on all bands may be different from what has been normal due to increased capacity in the control.

Low Output/Receive Self-Oscillation

Some transceivers with 15 MHz WWV may have low transmitter output and receive self-oscillation on the new band. The problem has not been seen in units with 5 MHz WWV. Should this problem occur, it can be corrected as follows.

On trimmer board **B** (PB1724) carefully unsolder T2502, TC2507, and the white/ violet wire, and remove them from the board. Do not unsolder the white/violet wire from the band switch.

T2502 has five solder lugs on it. The side with three lugs is unused. Prepare T2502 by soldering one of the two lugs to the metal can. Solder an 8 pF capacitor with short leads to the other lug. Solder the can to the shield plate as shown in the photograph. Connect the free end of the white/violet wire to the 8 pF capacitor.

Tune the transmitter up and adjust T2502 for maximum output at 10.125 MHz. Check the 40 meter band for proper operation. Incorrect adjustment of T2502 can cause the same problems there. Readjust T2502 if necessary. The transceiver should now be ready for an on-the-air check.

I must give thanks to Ed Kerr at Yaesu for his technical assistance and patience. See you on 30 meters!

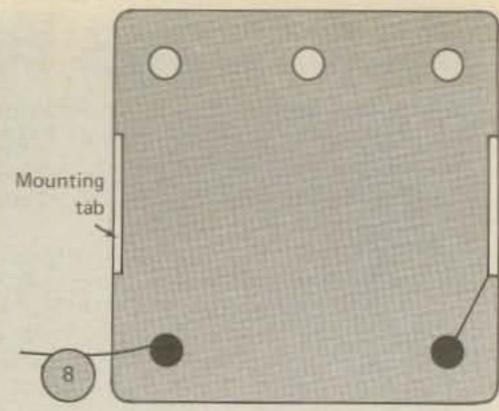


Fig. 3- T2502 bottom view. One solder lug is connected to the metal can and the other has an 8 pF capacitor with short leads attached to it.

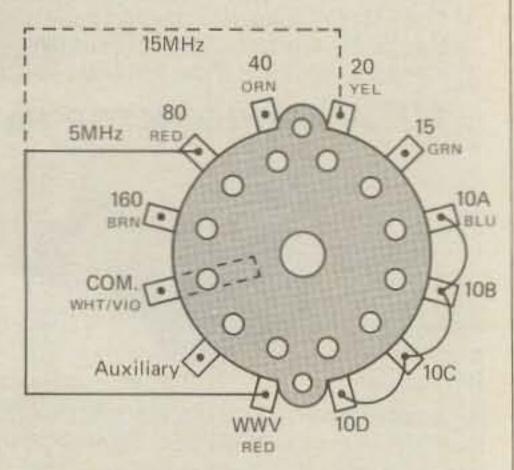


Fig. 4— Wiring diagram of band switch S1 sections A through K.

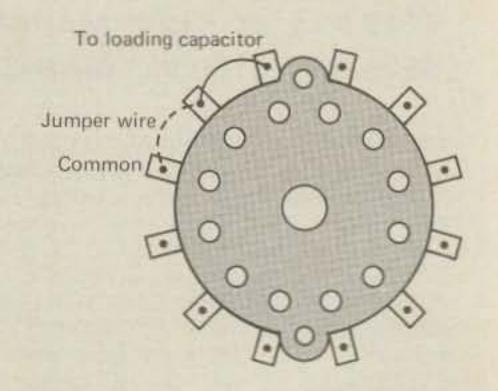


Fig. 5- Wiring diagram of band-switch section N. Terminals are on the rear side of the wafer.

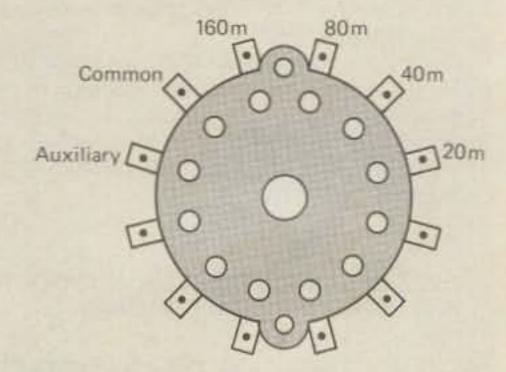


Fig. 6- Wiring diagram of band-switch section O.

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Nice, neat, not crowded. Receive section best I have used. Great on RTTY.

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A perfect performer and a pleasure to operate. W3LKA

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And our thanks to all the others whose comments we didn't have room to print.

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GO BEWEWS:

The Radio Amateur Callbook

A Tradition in Amateur Radio for 63 Years BY ALAN M. DORHOFFERY, K2EEK

So how do you review the Callbook? Like the old story goes, it has a great cast of characters, but the plot is nothing.

The Radio Amateur Callbook Company enjoys the undoubted distinction of being the oldest business in the field of amateur radio. Founded in 1920, the Callbook has deservedly been a fixture in the shacks of active amateurs world-wide ever since. Its symbol, Pegasus, the Flying Horse, has been used ever since the Callbook was founded.

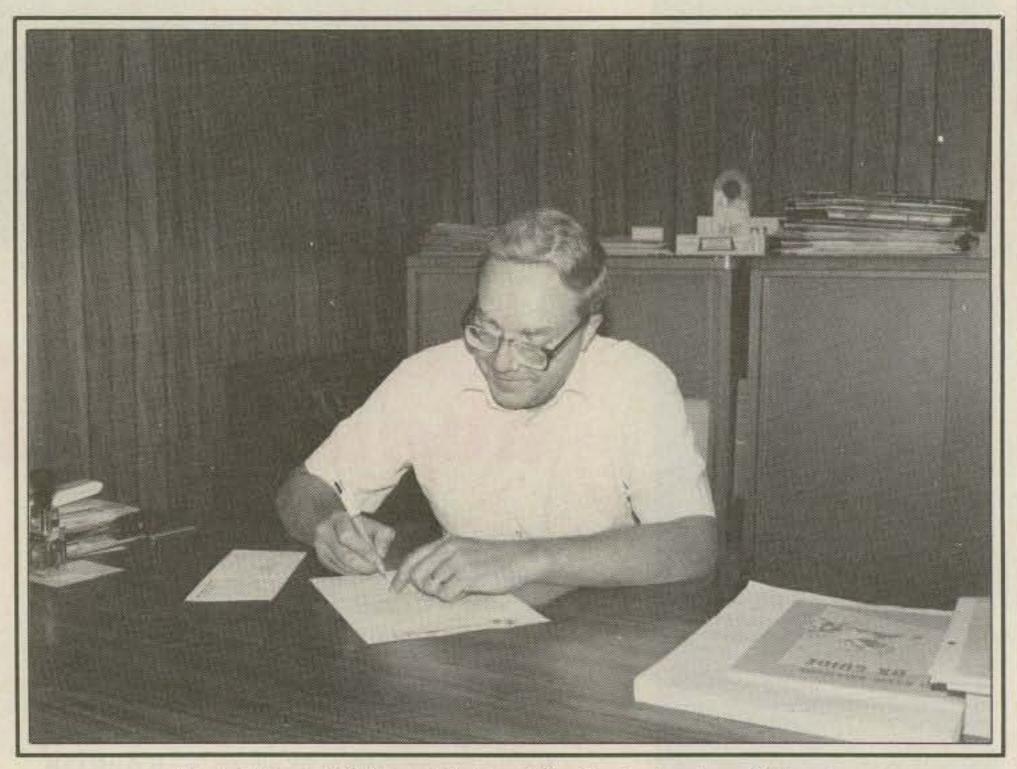
The Radio Amateur Callbook Company is located in Lake Bluff, Illinois, a quiet, pleasant outer suburb of the Chicago area. The company operates out of its own quarters, built for the Callbook, a neat office and warehouse building with colonial trim. The company is owned and operated by Mr. Herb Nelson, W9IGL, with the help of nine employees.

The Callbook is and always has had an important role in maintaining the cohesiveness of the amateur community; indeed, being listed in the Callbook is widely considered one of the proofs of membership in the world-wide fraternity of amateur radio. The Callbook is to amateur radio what a telephone book is to a community, listing us all, identifying each other, and helping us reach each other for QSL's, schedules, and the like.

At one time a listing of the amateurs of the world fit into a book little larger than a modern CQ magazine. But amateur radio has seen enormous growth since then, and the Callbook grew, first to a single thick volume, and then, in the late fifties, splitting into two volumes, one for American listings and the other for the rest of the world.

Technology has certainly had a part in the growth of the Callbook. The Callbooks have gone from handset type to the most modern printing techniques, and from carbon copies of license applications laboriously hand copied to sophisticated computer storage and recall techniques. Without the constant updating and improvements that the Callbook has implemented, it would be economically impossible to produce such a complete document at a price that amateurs can afford.

A conversation with Herb Nelson, W9IGL, the publisher of the Callbook, offered a fascinating look into the planning and work that goes into bringing out the new Callbooks,



Herb Nelson, W9IGL, publisher of The Radio Amateur Callbook.

which are published annually on December 1st, along with the quarterly supplements.

It is no secret that FCC data provides the input for the *U.S. Callbook*. Indeed, prior to the computerization of FCC records, licenses were typed manually, with a carbon copy going to the *Callbook*. And with today's Freedom of Information law, anyone can purchase from the FCC a complete computer tape of all outstanding amateur licenses, complete with license class, address, and date of birth. In fact, several different groups are known to purchase this information, which they primarily use for mailing lists of amateurs for commercial purposes.

Of course, with modern typesetting and print technology, it really is no trick at all to translate such a computer tape from the FCC directly into a callbook. What, then, does the Radio Amateur Callbook Company do beyond such a quickie typesetting exercise to justify the price of a new Callbook?

The answer to that question proved to be interesting indeed. To start with, the FCC really does not have an in-house quality-control program on normal licensing, relying instead on the license recipient to point out any errors. This means, for example, that there is no keystroke verification of data typed into the computer, so any aspect of the license could be incorrect. Actually, this is a very reasonable approach for the FCC, as it keeps processing costs to a minimum, and the amateur receiving a license incorrectly made out certainly will notify the FCC of any significant error.

On the other hand, it is obvious that this can cause significant error on the master tapes. Of course, in time the corrections find their way to the FCC tapes, but in the meantime the tape is in error. The Radio Amateur Callbook keeps its own master tapes and utilizes several error-trapping procedures to prevent such mistakes received from the FCC from reaching their tape and your printed Callbook.

For one, all FCC license issues are compared to previous listings for the same station by the *Callbook*. While this technique obviously does not work for new licensees, only a fraction of issued licenses are for new amateurs, with the bulk being license renewals, change-

*Editor, CQ

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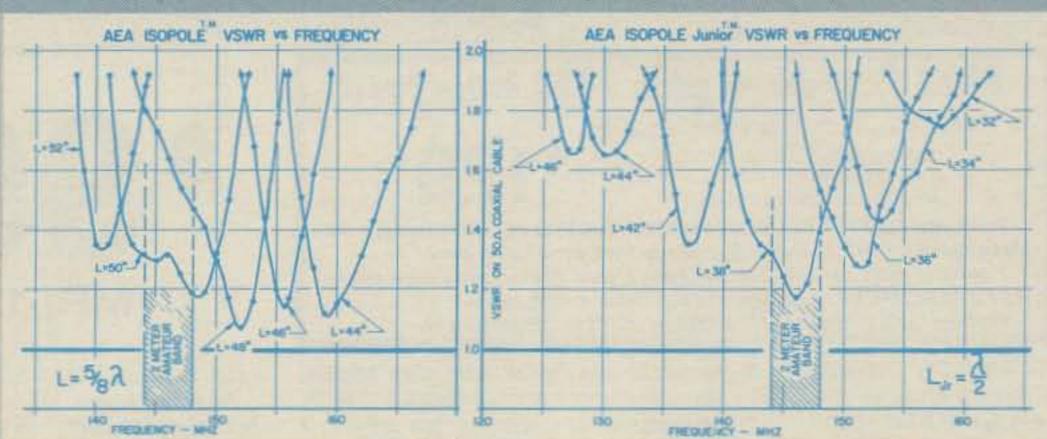
COMPETITORS KNOW ABOUT THE

ISOPOLE DO YOU? STUDY THE FACTS

The IsoPole antenna is building a strong reputation for quality in design and superior performance. Innovative IsoPole conical sleeve decouplers (pat.

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All IsoPole antennas yield the maximum gain attainable for their respective lengths and a zero degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane and present an unsightly bird's roost with an inevitable "fallout zone" below. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other when used with SWR protected solid state transceivers.



Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station antenna. A standard Amphenol 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole, you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. All IsoPole antennas are D.C. grounded. The insulating material offers superb strength and dielectric properties, plus excellent long-term ultra-violet resistance. All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is not supplied).

IsoPole antennas have also become the new standard for repeater applications. They all offer low angle of radiation, low maintenance, easy installation, and low cost with gain comparable to units costing several times as much. Some repeater installations have even eliminated the expense of a duplexer by using two IsoPole antennas separated vertically by about twenty feet. This is possible because of the superior decoupling offered by the IsoPole antennas.

The IsoPole antenna is now available in a 440 MHz version which is fully assembled and tuned.

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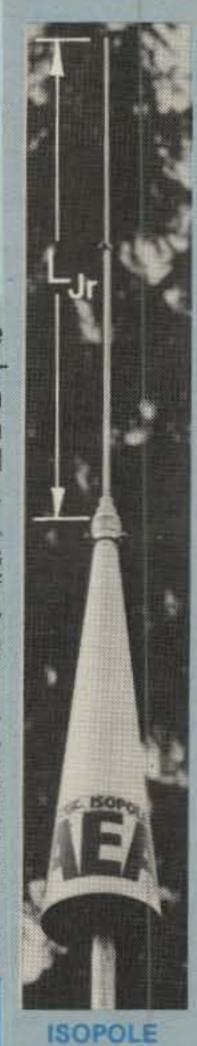
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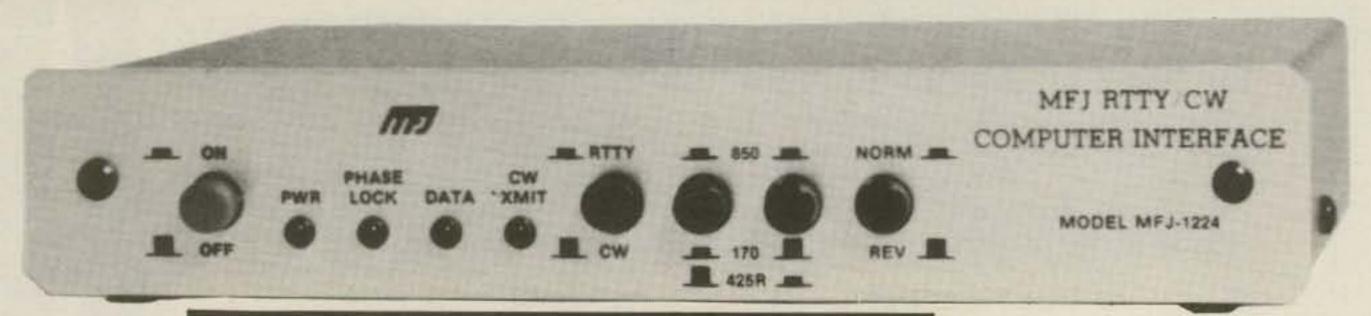




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MFJ Software plus MFJ Interface

for VIC-20 or Commodore 64

(Software cartridge alone, \$49.95. Order MFJ-1250 for VIC-20, MFJ-1251 for Commodore 64) \$12995

Powerful RTTY/ASCII/CW software for VIC-20, Commodore 64.

Developed by MFJ. Cartridge plugs into expansion port.

Features split screen display, type ahead buffer, message ports,

RTTY/ASCII/CW send and receive plus much more.

Includes cable to interface MFJ-1224 to VIC-20 or Commodore 64.

This new MFJ-1224 RTTY/ASCII/CW Computer Interface lets you use your personal computer as a computerized full featured RTTY/ASCII/CW station for sending and receiving.

It plugs between your rig and your VIC-20. Apple, TRS-80C, Atari, TI-99, Commodore 64, and most other personal computers.

Powerful MFJ software available for VIC-20 (MFJ-1250, \$49.95) and Commodore 64 (MFJ-1251, \$49.95). Features split screen display, type ahead buffer, message ports, RTTY/ASCII/CW send and receive plus more.

Uses Kantronics software for Apple, TRS-80C, Atari, TI-99 as well as VIC-20 and Commodore 64.

You can also use most other RTTY/CW software with nearly any personal computer.

A 2 LED tuning indicator system makes tuning fast, easy and positive. You can distinguish between RTTY/CW without even hearing it.

Once tuned in, the interface allows you to copy any shift (170, 425, 850 Hz and all shifts between and beyond) and any speed (5 to 100 WPM on RTTY/CW and up to 300 baud on ASCII).

Copies on both mark and space, not mark only or space only. This greatly improves copy under adverse conditions.

A sharp 8 pole active filter for 170 Hz shift and CW allows good copy under crowded, fading and weak signal conditions.

An automatic noise limiter helps suppress static crashes for better copy.

A Normal/Reverse switch eliminates retuning while stepping thru various RTTY speeds and shifts.

The demodulator will even maintain copy on a slightly drifting signal.

A +250 VDC loop output is available to drive your RTTY machine. Has convenient speaker output jack.

Phase continuous AFSK transmitter tones are generated by a clean, stable Exar 2206 function generator. Standard space tones of 2125 Hz and mark tones of 2295 and 2975 Hz are generated. A set of microphone lines is provided for AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying is provided for transceivers with FSK.

High voltage grid block and direct outputs are provided for CW keying of your transmitter. A CW transmit LED provides visual indication of CW transmission. There is also an external hand key or electronic keyer input jack.

In addition to the Kantronics compatible socket, an exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. The following TTL compatible lines are available: RTTY demod out, CW demod out, CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

For example, you can use Galfo software with Apple computers, RAK software with VIC-20's, or Clay Abrams software with TRS-80C, N4EU software with TRS-80 III, IV. Some computers with some software may require some external components.

DC voltages are IC regulated to provide stable

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MFJ-1224

AFSK tones and RTTY/ASCII/CW reception.

Aluminum cabinet. Brushed aluminum front panel. 8x1 1/4x6 inches. Uses 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, \$9.95.

MFJ-1223, \$29.95, RS-232 adapter for MFJ-1224.

RTTY/ASCII/CW Receive Only SWL Computer Interface



\$ **69** 95 MFJ-1225

Use your personal computer to receive commercial, military and amateur RTTY/ASCII/CW traffic.

The MFJ-1225 automatically copies all shifts (850, 425, 170 Hz shift and all others) and all speeds.

It plugs between your receiver and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers.

Use MFJ-1250 (\$49.95) software cartridge for VIC-20 or MFJ-1251 (\$49.95) software cartridge for Commodore 64. Use Kantronics software for Apple, TRS-80C, Atari and TI-99.

An automatic noise limiter helps suppress static crashes for better copy, while a simple 2 LED tuning indicator system makes tuning fast, easy and positive.

In addition to the Kantronics compatible socket, a general purpose socket provides RTTY out, RTTY inverted out, CW out, CW inverted out, ground and +5VDC for interfacing to nearly any personal computer with most appropriate software.

Audio in, speaker out jacks. 41/2x11/4x41/4 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, \$9.95.

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of-address renewals, change-of-license renewals, and even change-of-name renewals, as when, for example, a YL marries and takes her husband's name.

This comparison turns up many mistakes. The amateur's name may be misspelled, the street address wrong, or the city, state, or zip changed. The Radio Amateur Callbook computer is programmed to call up the old information and compare it to the newly received information. Then, where a difference is observed, the computer displays the information so that the operator can determine whether there is in fact an error in the data. For example, the old license might have shown W. Smith, while the new license shows Walter Smith. In such a case, the computer operator will accept the updated information. On the other hand, if Mr. Smith's address is shown one time as 1395 Elm, and later as 1935 Elm, it would appear that there is a significant error. The Callbook operator, finding no other suggestion that Mr. Smith did in fact move down the street to a house with a strangely similar number, and, noting that Mr. Smith was only renewing his license rather than showing an address change, would correct the recently received information, recognizing the 1935 Elm address as a keystroke error on the part of the FCC.

The information received by the Callbook allows the Callbook to run such checks even though the form 610 applicant has gotten a new call, the result perhaps of a change of call area or an upgrading of license class. So, even though the call is being changed, the Callbook retrieves the old data for the amateur and checks the name and, if applicable, the address against the current FCC data.

Another important area offers address checks for the Callbook. As licensed amateurs, we often get bulk mailings from various commercial suppliers, magazines, and organizations. However, some of these mailings are not received by the amateur to whom they are addressed, often because the amateur has moved, but has failed to notify the FCC of his move, even though this is a violation of FCC rules.

Mailings that are not deliverable are returned to the sender by the post office, and the sender pays 25 cents for the return. Many of the mailers send these returns on to the Callbook, and they make an effort to track down the correct address. This procedure involves mailing out a tracer to the address shown, asking if the amateur is in fact reachable at that address. Sometimes, of course, it proves out that the address is perfectly valid, and somehow the post office erred in its delivery attempt. Other times the tracer is forwarded, and the amateur notifies the Callbook, and hopefully the FCC, of his new address. At other times the mail is returned unforwardable, gaining the licensee that infamous note in the Callbook, "QTH Wanted By Callbook."

Often when an amateur moves he or she notifies the Callbook directly, thus getting the information of an address change to the Callbook perhaps months before the FCC is able to process his address change. This is especially true of amateurs actively engaged in one or another awards programs.

A particularly interesting situation occurs with club stations in the United States. The FCC does not include club station information in the FCC master license tapes. Rather, because of their special nature, club station license information is kept separately on an index-card file system. The Callbook Company



Inputting licensee information for the Callbook. In the foreground is Barbara Paprocki, the company's advertising manager.

arranges to have this information transcribed and then manually entered into the Callbook's master tape, again ensuring a level of accuracy that otherwise could not be duplicated.

The Callbook is dedicated to getting all U.S. amateurs properly listed with proper addresses, regardless of any club or league affiliation. The Radio Amateur Callbook master file is as accurate as possible, much more so at any given moment than the FCC copy available to any purchaser.

Of course, the Callbook Company is equally well known for its DX Callbook, published simultaneously with the U.S. Callbook. Needless to say, not every other country's government is as willing to release license information to the Callbook, although some are very cooperative. Yet, the Callbook retains a high degree of accuracy, again thanks to an array of procedures to get as much information as possible and to verify that the information received is accurate.

In some countries the government licensing authority itself publishes a callbook, which information finds its way into the DX Callbook. In other countries, the national society publishes a callbook. But here more care is required, as some of such callbooks include only paid-up society members, while others do attempt to list all licensees. In those countries where this is the only information available, The Radio Amateur Callbook can only hope that the non-society members will directly notify the Callbook of their call, name, and address.

In other countries an active amateur takes it upon himself to get current information on his country's licensees to the Callbook, whether it be new licenses issued, corrected or updated postal codes, or the like. In certain countries, the Callbook has regular arrangements in place for such assistance, while lacking in others. The Callbook always welcomes inquiries from overseas amateurs to determine if present arrangements are adequate.

In a few nations call information is available, but in an alphabet that the Callbook cannot typeset, such as the Greek, Arabic, or Cryillic. In such cases the Callbook must secure translation of the information into the English alphabet. And, in the United States at least, overseas mail must have the address in English characters, although it is permissible to include other alphabets interspersed.

Two special cases in the DX Callbook involve Japanese and Soviet amateurs. In the case of the Japanese amateur, the Japanese characters obviously do not lend themselves to English alphabet typesetting equipment. The Callbook gladly prints the addresses and calls of all Japanese amateurs for whom they

All new license data received is compared with old data kept on file on computer tapes. This ensures a high level of accuracy in the information printed in the Callbook.



can get an English alphabet address. In turn, Japanese magazines regularly print instructions on how Japanese amateurs can get this information to the Callbook, as do Callbook sellers, Japanese DX clubs, etc. So, although the Callbook does not include all Japanese amateurs for lack of translated addresses, it is a safe bet that any Japanese amateur active on the DX bands has ensured that he is properly listed in the DX Callbook.

The situation is some different with Soviet amateurs. Of course, as with the Japanese, the first problem is the alphabet, as Soviet licenses are issued in Cyrillic. A Soviet callbook is issued occasionally by the authorities, but it does not include complete mailing addresses, as apparently this information is classified. Regardless, the Callbook thus far has been able to get the Soviet callbook, and arranges at its own expense a translation of what information is available. However, recently there appears to be a problem in getting updated Soviet callbooks, and The Callbook Company would be glad to hear from anyone who could supply a new edition.

The key element of the DX Callbook is, again, the highest possible level of quality control. All procedures used in preparation of the U.S. Callbook are used, as appropriate, in the preparation of the DX Callbook as well, and every effort is made to get all licensees listed in a given country.

The DX Callbook is of immense value to the international amateur community. In the case of a great many countries, the DX Callbook contains the only published listing of all licensees, as, for example, in Canada.

Any amateur who QSL's his QSO's regularly is well aware that postage can become a considerable expense, and QSL's returned as undeliverable are money wasted. Returned QSL's can frustrate an award requirement, or the chance to firm up a new-found friendship, one of the joys of amateur radio. Amateurs are fortunate that we have a company so dedicated to keeping one of our most important operating aids accurate and useful.

Results of the 1983 CQ 160 Meter C.W. and Phone DX Contests

BY DONALD McCLENON*, N4IN



Top C.W. world high multi-op GW3YDX also made second world high score. His partner, G3XTJ, became a silent key on 30 August. One-sixty contesters worldwide will miss this fine operator.

his was the year of contrasts. Conditions for the C.W. contest were the best in many years, described in terms such as super, unbelievable, fantastic, and awesome. Phone contest conditions were the exact opposite, with poor DX propagation and a weather front of lightning storms all across the Gulf of Mexico and Florida. The resulting static and noise bothered people all over W/VE land, with increasing effects on scores as you approached the storms.

A total of 3539 operators were reported active on phone and 2715 on c.w., worldwide. This is more on phone and less on c.w. than last year. We received a record 707 logs from both contests.

Of all those who wrote in requesting deletion of serial numbers, not a one commented that he liked the new arrangement. All log comments on the subject wanted the numbers restored. The two main reasons given were: (1) something unique must be satisfactorily exchanged to constitute valid verifiable communication, and (2) the number gives you an idea of how the other guy is doing, which is of interest to many serious contenders. Extensive polling of W/VE participants afterwards showed a large number favor omitting the numbers, because some people take so long getting them right when conditions are poor or QRM is excessive. None of this was mentioned in any log comments received. We will continue with "no serial numbers" at least one more time, and ask for more opinions on it.

*3075 Florida Ave., Melbourne, FL 32901

Walt, GW3NYY, keying his way to fifth world high DX single-op on c.w.



Everyone who commented thought a word abbreviation for one's country was meaningless and a big time-waster. This was never intended, but unfortunate announcement wording caused the problem. No country abbreviations are required, but W/VE's must identify their state or province. No one gets multipliers for either W or VE in addition to states and provinces worked. Some DX logs still claim them.

A number of W and VE stations did not credit themselves with 5 points for working each other. If your score is higher than you expected, this is probably one reason. If you claimed 10 points for any North American Caribbean QSO's, your score may be lower than you expected after these were reduced to 5 points. Please check the rules carefully.

C.W. Contest—January

Because conditions were so remarkable, scores everywhere ran well above last year, even with fewer stations active. All 50 states, 9 provinces, and 92 countries were on, some much too briefly. No PEI or NWT/Yukon activity was reported. Most of those who worked the following states/provinces owe their multipliers to the calls shown: AK KL7GKY, KL7HBK; HI KH6AT, KH6KV; ID N7SU; ME KA1PE, W1OO; MT K0PP/7, K7VIC; ND N0CU, AK0S; NE K0HA; NV K7CA; RI W1OP; SD WB0RXF; UT K7CPC, K7DF; VT K1IK, K1LPS; WY KI7W: NF VO1HP; MAN VE4ABE, VE4JB; ALTA VE6OU.

W/VE's were fortunate to work any of these active prefixes: C6, CX, EA6, EA8, EA9, FG, GJ, GU, HI, HK, J3, J7, J8, KG4, KG6, KL7, LA,



YV3AZC was third world high DX singleop on phone. Alberto was a welcome multiplier for many of us.



WD9HFW operating N5DD was single-op Texas phone winner.

LU, LX, OA, OY, PY, T32, TF, UA2, UA9, UC, UD, UF, UG, UH, UI, UJ, UL, UM, UO, UQ, V1, V2, VP2E, VS6, XE, YV, ZB, ZF, ZL, 5B4, 5N8, 5Z4, 6Y5, 8P6, 9H1, 9Y4.

Top world score of 400,504 was made by NP4A, operated by K1ZM, last year's winning combination. He exceeded his previous QSO and multiplier totals. The other worldwide top 10 scorers in order were: GW3YDX (multi) 239,128, EA3VY (EA3KU Op.) 218,467, KV4FZ 217,874, UK2RDX (multi) 201,828, G3RPB (multi) 180,504, WA2SPL 175,628, G3SZA 174,087, GW3NYY 170,742, and YT3W (YU3EF Op.) 167,896. Top 10 scores in the W/VE Single-Operator, DX Single Operator, and Worldwide Multi-Operator categories are shown in the score boxes.

The old QSO record was exceeded by NP4A 633, N5JJ 626, W9RE 612, and K7CA 605. They were followed by WA2SPL 593, AB01 583, KS8S 562, AA1K 557, W1MX 555, W0AIH/9 546, and AD8I 544. Outside W/VE

besides those shown, high QSO totals were UK2RDX 526, OK5TLG/P 508, YT3W 497, GW3YDX 478, EA3VY 446, KV4FZ 439, UK2PRC 416, YU3TU 408, LZ1KDP 397, GW3NYY 390, G3RPB 389. High contact totals outside N.A./EU were KH6KV 216, 4X4NJ 198, UA9SAX 194, RA9AKM 193, UD6DKW 173, UM8MAZ 164, UA9MR 163, W1BIH/PJ2 157, UH8DC 145, JE1SPY 143. All these categories ran far above last year.

A new multiplier record of 104 was set by NP4A. He was followed by K5NA 95, WA2SPL 92, AA1K 91, AD8I 90, W1MX & N4IN 87, W2IB 86, WA2SRQ 85, N4SF 84, W4DR & KS8S 83. DX multiplier leaders not shown above were KV4FZ 82, HH2VP 73, G3RPB 72, EA3VY & GW3YDX71, G3SZA69, GW3NYY & UK2RDX 66, GM3IGW 65, OK5TLG/P 64. These were

large increases over past records.

Countries worked leaders were NP4A 50: YT3W 45; DK6AS, GW3YDX, OK5TLG, UK2RDX 44: G3RPB & K5NA 43; G3SZA, OK1KSO, OZ1LO, YU3TU 42; UB5ZAL 41. The highest W/VE country totals were K5NA 43, AA1K & WA2SPL 38, W1MX 36, N4IN & AD8I 34, K1MEM & W2IB 33, WA2SRQ 32, KS8S 31, N4SF & W4DR 30.

The following countries were reported as having 10 or more participants: W 1148, G 217, OK 184, JA 149, UA 112, DL 108, UB 99, VE 85, UA9 40, YU 38, GM 18, UR 14, VK 12, UP 12, GW 10, OH 10, UQ 10. Most of those with the larger numbers dropped off considerably from last year, even though conditions were much better.

There were at least 324 USSR stations on c.w. and 1098 on phone. Very few of these made any North American contacts. Besides propagation, the biggest factors preventing contacts were (1) failure of the Russians to work split frequency and indicate where they wanted to listen, and (2) W/VE's transmitting in the 1850-1855 kHz Russian window, thus blocking it. Lots of s.s.b. signals kept it closed during much of the c.w. contest. Education is needed here for everyone. Pass the word every chance you get.

The top single-operator world score W2EQS Memorial Trophy, presented by W1WY & W8IMZ, goes to EA3VY, since NP4A has won within the past 3 years, and second world high was multi-op station GW3YDX. WA2SPL wins the West Gulf ARC Plaque for top USA score. The Don Busick K5AAD Plaque for top singleop European scorer goes to G3SZA, since EA3VY cannot win two trophies, and the next two European scores were multi-ops UK2RDX and G3RPB. We still need donors for multi-op trophies for c.w. and phone. If interested, contact W1WY. The single and multi-op winner in each state, province, and country will receive the appropriate CQ certificate.

Phone Contest—February

No station in any of the Gulf states even came close to appearing in any of the top 10 score boxes, because of the gigantic static storms originating in that area. To make matters worse, DX propagation was also extremely poor. In spite of this, activity was so great that the top scores in other W/VE areas when compared on the basis of last year's rules were about the same.

All 50 states, 11 provinces (including PEI and VE8), and 68 countries were active, if only briefly for some. Three phoney countries were noted, which did not check out. Maybe wishful thinking in all that QRN!

The bulk of contacts with the following states/provinces was provided by the stal-



Gary's expedition to the Bahamas put some spice in the phone contest with KØGVB/C6A.



KO9Q (right) and assistant KE9A made fourth world high multi-op phone score using B.C. tower antenna.

warts indicated: ID N7SU & N7EIJ, ME KA1PE & W100, MO ABØI, MS K50S & N5FG, MT K7LTV & K7VIC, NE KØHA, NV KA7BRE & K7CA, RI W1LOV, SD KC0AF & AF0V, NF VO1HN, PEI VE1BPY & VE1BZS, MAN VE4AHF & VE4AHR, SASK VE5RA, ALT VE6AQI & VE6WP, NWT VE8XO.

Any of these active prefixes were good catches for W/VE's: DL, EA6, EA8, EI, F, FC, GD, GI, GJ, GU, HB, HH, HP, J8, KG4, KL7, KP4, LX, LZ, OE, OH, OK, PA, PJ, TI, T32, all Russian prefixes, VK, VP2E, XE, YU, ZD, ZF, ZK, ZL, ZS, 4X4, 5B4, 5N8.

Worldwide top scorer was VE3CVX 154,860 points, taking advantage of the new 5-point per W provision. Next were WB3GCG 128,084, OK3KFO (multi) 128,020, W9ZRX 113,920, WB8JBM (WD8IJP Op.) 106,524, ABØI (multi) 99,970, KC8JH (multi) 91,698, K1FFK (multi) 80,866, and VE3INQ 76,285. Top 10 scores are shown in score boxes in each category used to list c.w. scores.

In spite of the poor conditions, three stations equalled or exceeded last year's QSO record. They were W9ZRX 827, WB3GCG 802, and WB8JBM 736. The list continues with ABØI 717, KC8JH 690, OK3KFO 682, K09Q 611, W9AZ 600, KØHA 587, N4DBR 586, K1FFK 580. Outside W/VE, some high QSO totals were OK3KFO 682, UB5MDA 374, UR2RNA 355, OK1KSO 344, YT3W 215, K2KMC/MM2 166, KØGVB/C6A 149, GW4IOI 120, G3SZA 104. Outside N.A./EU we have YV5AZC 88, YV2IF 44, VK2AKU 30, UA9CBO 29, VK3BEE 27.

Nobody worked last year's top of 75 multipliers. Leaders were WA2SPL & WB3GCG 71; AB1A 69; WB8JBM 66; ABØI 65; K1IK & W9ZRX 64; KC8JH 62; K1FFK, AD8I, NE4G 61; VE3CVX 60. DX station leaders were KØGVB/C6A, OK3KFO, YV3AZC all 37; YT3W 32; G3SZA & OK1KSO 30; YV2IF 27.

Last year's country total of 32 was topped by OK3KFO with 37. He was followed by YT3W 32; OK1KSO 30; G3SZA 27; and OK1KPU, UB5MDA, UR2RNA, all 23. Highest W/VE country totals were WA2SPL 20; WB3GCG 19; AB1A 16; and K1FFK, NE4G, N4IN, AA4VK, WB8JBM all 13.

This many stations were reported active from the prefixes shown: W 1894, UB 606, UA 397, G 146, VE 115, VK 35, OK 27, UA9 23, UC 22, YU 20, DL 19, UP 16, UQ 16, GW 14.

The World high score W@AW Memorial Trophy donated by Friends of John Doremus was won by VE3CVX. The West Gulf ARC plaque for top USA single-op station will go to second world high WB3GCG. Top European single-op UR2RNA will receive the Don Busick K5AAD plaque for that honor. As for the c.w. contest, any individual or organization wishing to sponsor an award for multi-op stations, please contact W1WY. State, province, and country winners will receive certificates as for the C.W. contest.

Club Competition

Lots more interest is being shown in the allmember aggregate club scores from both contests. This generates considerably more activity. There are 68 clubs listed, with the highest scoring member shown for each mode, when there were entries for both. The race was a photo finish, with Yankee Clipper Contest Club in front of Northern Ohio Radio Society by one medium-sized score. Both were over 1.2 million points, about 2.7 times last year's top. In addition to these 7-figure scores, there are 20 6-figure ones, compared to 8 last year.



Most phone operators owe their LA multiplier to this KA5ERA crew. Standing (left to right) are KA5ERA and KA5PFL. Sitting are N5EIG and WB8TCT.

Plaque Winners

C.W.

World: Station EA3VY (Opr. Fernando M. Lizoma, EA3KU), The Charlie O'Brien, W2EQS Memorial. Donated by Frank Anzalone, W1WY, and Bernie Welch, W8IMZ. U.S.A.: Joe Krone, WA2SPL. Donated by the West GULF A.R.C.

Europe: Dave Wilson, G3SZA. Donated by Don Busick, K5AAD.

Phone

World: John Philipps, VE3CVX. The John Doremus, W@AW Memorial. Donated by "Friends of W@AW."

U.S.A.: Vaughn Worth, WB3GCG. Donated by the West Gulf A.R.C.

Europe: Andrus Lillevars, UR2RNA. Donated by Don Busick, K5AAD.



Georgia single-op phone winner K4UEE.

Next Time

Although a long-term improvement is promised by the sunspot cycle, we can't guarantee c.w. conditions will be as fantastic as they were this year. It is, however, quite possible, and activity should increase, making the contest more enjoyable for all. Phone conditions have to be vastly better; how could they possibly be worse? Even as it was, we set a record for activity, so be sure to enjoy the next one! The c.w. contest will be held the last full weekend of January 1984 (Jan. 27, 28, 29), and the phone contest the last full weekend of February (Feb. 24, 25, 26). Send your s.a.s.e, to CQ with enough postage for the log and summary sheets you plan to use. Send in your log, however small, to show CQ you appreciate their support of this activity, and to credit those you worked. Logs go to me at my home address. 73, Don, N4IN

Soapbox W/VE C.W.

Another super contest. Conditions were awesome!-N1ACH. Unbelievable condx; worked all continents in about 6.5 hours-K5NA. As usual CQ knows how to pick the right weekend—W2FJ. On our final look around the band Sunday morning, a new big signal became our final Vermont multiplier-WA3YON. Excellent contest, good DX window discipline-WB3CAC. Fantastic conditions, best score ever-AA1K. Bring back the serial numbers and take away the kilowatts-N3CO. All went well until basement heater quit. So did I a few hours later; too cold—K3SO. I'm over 69 now, but it's still fun-W3BUR. Had dental work just before contest. Would rather have Murphy in the equipment than in my teeth-W37S. A new first: everything worked OK-N4EHJ. Why is this contest weekend the only time each year I can work Russians?!-N4WW. Receiving loop helped with local noise-W4TMR. Exciting to work Europe from this far west-AF5M. Big thrill to have a European pileup on Sat. night-NA5R. Thanks to the stations who made the contest a pleasure for me-WA5MUE. Best and earliest European opening ever heard on 160!-K5RC. Cow got tangled in coax and ripped it out of the wall just minutes after the JA opening. Tnx for waiting, Betsy-N5DD.

Most enjoyable without the QRN of past years—N5JB. Really tough making contacts with a cloudburst pounding on the metal shack roof—WB6EGE. Lost several hours due to local storm QRN—K6SE. It's harder from out here than it was in Tenn.—N4ARO/6. Good practice to become a better c.w. op.—WA6OCV. Horrendous wind and rain throughout contest—K6MXO. As a newcomer, enjoyed my first contest. Keep up the good work—WB7OPT. Good Asian opening topped by working VS6DO—W7AVV. Awaking sud-

Aggregate C.W. and Phone Club Scores **Total Score** Club Name C.W. Phone NP4A WA2SPL 1,237,278 Yankee Clipper Contest Club 1,212,749 Northern Ohio Amateur Radio Soc. AD81 WB8JBM 459,340 N5JJ Texas DX Society Potomac Valley Radio Club 418,021 K40D WB3GCG 319,937 W7RM Rubber Circle Contest Club WB7FFF 202,494 VE3ABG Canadian Contest Club VE3ABG 201,828 Tallinn Radio Club UK2RDX 201,752 Pohorski Bataljon YT3W YT3W 199,722 Kansas City DX Club ABOI ABOI 192,572 Central Virginia Contest Club W4DR N4EHJ 159,872 CRC Telegraphy Comm. OK5TLG 153,263 Kankakee Area Radio Soc. W9AZ W9AZ 145,905 Ontario Contest Club VE3BMV UK2PRC 144,685 Lithuanian Contest Group 143,056 Radioclub Chomutov OK1KSO OK1KSO 140,044 Central Arkansas DX Club AF5M WA5WKO Sheboygan County DX Assoc. 133,919 KE9A KO9Q 130,480 City Student's Radio Club LZ1KDP 128,020 A.R.C. ov Zvazarmu **OK3KFO** K7OX 122,028 Central Arizona DX Assoc. WB7FDQ 118,533 III Wind Contest Club KK9A KK9A 112,536 Murgas ARC **WA3YON** K3YTL 99,288 Onalaska ARC W9UP W9UP 94,556 F.O.R.C.E. KØFVF/9 N. Mex Big River Contesters 93,081 K5TA 91,872 Davenport ARC WØBXR 88,334 North Berkshire RC K1FFK 77,720 Amateur Radio Transm. Soc. N4XM N5JB 73,794 N5JB North Texas Contest Club 65,615 South Florida DX Assn. W400 64,978 N4DBR Contest Club N4DBR 56,505 Byelorussian Polytech. Inst. UK2AAG UK2AAG 42,818 Lynchburg ARC AA4FF AA4FF 41,902 Radioclub Hölysov OK1KQJ 41,650 Radioclub Levice **OK3KCM** 40,356 Frankford Radio Club W3AP 38,134 Greater Milwaukee ARC N9AW WA9TZE Dayton ARA 37,979 W8ILC W8ILC. 37,940 UK4HBB Kuibyshev RC 35,488 Hamfesters RC W9AA Providence Radio Assoc W10P 30,174 Central Florida DX Club AA4MM 30,085 Eastern Iowa DX Assoc. KØGVB/C6A 27,750 27,311 St. Zagora R.C. (LZ1KSZ) LZ1DQ 26,838 Radio Club Belisce YU2KDE 25,060 Braca Stojakovic R.C. YU7AJD 25,024 UK9ADA Troitsk Veterinary Inst. 24,911 Radioclub OK1KWV OK1KWV 23,842 Radiotechnika OK1KKS WD4RCO WD4RCO 19,389 Southeastern DX Club 15,180 Radioklub Ceskmalinska OK1KZD 14,592 Central PA DX Club W3CNS OK2KYZ 14,582 Radioclub OK2KYZ 13,728 Radioclub OK1KUR OK1KUR 13,431 Petaluma DX Soc. WB6EGE 10,693 JA9YBA Kanazawa Univ. R.C. Willamette Valley DX Club 8,568 AI7B 6,975 Redwood Empire DX Assoc. K6ANP 6,513 CIT Radio Club JA2YEF 6,398 Nagoya Univ. R.C. JA2YKA 5,728 Northern California DX Club W6NKR 5,440 Canton ARC W8IM 3,856 Radioclub LZ2KCS LZ2CW 2,690 Fukul Univ. R.C. JA9YAP 2,493 Kumamoto Univ. Ham Club JA6YAI 2,120 Akita Contest Club JH7YPG 576 Radioclub OK1KRQ OK1KRQ Sevier County ARC KD4PP 84

denly after dozing off, accidentally set off my CQ keyer, and it raised ZL3GQ for my first DX contact—N7CKD. Wow, 11 new countries—AD8I. 36 Europeans with 2 Russians, wow! WA8YVR. Most DX ever worked in a contest—KC8P. That shunt-fed tower sure works—K8CV. Absolutely the best conditions ever heard on 160—K8AC. Super contest and

Super Bowl on same weekend. Super wife put up with the whole thing—K8LM.

We all thoroughly enjoyed the contest, a first for the group—WØBXR. Don't care much for contests, but love top band. This contest I stayed up late for—KØRW. Flew back for weekend to participate. The trip was well worth it—VE1AXT. Any W/VE taped operating

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in window should be penalized 10 multipliers—VE1CEG. Best condx in 20 years— VE3ABG. A big thank-you to the s.s.b. folks who QRT the whole weekend for us—VE3INQ.

Soapbox DX C.W.

Thanks to CQ for this great contest-G3SZA. Best W pileup since 1976—OH2BO. Generator trouble shut me down this time-VP2VIN. Conditions so good, didn't have time to get tired-DK6AS. Had to quit early to catch a plane—ZF2AO. Contest good for new countries and antenna testing-OK1KPU. Threw out 125m of wire towards N.A. the day before contest, and it helped a lot on receive-OZ1LO. Reports should be anything but the meaningless 599-J73D. Bring back serial numbers. We want to know how the other guy is doing-G4BUE. My first long contest and thoroughly enjoyed the challenge it presented-G40BK. Very nice contest, 73-UA3JD. Antenna blew down in storm a few days before the test-OY7ML. Enjoyed my first strictly 160M contest with the rapid condition changes. Hope to be here for the next one-HH2VP. Beverage antenna works wonders. Many N.A.'s were undetectable on the others—4X4NJ. Heard many W's. If I had a linear, maybe they could hear me-5Z4CS. Thanks for nice contest-UQ2PQ.

My first contest. Next year hope to work more countries-XE1MD. Many thanks to everybody for the contest-UO50DB. Exciting to be back on 160 again. Last time I was EP2BQ-ZL2SQ. Had difficulty preventing a herd of goats from eating the feeder-EA7DMF. Let's return to the good old Numbers-HB9AQS. First contest in 20 years didn't hear a big W1BB sig-KV4FZ. Good conditions but strong EU QRM-UK9ADA. This is the band! Lots of fun—LZ1KDP. Put up quad on 95 meter chimney aimed on USA-OK5TLG/P. Excellent USA opening both nights. Made 52 W/VE contacts-UK2RDX. Very fine US opening second night—JA9YBA. Never thought the day would come when we would work more W than G stations-GM3IGW. Bring back serial numbers-GM4GRC. Band sounded like 40 meters at times—GW3YDX. High static level here— PY2ERA.

Soapbox W/VE Phone

Hadn't planned entering, listened for DX at midnight, and joined in-K11K. Terrible condx first night, but made west coast next night-K1LPS. Time to get an amplifier! — KA1GHR. QRN terrible both nights. DX signals way down, with QSB. Will give it a real go next year-WA2SPL Gave myself 10 points for the ship off Bermuda 'cause I'm such a nice guy-W3EAN. Keep up the pleasant non-Wayne approach to CQ and its contests-KC3AD. Contest not the same with W8LRL absent from injury-WB3GCG. No Murphy and we didn't even run out of beer-N4DBR. Conditions an astronomical reverse from good forecast-WB4VQO. Didn't plan to enter, but found Ala. in demand, and got in too deep to quit-W4ZWE. Weather front did me in-AA4MM. Static and storms very bad throughout-W4PZV. Static horrible. Operator patience and courtesy super-W4HVU. KH6CC came on and worked 4 stations; 30 minutes later 50 stations said they had worked him-NQ4C. Conditions have never been worse, but still had a great time-W4TMR. Conditions much different from my 18 years in the Canal Zone-KF4HK. Condx were the pits, but a good bunch of guys-W4MAF.



KØGT got on phone to work fellow lowan KØGVB/C6A and he then worked many others.



Part of the fifth world high c.w. multi-op crew and gear at OK5TLG/P. Those second, third, fourth, and seventh from the left are OK1MMW, OK1DFW, OK1FCW, and OK2BTW. The four others are named in the station crew list.

Condx lousy first night, and worse the second—*N5FG*. Our first ever 160 contact began the contest—*KA5ERA*. Had fun in spite of very noisy band—*N5DD*. Challenging as usual due to Gulf thunderstorms, but always fun—*N5JB*. Thrill to work W1WY to complete 160 S.S.B. WAS—*K6HNZ*. Some don't seem to know that "portable 6" puts you in California—*N4ARO/6*. Called many who replied "Huh? Who? Your call? Sorry, try later" They all missed Idaho—*N7SU*. Southeast states couldn't hear me. My noise was + 10 dB, so theirs must have been worse—*AK7F*. Oneway propagation; eastern stations couldn't hear us. Severe noise even here—*W7ACP*.

Tough to know many are calling but you can't pull them out—K8US. Condx so bad, watched TV. Let's have the QSO numbers back—KC8P. Thanks to all who made it an enjoyable weekend—WB8JBM. Received SWL card from England with IRC's. Will hang them on wall—KB8LH. Frustrated being told by 4 people that J6LB hears me, and all I hear is static—W8CAR. KE9A couldn't tell if my snoring or his noise level was higher—KO9Q. A pleasure to have JA3HTT as one of our operators—KK9A. New beverage showed us what we've been missing—W9AZ. Top band is top band; looking forward to next time—KR9G.

Super poor conditions—KØUK. Missed many calls in bad QRN—NØDQS. Very noisy; no incentive to stay with it all night—VE1YX. Enjoyed the contest and look forward to more—VE3CVX. Rough contest with poor conditions and too many processors with distorted audio—VE3INQ. I enjoy CQ sponsored contests where there is always a lot of action—VE3NBE. Needless to say, condx were the blahs—VE5XU. Have never seen the band this bad—VE6AQI. Sure was noisy—VE7CRU.

Soapbox DX Phone

Would have a good score if I could count all the states I called—VP2EU. It took me some time to get UJ's, UM's, etc., involved in the

contest, so let's hope they'll participate next year-UA9CBO. Some Bahamians still may not be sure I wasn't with DEA, FBI, or CIA!—KØGVB/C6A. First night poor propagation. Second was better, but of short duration—EA6CE. Good activity despite the worst conditions I've ever known—G3SZA. Poor DX condx-DJ9ZB. We were really rocking and rolling out here with 25 foot seas and 50 knot winds. Wish I had more time to operate and conditions had been better-K2KMC/MM2. First night static so bad, couldn't even contact Texas. Second night a little better near dawn— XE1HHA. Poor conditions, fewer participants than last year. Still enjoyed it immensely-GW4101.

C.W. Multi-Op Station Crews

W1MX: KA1R, N2ME. W10P: KA1DUV, N1AKO, N1BBM, W1GDS, WB1FDY. K3FD & WB3KKX. WA3YON & WB3CAI, WB3FAA, WB3FYT. WB3CAC & K3WGR, W3UM. K3YTL: AD3L, KB3JK. N4XM & KD4U, KK4Q, N4TY, NO4R. N4SF & K4NYV, N4EL, N4TN. W3ESU/4 & K4XU. K4CNW & KX4H. W4DR & KG4W, N4EVL. N4EHJ & K4JM, KX4S, N4ND, WB4PIQ. AF5M & KB5RF, W9BN. K5TA & AA5B, N5RR. NA5R & K5KG, K5RC. KZ5M & K5MA, K5VWW. WB6EGE: KA6AHK, KA6OPN, KB6HT, WB6WPO, WB7DEG. W7RM: KB7G, W7WA. K7XX & K7SS, KE7V. W7TJ & K7LXC. KG7D & KT7G.

K7IDX & KI7T. WASYVR & K8LX, WASTBQ. ADSI & K8ND, KU8E, WD8IXE. KS8S & AD8P, KN8S, W8FN. KK9A & WD9DZV. W9AZ: AK9F, K9NR, N9CFJ, N9DAV. KBFVF/9 & KMOO, WOUC. KE9A & KO9Q. KQ9Y. WOBER: K9AYK, K9WA, KM9P, W9TW, KOIS. ABBI & N7DF, KOUAA, KMOL. UK9ADA: UA9ADY, UA9AGL, UA9-165-1539. UKBAMM: UA0AAA, UAØAAK, UAØ-103729. UK9CDG: EZ9CAB, EZ9CBT, UA9-154-1344. UK9CAC: Revin, Sverdlovsk, Vorobev. UK9UDD: UA9UNN, UA9UPL, UA9-130-277. LZ1KDP: LZ1GC, LZ1JY, LZ2CJ, LZ2UU, LZ2-F-166. OK1DFW, OK1DWF, OK1FCW, OK5TLG/P: OK1MMW. OK2BFN, OK2BTW, OK2BWM,

	Top 10	Scores	W 1891
Ten			10 W DE
	10 W/VE Op. C.W.		10 W/VE
WA2SPL	175,628	VE3CVX	Op. Phone 154,860
K5NA	164,825	WB3GCG	128,084
AA1K	153,244	W9ZRX	113,920
VE3BMV	145,905	WB8JBM	106,524
N5JJ	141,507	TTDODDITT	(WD8IJPOp.)
VE3ABG	137,874	KC8JH	91,698
WA2SRQ	129,965	VESINO	76,285
K7CA	125,930	AB1A	72,312
W9RE	121,976	KØHA	71,688
W2IB	114,122	KB8LH	71,108
		AA4VK	70,200
Top	10 DX	Tor	10 DX
Single	Op C.W.		Op Phone
NP4A	400,504	UR2RNA	43,608
	(K1ZM Op.)	YT3W	33,856
EA3VY	218,467	11.15.10.	(YU3EF Op.)
NAME OF TAXABLE PARTY.	(EA3KU Op.)	YV3AZC	31,968
KV4FZ	217,874	UB5MDA	31,487
G3SZA	174,087	K2KMC/MI	
GW3NYY	170,742	KØGVB/C6	TOTAL CONTRACTOR
YT3W	167,896	G3SZA	14,070
LILIOVE	(YU3EF Op.)	YV2IF	11,529
HH2VP	146,146	GW4IOI	11,440
YU3TU	141,764		(GW8TVX Op.)
OZ1LO DK6AS	117,095	OK1KPU	7,866
UNDAG	113,522		(OK1JDX Op.)
T	op 10		
The second secon	Op C.W.		op 10
GW3YDX	239,128		-Op Phone
UK2RDX	201,828	OK3KFO	128,020
G3RPB	180,504	AB01	99,970
GM3IGW	162,305	KIFFK	80,886
OK5TLG/P	159,872	KO9Q	74,704
W1MX	148,509	W9AZ	71,991
AD8I	140,310	WA5WKO	70,354
LZ1KDP	130,480	N4DBR VE2ABC	64,978
KS8S	125,579	VE3ABG	64,620
GM4GRC	117,924	KK9A	63,072
	201000000000000000000000000000000000000	OK1KSO	51,420



EA7DMF location in Mojacar, Spain. Operator G4MH worked well into the USA.

OK2PGG. OK1KSO: OK1JCW, OK1JKT. OK1KQJ: OK1DXS, et al. OK3KCM: OK3TJI, et al. OK1KWV: Not given. OK1KKS: Martinele, Wildt. OK1KZD: OK1DHJ, et al. OK2KYZ: OK2BPY, OK2BYU, OL7BBY, OK2-3301. OK1KUR: Not given. OK2KQX: Not given. OK1KQH: Not given. OK1KRY: Not given. OK1KRQ: OK1WP, OK1-23139. OK3KFO: OK3CXW, et al.

G3RPB & G3PQA, G3RAU. G3FVA: G3SVW, G4HON, G4LVI. UK2RDX: UR2RMJ, UR2RNA, UR2RNX, UR2RNJ, UR2RRR. UK4HBB: UA4HAU, UA4HFG. UK3QBW: UA3QOF, UA3QOQ, UA3QRK. UK6LAZ: UA6-150-1071, UA6-150-1103. UK6LDM: UA6LFQ, UA6LFR, UW6OE. UK6LTM: RA6LTK, UA6-150-852, UA6-150-1313. DJ1BZ & DL3SAS, DL3SAZ, DL5TT, DL5TV. DL8FJ: DC1IZ, DD4LX, DF5LA, DF7LF, DG3LL, DK4VP, DL1LAM, DL3UR, DL4LV. KH6KV & KH6DX. JA9YBA: JA9LJI, JA9LNJ, JA9QCE, JH0CAZ. JA2YEF: JR2PVI, JR2TWA, JR2UWZ. JA2YKA: JR2GMC, JA4UDP, JA9NFO, JA9SSY, JA9XXS, JA9YAP: JF3HKY, JA9OJM, JE3UXL. JA6YAI: JR6EZE, JE6MQW, JE6UWI, JH0FKC. JH7YPG: JA7HMZ, JH7KAC, JA7UFO.

UK7PAL: UL7LCZ, UL7PAE, UL7PBY. UK2GAB: UQ2-037-031, UQ2-037-100. UK2PRC: UP2BDM, UP2BIL. UK2BCC: UP2BJK, UP2-038-346,

UP2-038-728. LA40: LA4DCA, LA4HW. GM3IGW: G3IGW, G3BBD. GM4GRC: GM3OLK, GM3YOR, GM3ZSP, GM4EJI. UK5IBM: UB5ITU, EZ5IEN, UB5-073-1512. GW3YDX & G3XTJ. UK2AAG: UC2AAF, UC2-009-105, UC2-009-490, UC2-009-756. UK2WAF: UC2XW, UC2-006-27. YU2CBM: YU200, YU2RTW, Cocic, Milin. YU2KDE: Ivo, Bozo. YU7AJD: YU7ORS, YU7RS-769.

Phone Multi-Op Station Crews

K1FFK: K1RQ, KA1CDC, KB1W, N1BZG. K3YTL: WA3JWP, WA3YON, WB3CAI, WB3FAA, WB3FYT. WB4VQO & W8IMZ. NADBR & NV4H, WA4SRF. NE4G & N4HIN, KA4LBI, WA5WKO & KB5DN, KB5RF, KI5Q, WD5HUH. KA5ERA & KA5PEL, N5EIG, WB8TCT. N5FG & KS5M, WB5VCE. WA60CV & N6RZ, K70X & D. Elliott. WB7FFF & K7EV. N8AKY & K8LDO, KM8U, N8DLR. K8US & N8EDE. W9AZ: AK9F, K9NR, W9HPR, WB9HAD. KK9A & TA3HTT, W9UVM, WD9DZV. KS90 & KA9DVY, KA9HHC, KC9XM, N9BZR. W9J00 & WD9EMM. K090 & KE9A. NOBSA & NODKZ. ABOI N7DF, KOUAA, KMOL, NODQX. VE3ABG & VE3GPB. DK3KFO: OK3CMZ, OK3CUM, OK3CXF, OK3CZM. OK1KSO: OK1JCW, OK1JKT. UK3ABT: EZ3ABO, EZ3ACO, UA3-170-935. UK2AAG: UC2-009105, UC2-009490, UC2-009756.



The neat layout at J73D used in the c.w. contest. You must be quick to catch him; he doesn't stay on very long.



Most of the c.w. Hawaii contacts were provided by these two, KH6DX (standing) and KH6KV. They were multi-op KH6KV.



Dennis, N7CKD, is editor of the "West Coast 160 Meter Bulletin." He does wonders with very limited real estate.

UP2BIL	UKZBCC: UPZB	in, u	PZ-038-340, 775	, 400011	t stay on very long		Worldord With	-			
C	W. SCORES	MOOVO	10 000 100 41 5		Texas	WA7SHN	29,610 167 47 9		Indiana		- 1
A		N3CXB	18,286 196 41 5	N5JJ	141,507 626 81 28	N7CKD	19,436 188 43 7	W9RE	121,976	612 79	25
	oups after calls denote score,	W3CNS W3ARK	14,592 133 48 6 7,821 105 33 5	K5RR	80,438 439 74 21	W7KJI	15.523 138 43 6	1.1.077.000	Wisconsin	77,137 - 7,00	77
BUILDING STATE OF THE STATE OF	multiplier, and DXCC coun-	K3ND	5,664 46 32 12	0.500	(N5TP Op.)	W7BYK	15,390 155 38 6	WØAIH/9	103,334	546 77	22
TWILDS SWIFTED	ed. Multi-op scores follow	MONED	CATALOGICA CONTRACTOR OF THE CATALOGICA CONTR	K5RC	71,898 433 69 20	WA7STA	700 22 14 2	W9UP	91,960		
single-op lis	rtings.	1000111	Alabama	N5DD	69,160 456 65 14	HAVEC	Whoming	Made		N9CIQ O	
SING	LE OPERATORS	W8IM	5.440 74 34 4	N5AU	48,951 341 63 14	Direction .	Wyoming 19,440 182 48 4	K9JXW	50,034		
Onto		100.00	Florida		(K5ZD Op.)	WASMAM	5.344 72 32 3	N9AW	20,629		
- 50	Connecticut	N4IN	107,010 390 87 34	N5JB	46,562 296 62 14	W7HLA	4,321 70 29 2	K9GDF	85	7 5	
W1WEF	40,680 234 60 13	W400	58,433 270 71 26	K5WA	27,846 240 51 9	KC7QY	2,856 52 24 2		Colorado		
W1WY	30,552 189 57 15	WA4SV0	54,593 245 77 25	K5LZ0	25,056 197 54 10	100.001	7632442	KØCL	86,156	478 68	17
W1XX	26,978 232 47 11	N4WW W4BV	49,536 211 72 25 8,405 92 41 6	KB5UL K5DX	23,700 218 50 6 19,350 169 50 8	onnois.	Michigan	KØEU	26,780		
	Massachusetts	WB40SN	7,182 46 38 18	W5QF	14,760 155 45 4	NBEA	94,017 447 77 24				
K1MEM	69,300 220 77 33	KBUNP	3,596 49 31 7	W5FIX	9,348 106 38 7	KC8P	66,430 376 70 18	- 3 -	Kansas		
WIAGE	16,125 150 43 8	1100111		KG5U	6,623 82 37 4	W8VSK	34,965 200 63 16	WARTKJ	33,990		
KA1GHR	8,177 68 37 8	WD4RC0	Georgia 6,279 76 39 3	KN5H	4,284 72 28 4	KBCV	11,877 150 37 3 602 20 14 2	KØBW	20,988		
AA10	3,925 68 25 4	N4UZ	4,089 66 29 3	W5IRP	3,822 69 26 3	KIBC	002 20 14 2	NØBLD	7,720	89 40	4
The state of the s	New Hampshire	K4BAI	3,000 61 24 2	W5S0D	2,756 50 26 2		Ohio		Minnesota		
N1ACH	24,990 139 51 19	17.150.11			California	K8AC	72,800 408 70 18	WIN	23,324		
	Vermont	W4Y0K	Kentucky 38,060 306 55 11	K6SE	100,386 433 66 16	KC8JH	61,439 385 67 14	WØTIV	2,553	48 23	2
K1IK	30,525 222 55 13	NQ4C	31,683 229 59 11	K6M0	27,888 178 42 8	K8US	47,768 372 56 8		Nebraska		
K1LPS	5,214 70 33 4	NUNC	P.501 (*1/6/42) LU	AD6D	13,440 133 42 4	K8LM	37,746 287 54 11	КВНА	74,118	484 66	17
	New Jersey	WATER	North Carolina	KETS	11,211 124 37 4	KW8N	34,086 200 57 15	KØGND	2	1 1	1
WA2SRQ	129,965 509 85 32	W4TMR	63,954 408 66 14 935 26 17 2	N4ARO/6	8,177 95 37 5	W8SDL	26,352 202 54 10	medite.	South Dakota	1,000	
W2FJ	102,789 428 81 28	WA4EXW	THE STREET AND THE STREET	W6NKR	5,728 54 32 6	WBCAR	21,609 180 49 9 20,976 150 57 11	WBØRXF	10,452	122 30	2
N2IN	5,375 94 25 3		South Carolina	WA60CV	4,917 60 33 6	W8ILC K8SVT	20,050 181 50 5	WDUDAF			-
	New York	W4MAF	28,652 252 52 7	N60U W6PFE	3,920 60 28 4 3,500 58 28 2	WASRCN	16,899 177 43 5		New Brunswick		24
WA2SPL	175,628 593 92 38	AA4V	28,380 136 60 22	W6LFB	3,400 58 25 5	W8EX	15,594 127 46 10	VETAXT	59,466	202 33	21
K5NA	164,825 537 95 43		Tennessee	К6МХО	3,180 75 20 2	NBBJQ	13,631 148 43 3		Newfoundland		-
W2IB	114,122 475 86 33	K4X0	10,962 120 42 4	AA6EE	2,430 63 18 2	N8TN	12,062 157 37 2	V01HP	26,922	101 42	18
KR2V	18,662 193 43 5	KD4PP	6,603 102 31 2	Printer.	Arizona	AA8S	11,638 96 46 7		Nova Scotia		
W2GKZ	7,038 90 34 3		Virginia	K70X	81,280 461 64 14	KB8LH	4,725 80 27 4	VE1CEG	4,494	38 21	7
W2DW K2MN	6,545 78 35 7 5,984 82 32 4	W4XD	35,090 261 58 9	AK7Y	30,160 261 52 6	K8MR	4,134 72 26 4	men-	Quebec		
W2CJQ	5,504 80 32 2	K400	35,032 261 58 10	W7YS	18,894 181 47 4	KBYTW	4,125 75 25 2	VE2DUI	11,788	89 28	3
WZXL	2,268 47 21 3	AA4FF	20,540 178 52 6 7,490 104 35 3	WB70PT	3,213 55 27 2	KC8MK N8AXA	2,544 47 24 3 2,420 52 22 2		Ontario		
30000	Delaware	W4KMS	5,487 75 31 5	WB7FDQ	2,660 46 7 2	HOMAN		VE3BMV	145,905	412 71	21
AA1K	153,244 557 91 38	HAMMO			Idaho	VOCO!	West Virginia	VE3ABG	137,874		
Part I		WENT	Arkansas	N7SU	19,872 176 48 7	K80QL	44,005 214 65 21	VESINO	104,855		
Naco	Maryland	W5KL	25,529 237 49 5		Montana	200000000000000000000000000000000000000	Illinois	VE3LSK	38,514		
N3C0 W3ICM	36,558 302 54 7 24,750 202 50 11	L'anni Lian	Louisiana	KØPP/7	43,740 312 60 10	W9YYG	44,016 362 56 6	VE3NBE	15,345		
K3SO	15,640 179 40 4	W5KC	10,537 121 41 6		Nevada	W9PNE	40,238 268 62 12	VE3ILE	4,370	49 19	2
W3HVM	2.369 50 23 2		Mississippi	K7CA	125,930 604 70 18	K9IFO	34,692 248 59 11 15,004 154 44 6		Manitoba		
***************************************	Pennsylvania	AE5H	8,346 98 39 4	W. OH		W9AA		VEAADE		78 36	3
W3BGN	51,776 249 64 28	WA5MUE	384 16 12 1	WZCI	Oregon 71 126 264 57 12	K9BG	13,771 133 47 5	VE4ABE	and the second s	10 30	-
W3BUR	AS 557 272 62 10	7 7 3	New Mexico	W7EJ W7AVV	71,136 364 57 12 14,042 119 34 6	W9LNQ	11,592 129 42 5	WEEDS	Saskatchewan	270 52	11
W3AP	40,356 250 59 18	KN5S	3,159 50 27 3	HIMAA		WD9CSA	10,998 129 39 4	VE5RA	75,981		1 1000
W3CV	29,768 156 61 18		Mary M.	VZODO	Utah	K9NR	10,080 108 42 4	VE5XU	32,355	100 40	9
W3AJS	29,376 213 54 14	Marie Control	Omenium	K7CPC	12,997 142 41 4	KM9Y	8,892 102 39 5	Village Co.	Alberta	105.00	
W3TS	26,028 212 54 10	KK5I	87,827 514 71 20		Washington	KA9ACS	6,177 102 29 2	VE60U	22,971		
W3UHP	22,950 204 50 7	N5AFV	1,072 32 16 2	WA70FH	49,501 260 59 14	W9REC	3,159 57 27 2	VE6AQI	3,502	46 17	-

	British Columbia	Dominica	1	Norway	Wisconsin	Rhode Island W1LOV 8,288 133 28 2 Vermont K1IK 67,840 476 64 13 K1LPS 4,686 62 33 3 New Jersey KC2ME 26,775 275 45 6 W2FCR 11,988 150 37 3 New York WA2SPL 67,237 369 71 20
VE7CRU	59,364 236 51 9	J73D 6,125 46 2	5 10 LA2GV	22,725 181 25 25	KØFVF/9 94,556 482 77 23	W1LOV 8,288 133 28 2
AELBO	33,040 200 32 11 Alaska	England		Puerto Rico	KE9A 59,215 371 65 14	Vermont
KI 7HBK	1 672 28 11 5	GABUE AS 944 210 4	9 42 NP4A	400,504 633 104 50	WADYD 01 972 529 72 20	K11K 67,840 476 64 13
THE PERSON	Asiatic Russia	G4BUE 48,944 210 4 G40BK 37,354 203 3 G3XWZ/A 36,864 209 3 G4ARI 3,604 46 1 European Russia UA1DZ 89,082 330 4 UA4HBW 37,060 205 3 UA6YAF 32,967 191 3 EZ4ZCB 18,425 145 2 UK1AFA 17,365 152 2	8 28	Scotland (K12M Op.)	Miceouri	New Jareau
RASAKM	61,642 193 34 34	G3XWZ/A 36,864 209 3	6 29 GM30X	9 614 91 22 22	ABØI 99.752 583 74 20	KC2MF 26 775 275 45 6
UA9SAX	55,968 194 33 33	G4ARI 3,604 46 1	7 17	Snain	Asiatic Russia	W2FCR 11,988 150 37 3
UA9MR	39,816 163 28 28	European Russia	EA3VY	218.467 446 71 40	UK9ADA 25.024 123 23 23	New York
EZDMAZ	21,648 106 22 22	UA1DZ 89,082 330 4	9 36	(EA3KU Op.)	UKBAMM 15,972 91 22 22	WA2SPL 67,237 369 71 20
EZ9CAD	11.900 94 14 14	UA415W 37,000 203 3	3 33 EA7DMF	57,650 189 50 35	UKBAMM 15,972 91 22 22 UK9CDG 15,580 96 19 19 UK9CAC 11,001 70 19 19 UK9UDD 8,496 67 18 18 Bulgaria LZ1KDP 130,480 397 56 40 Czechoslovakia OK5TLG/P 159,872 508 64 44 OK1KSO 91,636 267 62 42 OK1KQJ 41,902 238 41 38 OK3KCM 41,650 281 35 33 OK1KWV 24,911 214 29 29	K2EK 38,465 345 49 9 K2VV 13,431 175 33 2
UASADE	11,178 71 18 18	RA4HWD 20,384 133 2	8 28	(G4MH Op.)	UK9CAC 11,001 70 19 19	K2VV 13,431 175 33 2
UA9SJL	10,956 59 22 22 7,470 55 15 15	EZ4ZCB 18,425 145 2	5 25	Switzerland	DASODO 0,490 0/ 18 18	K5NA 10,710 138 34 5 W2GKZ 4,509 73 27 2
EZ9ADE	VALUE SANTA (A	UK1AFA 17,365 152 2	3 23 HB9AUS	5,920 74 16 16	171KDD 130 480 307 56 40	KB2SE 4.379 71 29 2
MADDEE	Australia	11A3AHN 13 860 124 2	2 22 HHODO	Turkmen	Czachoslaunkia	WB2TKD 2,712 52 24 3
VK3BEE	1,771 24 11 7	UA3AHN 13,860 124 2 UA6ALV 11,088 106 2	1 21 011800	33,750 145 25 25	OKSTI G/P 150 872 508 64 44	W2DW 2,640 54 22 2 Maryland WB3GCG 128,084 802 71 19
Uncount	Azerbaijan 49,020 173 30 30	UK3DBV 8,640 84 2	0 20 1105741	UKraine	0K1KS0 91.636 267 62 42	Maryland
UD6DKW UD6DLL	49,020 173 30 30 11,546 55 23 23	UA3EAL 6,678 50 2	1 21 UBSZAL	27 637 189 29 29	OK1KQJ 41,902 238 41 38	WB3GCG 128,084 802 71 19
	Danmarda	UA3DDC 5,239 77 1 UA3SED 3,038 48 1	3 13 UB5UG0	26,670 167 30 30	OK3KCM 41,650 281 35 33	K21TG 25,748 286 41 5 W3ICM 23,160 253 40 7
VPRRO	28 140 130 42 10	UA3SEO 3,038 48 1 EZ3ACO 2,020 42 1 UA6HNJ 1,969 36 1 UA3JD 1,512 22 1 UA4BI 808 21 Faroe Is.	0 10 UB5WC	20,400 213 23 23		W3HVM 1,200 36 16 2
11.500	Brazil	UA6HNJ 1,969 36 1	1 11 UB5ZCV			
PV2FRA	18 3 2 2	UA3JD 1,512 22 1	4 14 EZ5UAG UB5ENV		OK2KYZ 14,582 163 23 23	Pennsylvania W3TS 68,672 543 58 9 K4JLD/3 3,248 55 28 3
FIELDS	British Virgin Is	UA4BI 808 21	8 8 UBSUKH	18,200 142 25 25 15,864 137 24 24	OK1KUR 13,728 141 26 26	W3TS 68,672 543 58 9 K4JLD/3 3,248 55 28 3
VPOVIN	60 4 3 2	Faroe Is.	UK5MAI		GUEUNV 3,033 130 13 13	K4JLD/3 3,248 55 28 3 W3EAN 2,760 60 20 3
*******	Bulgaria	0Y7ML 80 4	4 4	(UB5MNY Op.)	OK1KQH 5,321 89 17 17	KC3AD 2,662 56 22 2
LZ2RF	63.181 281 41 37 27 311 163 31 30	Finland	NACGO	13,708 124 23 23	OK1KRY 3,975 70 15 15 OK1KRQ 576 21 8 8	WA3YON 1,691 40 19 2
LZ1DQ	27.311 163 31 30	OH1MA 102,924 319 5	4 36 UBSTH	9,360 100 20 20	OK3KFO 210 7 5 5	W3ARK 1,666 43 17 2
LZ2CW	27,311 163 31 30 3,856 48 16 16		1 30 UB5EIS UB5ZFE	9,306 78 22 22 8,721 46 27 21	England	AD3L 564 22 12 2
The same of	Cayman Is.	France	F75FAN	7,125 104 15 15	G3RPB 180,504 389 72 43	Alabama
ZF2A0	3,990 37 21 5		6 20 UB5ES	6,804 58 21 21	G3FVA 6,886 70 22 22	W4ZWE 62,643 513 57 6
	(VE1YX Op.)	Georgia	UB5ABZ	5,460 68 15 15		Florida
	the second	UF6FIF 14,070 109 1	THATE		Estonia	AA4MM 30,085 243 55 11
Auren	Czechoslovakia	Germany, West	UYSTE	2,884 42 14 14	UK2RDX 201,828 526 66 44	N4IN 27,384 208 56 13 W4PZV 9,477 108 39 6
OK3DG	64,680 348 42 39	DK6AS 113,522 317 6	2 44 URSWA		European Russia	W4PZV 9,477 108 39 6 W4HVU 700 22 14 3
OK3CXF OL8CMQ	57,750 305 42 37 49,212 320 36 36	DLØVW 34,965 268 2	7 27 UBSUW		UK4HBB 37,940 255 28 28	Georgia
OK1KPU	31,376 196 37 30	(DL5AS	up.)		UK3QBW 31,987 212 29 29	K4UEE 16,560 162 48 5
The same of	(OK1JDX Op.)	DJ3XD 21,199 147 2 DJ3XK 20,480 126 3		Virgin Is.	UK6LAZ 25,480 170 28 28 UK6LDM 17,576 130 26 26	WD4RC0 13,110 154 38 7
OK1DTM	29,568 220 33 32	DE31 P 18 536 125 2	18 25 KV4FZ	217,874 439 82 36	UK6LTM 16,926 155 21 21	Kentucky
OK1DTN	27,168 205 32 32	DF6LH 6,859 76 1	9 19 GW3NYY	Wales		NQ4C 37,688 310 56 9
OK3ZBU OL5AZY	25,194 231 26 26 24,786 170 34 34		W EV		DJ1BZ 57,160 284 40 33	NA4D 17,440 209 40 3
OL4BDY	22,178 215 26 26		23 23	White Russia	DLØFJ 16,936 122 29 28	North Carolina
OK3CQD	22,140 200 27 27	Gibraltar	UC20BA		Hawaii	AA4VK 70,200 536 60 13
0K2BUV	20,046 200 26 26	ZB2E0 13,650 97 2	6 25 UCZAAP	3,936 48 16 16	KH6KV 101,712 216 48 11	W4TMR 51,250 480 50 7
OK1DOK	19,980 140 30 30	Haiti			Japan	KF4HK 29,596 276 49 6 W3ESU 5,970 92 30 3
OL2VAG/S OK1MNW	16,075 159 25 25 15,484 133 28 28		3 26 YT3W	Yugoslavia 167,896 497 62 45 (YU3EF Op.)	JA9YBA 10,693 128 17 8	WA4SLC 2,808 48 26 4
OK3CZM	15,090 121 30 30	Ireland	STEEL STEEL	(YU3EF Op.)	JA2YEF 6,513 91 13 5	South Carolina
OL1BBR	14,539 118 31 31	EI9J 47,816 201 4	13 34 YU3TU	141,764 408 61 42	JA2YKA 6,398 113 14 7 JA9YAP 2,690 65 10 3	W4MAF 38,048 296 58 10
OK1HBT	12,675 137 25 25	Israel	YU4YA	66,066 317 39 38	JASYAP 2,690 65 10 3 JASYAI 2,493 86 9 5	W4TWW 5,910 87 30 4
OL2VAH			11 29 YU7SF	31,131 230 27 27 430 22 5 5	JH7YPG 2,120 48 10 6	Tennessee
OL1BGA OK1KNC	12,336 132 24 24 12,232 153 22 22	Japan	10701	400 22 0 5	Kazakh	N4FNB 15,624 171 42 4
OL9COI	12,180 162 21 21	JA7A0 9,786 93 2			UK7PAL 8,398 58 19 19	W4UWC 11,096 140 38 3
OK1HCH	11,520 123 24 24		4 8 MU	LTI-OPERATORS	Latvia	K4X0 3,248 55 28 2
OLBCNI	10,902 128 23 23		8 10	LII-OI LIIATONS	UK2GAB 33,792 188 33 29	KD4PP 84 7 6 1
OK2SBJ	10,563 139 21 21	The same of the sa	4 6	Massachusetts	Lithuania	Virginia
OL1AZM/ OK1DRQ	9,568 112 23 23 9,429 127 21 21	JA3IAF 5,225 64 1	1 6 W1MX	148,509 555 87 36	UK2PRC 113,974 416 49 42	KD4NI 61,600 520 55 7 AA4FF 22,278 219 47 5
OK10PT	8,550 129 19 19	JA9BOH 4,543 82 1 JR1CFG 4,395 46 1	The second secon		UK2BCC 47,566 262 34 29	K40D 9,880 113 40 3
OK2BEJ	8,420 119 20 20	INVESTIGATION CONTRACTOR OF THE PROPERTY OF TH	5 8 3 7 W10P	Rhode Island 30,174 274 47 9	Norway	N4EHJ 9,126 151 27 4
OK2BMU	8,360 121 20 20			Pennsylvania	LA40 62,594 363 34 34	W4KMS 5,910 88 30 3
OK3CQA OK2PAM	8,162 98 22 22		5 3 K3FD	60,903 364 67 17	Scotland	Arkansas
OL5BFX	8,140 94 22 22 7,920 102 20 20		6 5 WA3YON	46,482 320 61 10	GM3IGW 162,305 384 65 38	W5KL 6,324 102 31 1
OLØCLB	7,888 144 16 16	JA68IF 620 38 JR78TI 576 28	5 3 WB3CAC		GM4GRC 117,924 318 62 39	New Mexico
OK1MZ0	7,200 95 20 20	JA3BCT 250 9	5 3 K3YTL	10,535 137 35 2	Ukraine	KN5S 645 20 15 2
OK28WT	6,783 98 19 19	JA7EDZ 50 25	1 1 2	Kentucky 77,720 497 67 16	UK5IBM 44,694 211 39 35	- Shiemonia
OK3TBG OL7BEH	6,780 95 20 20 6,516 91 18 18	ALL STATES			GW3YDX 239,128 478 71 44	N5AFV 7,740 100 36 2
OK1MCW		Kenya	MASE	North Carolina 117 096 504 84 30	White Dunels	10000
OL7AZH	5,814 99 17 17	5Z4CS 90 3	3 3 Wassil	117,096 504 84 30 4 56,950 353 67 16	White Russia UK2AAG 54,880 285 35 29	N5DD 62,060 504 58 9 (WD9HFW 0p.)
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OL58CV	4,573 70 17 17 4,420 70 17 17	UM8MCY 72 6	2 3 4.2011	Virginia 109,643 476 83 30 73,803 396 73 20	YU2CBM 65,236 236 47 36	W5IRP 2,040 41 24 2
OK2BCI	4,312 31 22 22	T32AF 36,580 122 3	W4DR	109.643 476 83 30	YU2KDE 26,838 200 27 27	KN5H 96 8 6 1
OK1AIJ.	4,260 85 15 15	132AF 36,580 122 3 (KH6UR	Op) N4EHJ	73,803 396 73 20	YU7AJD 25,060 178 28 28	California
OK2PAW	4,182 75 17 17	Latvia	Op.,	Arkansas		K6HNZ 46,032 365 56 6
OK3CGI OK3FON	4,096 73 16 16 3,936 58 16 16	U02PQ 69,044 303 4	11 33 AF5M	69,690 433 69 17	from the following: W3PEV, WB4RUA,	W7CB 8,664 100 38 4 K6ANP 6,975 101 31 3
OK1ADU	3,724 42 19 19		7 17	New Mexico	NX4V, KE6VL, NBAKY, WBIMZ, OH1XX,	N4ARO/6 5,248 72 32 4
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OL8COJ OL1BCB	3,380 82 13 13	EZ2QAC 1,540 34 1	0 10 NA5R	105,307 521 79 28	OL7BEO, UASECF, UASET, UASIAK,	AA6EE 100 10 5 1
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OK2BAS	2,702 55 14 14	EZ2BAV 42,030 266 3	30 30	California		WB7FDQ 23,036 204 52 5
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OK2BQU OK10NH	520 8 8 8 232 20 4 4	PARLOH 16 718 130 2	26 26 WASYVE	70,518 295 73 24	Connecticut W1WY 15,756 184 39 5 Massachusetts AB1A 72,312 449 69 16	N7AEH 11,470 133 37 5
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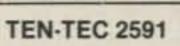


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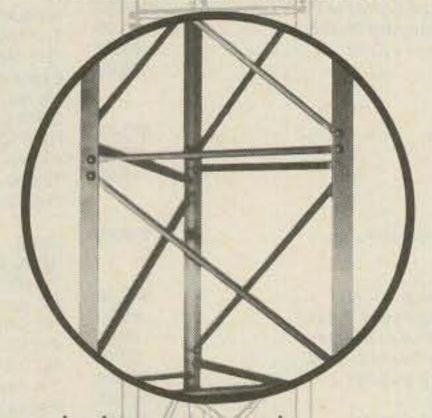
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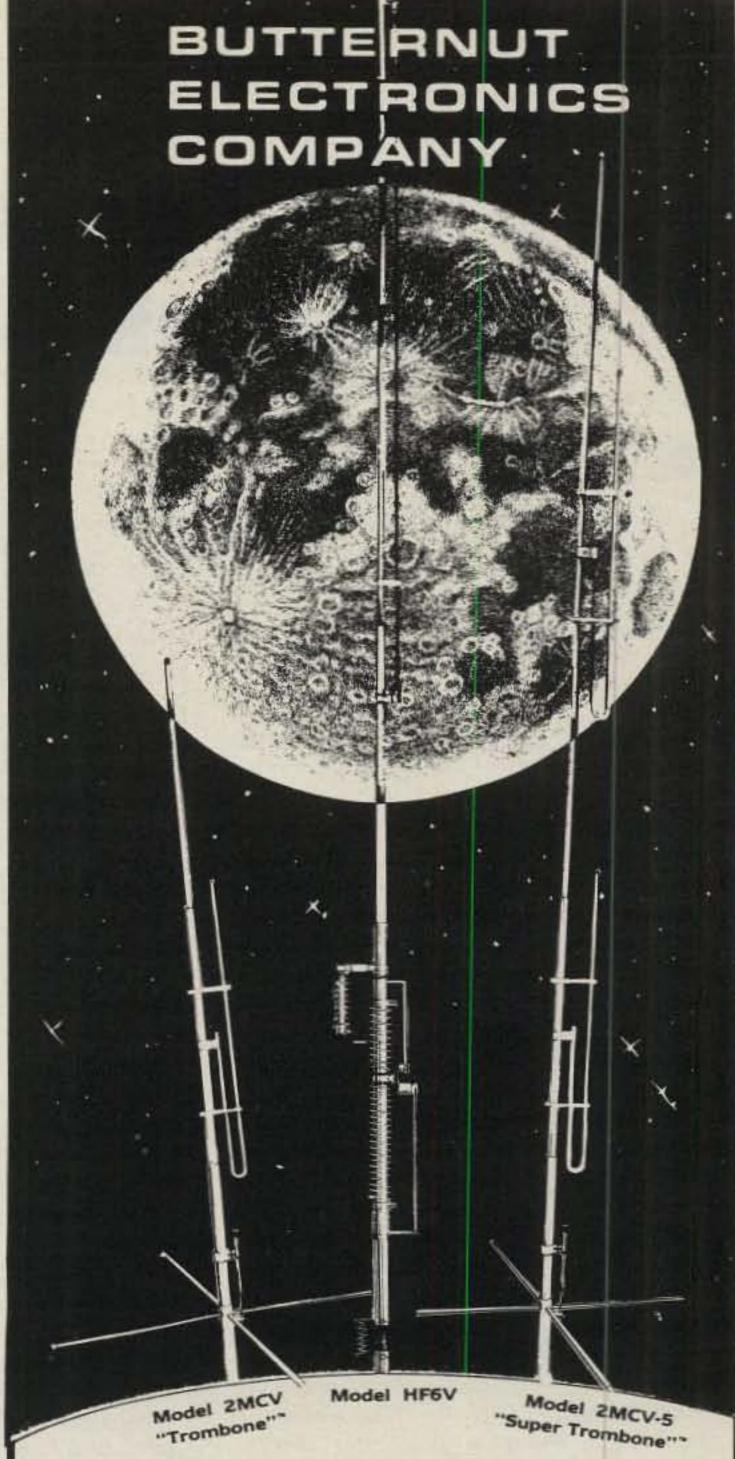
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Model 2MCV "Trombone" - omnidirectional collinear gain vertical for 2 meters having the same gain as "double-5/8λ" types, but the patented "trombone" phasing section allows the radiator to remain unbroken by insulators for maximum strength in high winds. No coils "plumber's delight" construction and adjustable gamma match for complete D.C. grounding and lowest possible SWR. Height: 9.8 ft/2.98 meters.

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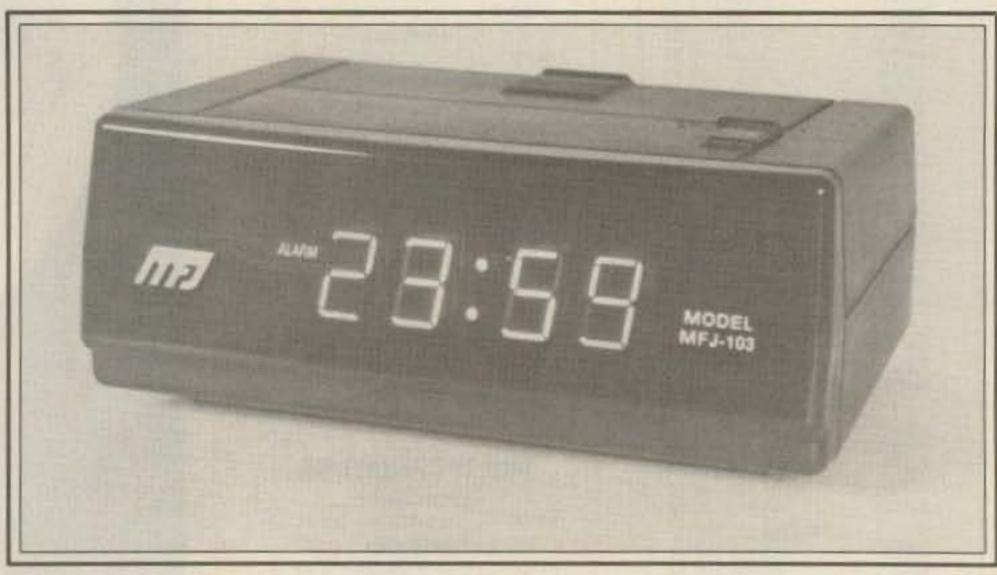
A Trio of Station Clocks From MFJ

n interesting series of both digital and analog clocks designed to appeal to the radio amateur/s.w.l. has been brought to the market by MFJ Enterprises. Considering that there must be literally a million different styles of clocks available, one wonders what features MFJ selected for their clocks such that they would be of special appeal to the radio amateur/s.w.l. market. In fact, all of the MFJ clocks do have different timing, physical, and electrical features, and three of the most interesting models were selected for review.

The MFJ-103 Digital Clock

The MFJ-103 is a handsome, a.c. line operated digital clock in a black plastic case measuring about 5 1/4 " × 3 1/2" × 21/8". The four-digit display is of a green fluorescent type measuring about % inches high, but placed behind a blue-filter front mask which seems to make the digits appear larger and also gives them a pleasant, soft-blue appearance. It can be operated from 110 v.a.c., 50 or 60 Hz (instructions are provided for the simple conversion to 50 Hz), and from 220 v.a.c. using any simple 220/110 v.a.c. transformer having a 3 watt capacity. The electronics are based on a well-proven Texas Instrument digital clock IC.

The time display can be chosen to be either in the 12-hour or 24-hour format by setting a rear panel slide switch. There is an alarm function which uses the same time format, 12 or 24 hour, as is set for the main display. Setting of the display or alarm times is conventional by the means of push-buttons hidden under a toppanel tilt cover. Positive time setting is achieved by having the "hour" and "minute" push-buttons advance their respective displays only one digit for each depression of the push-buttons. This system is a bit slower than the "fast/slow" time set controls found on some digital clocks, but one can almost always achieve the correct time setting the first time around rather than run the digital display beyond the desired time as often happens with the other scheme. The time setting can easily be synchronized with some standard time signal, such as WWV, by a series of simple pushbutton depressions which set the display time a minute ahead of the desired set time and then allow the clock to start timing when a single push-button is released upon hearing the WWV time tone. As will be covered shortly, this time setting procedure would appear to be capable of only setting the clock to the nearest minute, but in fact, it achieves exact seconds time setting. A convenience feature allows the time display to be set to 00:00:00 in the



The MFJ-103 Digital Clock.

24-hour mode and 12:00:00 a.m. in the 12-hour mode by the simultaneous depression of three push-buttons. This feature really doesn't have much to do with time setting, but it is an interesting extra if one wants to temporarily use the clock as a precision timer going from 00:00:00 to 23:99:99 hours in the 24-hour mode. Interestingly enough, this "reset" feature doesn't affect time-alarm time setting. Therefore, one can still have the alarm sound at any preset, desired time after starting the timing from 00:00:00.

The clock was described as having a fourdigit display, but the display can be switched to display minutes and seconds by depressing the switch cover lid. The time-setting functions previously described in reality set the clock to :00 seconds, although normally only full minutes are displayed. A 9-minute ID reminder function is achieved by using the "snooze" feature of the clock when the "alarm" function is turned on by means of a separate "alarm on/off" slide switch on the top cover. Once the alarm has been activated by the real-time setting having reached the alarm-time setting, the switch cover lid can be depressed momentarily to silence the alarm (an interrupted tone) until 9 minutes elapse when the alarm will sound again. Another momentary depression of the switch cover lid will repeat the cycle for a total of six repeats.

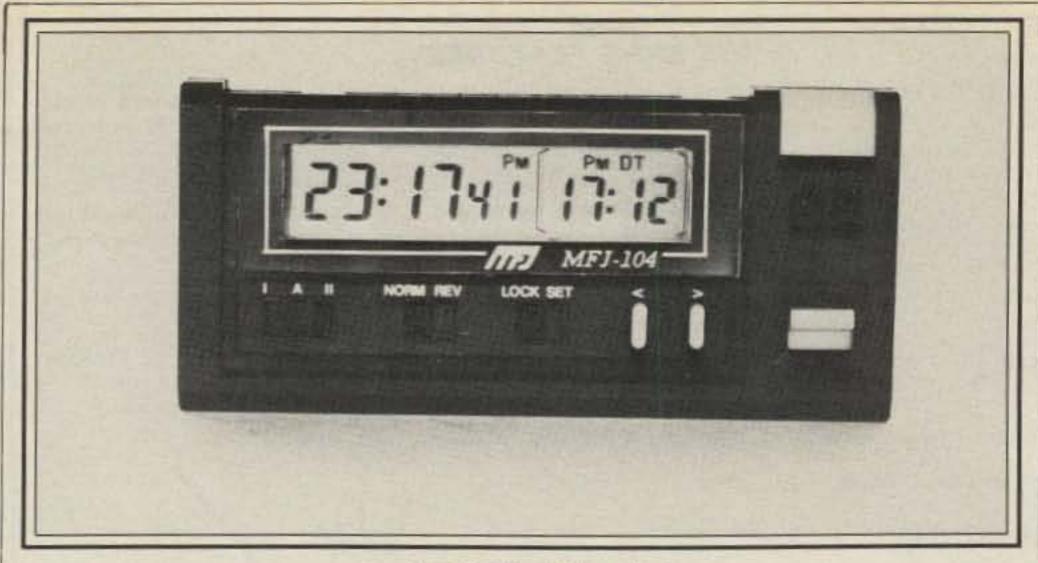
A standard 9 volt battery may be installed in the clock to prevent the loss of the time setting in the event of a power failure. When power fails, the display will blank out, but the battery will power an RC oscillator to maintain the timing function. When power returns, the display automatically continues. No exact tests were made concerning the accuracy of this feature, but a few quick ones indicated that correct timing was maintained within ± 1 second for 1 minute of outage. So, even if line power were lost for an hour, the clock shouldn't be off by more than a minute when power-line synchronized timing resumes.

The MFJ-103 clock does have a lot of features and appears to be a fine instrument. Its only disadvantage is that it cannot do everything at once—that is, to be simultaneously a station-time display clock with alarm feature, long-duration timer, ID period timer, etc. However, rarely does one need all these functions simultaneously. MFJ doesn't mention it in their literature on the MFJ-103, but it is extremely easy to convert the clock either mechanically or electronically to serve as both a local-time/memory-time clock. The mechanical conversion involves nothing more than replacing a plastic pointer on the inside of the switch cover lid to cover the "alarm-time display" button instead of the "second-display" button. Then whenever one depresses the switch cover lid, memory time will be displayed if the alarm time has been set to some time one wants to remember (e.g., the starting time of a net). An electronic switching circuit can be used, utilizing the push-button contacts, to switch the display automatically between local and memory time with, for instance, a 3:1 time-display ratio.

The MFJ-104 Dual Time Clock

While the MFJ-103 can be described as a very versatile, general-purpose digital clock for fixed station use, the MFJ-104 can be de-

*c/o CQ Magazine



The MFJ-104 Dual Time Clock.

scribed as a little gem for portable amateur/ general-purpose applications.

The MFJ-104 is basically a miniature, battery-operated alarm clock which has two liquid-crystal time displays. Either display can be set independently to any desired time, but they are controlled by a common crystal time base and are automatically synchronized for seconds time setting. The size of the clock is roughly 3¾ " × 1½ " × ½ ". The weight is about 1½ oz., including the single button-cell battery (an LR-44 watch-type which should be readily available almost anywhere around the world). A tilt-over cover functions either to cover the front-panel set switches during transport or to function as a tilt stand during use of the clock.

The clock, an imported item, was probably meant for frequent travelers and business people who needed instant dual-time zone information, but the clock has obvious applications within the amateur radio field. The main digital display has six digits for full hours/minutes/seconds display. The hours and minutes display is about 1/4 inch high (hours and minutes only) and is clearly visible out to about 2 feet.

Setting of the clock is quite simple, since it basically only functions as a simple dual zone, alarm clock. A slide switch selects whether the primary or secondary digital display should be set, and only two up/down push-button setting switches provide for time setting. If the push-button switches are just "pulsed," the display will be advanced a digit at a time (one minute up or down for the main or secondary displays). If either push-button is held down for about one second continuously, the time display will advance at about the rate of one minute per five seconds. This rate is extremely fast, but time setting is not all that difficult, since if one overshoots or undershoots the desired time setting, the pulsed, singlestroke mode of the time-setting push-buttons allows for easy correction. A "lock/set" slide switch allows the main display to be exactly set with a time signal. When the switch is in the "set" position, the clock can be set but will not time. By presetting a time and then sliding the switch from "set" to "lock" on a time signal, the clock will time from the preset time. The secondary display cannot be set in a similar manner, but nonetheless, it can be set exactly since it is internally synchronized for seconds with the main display. That is, when the sec-



The MFJ-105 Wall Clock.

onds display on the main display reaches 00 seconds, the minutes readout on both displays will be advanced by one minute simultaneously.

The dual time zone displays can be used as one desires—the main display for exact local time and the secondary display to remind one of approaching net time in a different time zone or for continuous display of GMT time. The secondary display has a rather sophisticated function in that it can be set both for a dual-time and alarm-time function. In effect, it adds a dual time zone plus memory function to the clock. Rather than going into details, a simple illustration might convey the idea. Setting the front panel I-A-II switch to the I position, the clock can be set on the main display, for instance, to 12:21:00. Setting the same switch to "A" and the "Alarm" switch to "on," the clock can be set to 13:09 on the secondary digital display. Setting the same switch to II and the alarm switch to "off," the secondary display can be set to 20:56. Leaving the switch in the II position, the main display will count up from 12:21:00 and the secondary display from 20:56. If one changes the switch to "A," the secondary display will change to 13:09 while the primary display continues to visibly count up and the secondary internal clock counts up from its initial time setting. The alarm, or reference setting of 13:09 will, of course, remain fixed, but it is always recallable on the digital display.

An interesting "NORM/REV" switch on the clock does just what it says: it reverses the

numbers on the main and secondary digital time displays. It is a bit difficult to decide the value of this feature except perhaps that it might serve to provide one a time zone reversal appreciation when working a favorite and regular DX station.

The alarm feature on the MFJ-104 includes a rear-panel switch that provides for the selection of four different alarm "melodies." A combined "snooze/lamp" push-button does just what it indicates: it lights a small lamp for viewing of the display in dim light, and if it is depressed while an alarm tune is being played, the tune will stop and be repeated automatically 30 seconds later. If the tune is not interrupted during its initial play cycle, it will not repeat by itself, but the alarm function, if the "alarm on/off" switch is left on, will not be cancelled; it will automatically repeat in 24 hours. The tunes are all quaint little ones that play for about 20 seconds with one notable exception. The engineer who programmed the tunes must have been a great Anton Dvorak fan. The "Humoresque" tune plays for 95 seconds unless, of course, one turns the alarm off! And, the long play time of the tune doesn't seem to be a fluke, since the tune advances through different sequences without apparent repeats.

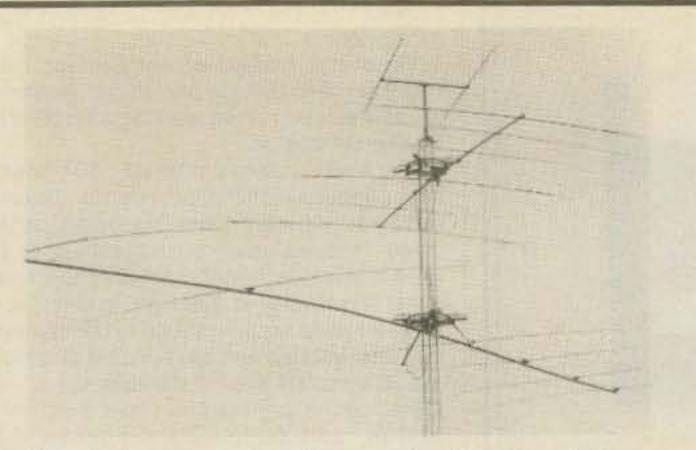
The MFJ-105 Wall Clock

The MFJ-105 clock probably will appeal to those amateurs who want a large, easy-toread, analog wall clock in the 24-hour format. The clock has a diameter of about 12 inches and is far more handsome in appearance than the usual black-and-white advertising photographs can indicate. The clock face has an anodized bronze finish with black numerals. The hour and minute hands are black, while the sweep second hand is red. The outer frame is metal covered with a wood-grain vinyl. The back is fully covered except for the area of the quartz clock movement. It is a very nicely constructed wall clock compared to some of the "cheapies" which have cardboard clock faces, plastic framing, and no backing. Across the room visibility of the clock is excellent.

The clock movement is crystal controlled and runs off a single AA cell. The time accuracy is said to be within ±15 seconds per month. Under normal constant room temperature conditions, the accuracy should be within a fraction of that stated. No long-term tests were made, but short-term tests would certainly seem to augur for such a result. Setting of the clock is quite simple, and one doesn't have to remove the clock from the wall to set it. When the setting knob on the bottom of the clock is pulled, the sweep second hand snaps back to 00 and the knob can be turned to set the hour and minute hands. When the knob is released, the clock will start operating so one can set it exactly to a time tone.

If one wants to concentrate on 2400 time (e.g., for GMT) and wants a handsome wall clock, the MFJ-105 will certainly fit the bill. For those who can afford several of the clocks for GMT and various other time zones, the result will certainly be a display that will look as good as any international radio broadcasting station studio installation.

All of the MFJ clock products just described serve somewhat different needs, but I would certainly rate all of them as quality products and good value for the money. Each of them carries a one-year warranty and the almost unique MFJ return it within 30 days if not satisfied offer.



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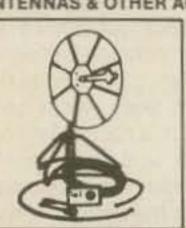
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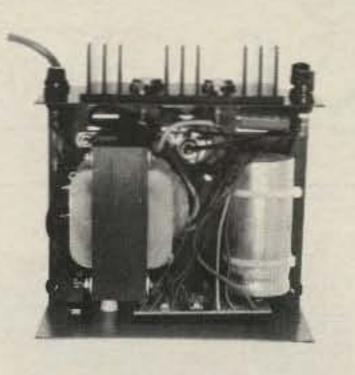
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MODEL RS-50A

RS-A SERIES



MODEL RS-50M



MODEL VS-50M

MODEL RS-7A

MODEL	Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	33/4 x 61/2 x 9	5
RS-7A	5	7	33/4 x 61/2 x 9	9
RS-10A	7.5	10	4 x 71/2 x 103/4	11
RS-12A	9	12	41/2 x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 133/4 x 11	46

RS-M SERIES



MODEL RS-35M

Switchable volt and Amp meter

MODEL	Continuous	ICS*	Size (IN)	Shipping
	Duty (Amps)	(Amps)	H x W x D	Wt (lbs)
RS-12M	9	12	41/2 x 8 x 9	13
RS-20M	16	20	5 x 9 x 101/2	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 ³ / ₄ x 11	46

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MODEL VS-20M

. Separate Volt and Amp Meters

Output Voltage adjustable from 2-15 volts

Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC@10VDC@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16 9 4	20	5 x 9 x 10½	20
VS-35M VS-50M	25 15 7 37 22 10	35 50	5 x 11 x 11 6 x 13 ³ / ₄ x 11	29 46

RS-S SERIES



MODEL RS-12S

Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12S	9	12	41/2 x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18



MODEL RS-7B

 Matches EF Johnson PPL Radios Available as models.

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7B	5	7	4 x 7½ x 10¾	9
RS-10A	7.5	10	4 x 71/2 x 103/4	11

*ICS-Intermittent Communication Service (50% Duty Cycle 5 min. on 5 min. off)

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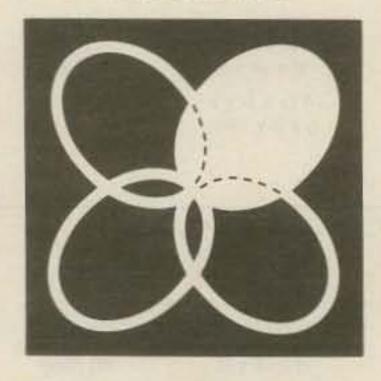
Make this the year where you hear and are heard! The sun spot number is dropping fast and there is still time to install your new INSTANTARRAY system before the temperature dives. Order now and "own" your frequency during the fall CQ WW tests. Run JA's on 80 in the late afternoons this December and join them for breakfast the next AM. Achieving the 80 & 40 portions of the 5BWAZ & DXCC awards should be fun, not a chore!

Col. Atch. Co will sell you any individual component we make or a whole system! Start off with a single 40 or 80 meter 1/4 wave vertical radiator or purchase a ready-to-erect two or four element INSTANTARRAYTM. The complete INSTANTARRAYTM system includes the verticals, their mounts, insulated guys, SS hardware galore, our attractive LOBE SELECTOR control box with self contained DC supply, a really novel beam forming phasing harness and a weatherproof relay box which distributes the power to the vertical radiators. Our 4-40 and 4-80 systems provide low angle 360 degree coverage in 90 degree segments with exceptional rejection of signals from the rear and sides. All of this in milliseconds.

Trying to show you all this in a CQ ad is virtually impossible. Hence we have produced a dynamite VHS demo video tape, which tells it all. We will loan you this tape upon receipt of a \$35 deposit which we will either refund when you return our tape or will credit against your first order.

Yes, we also do have a brand new brochure with diagrams, pictures, specs, etc. which we will send you gratis. We accept both MASTERCARD and VISA.

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SHOWCASIE

Kilo-Tec Coaxial Cable Weather Boots

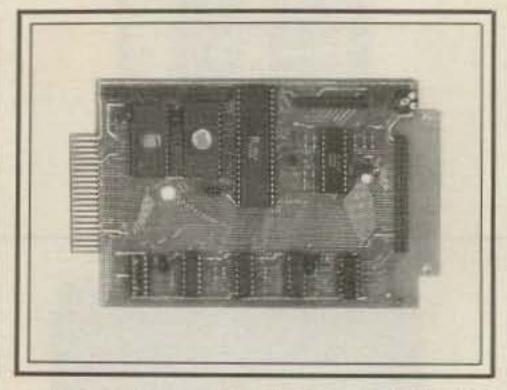
Kilo-Tec has announced a new custom weather boot for use with RG8X, RG59, RG58, and RG8 coaxial cables and PL-259/SO-239 combinations. Simply slip the weather boot over the coaxial cable before soldering on the connector, and then slide the boot over the PL-259/SO-239 for a weather seal. The boots are manufactured with a flexible vinyl material that resists moisture and breakdown from the sun's rays. The boots are designed to keep the connections clean and dry and to keep moisture out of coax cables.



Three models are offered: Model KTB-58 for RG-58 cables, Model KTB-8 for RG-8 cables, and Model KTB-8X for RG-8X or RG-59. A kit of two of each type (total of 6 ea.) is offered for \$5.95 plus shipping and handling. Custom weather boots can be made for other types of cables and connectors. For more information, contact Kilo-Tec, P.O. Box 1001, Oak View, CA 93022, or circle number 100 on the reader service card.

Magnum Distributing CMJ-IF Multi-Function Subsystem

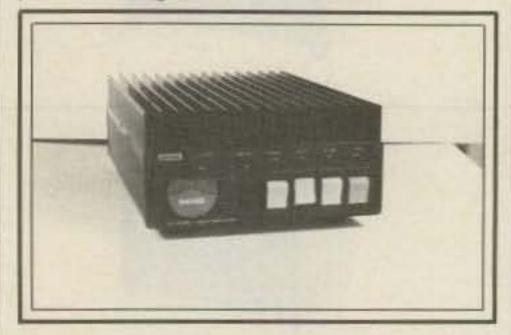
Magnum Distributing's CMJ-IF multifunction subsystem is for use with the TRS-80 Color Computer and the TDP System 100 Personal Computer. The CMJ-IF plugs into the cartridge port and provides speech synthesis, two parallel ports, 4K or 8K of EPROM/ROM space, two counter timers, serial communications port, and extender port. As a speech synthesizer, the CMJ-IF can virtually say any word in any language, accessed from Basic. The extender port enables the user to access a disk controller or Rompak without having to disconnect the CMJ-IF. The parallel ports enable the owner to use a parallel printer, and the serial communications line is for connection to serial printers or a modem.



The unit is priced under \$200. For more information, contact Magnum Distributing Company, 1000 S. Dixie Hwy. W. #3, Pompano Beach, FL 33060, or circle number 105 on the reader service card.

Daiwa LA2155 Linear Amplifier

Daiwa has introduced a new high-power 2 meter linear amplifier, the LA2155. The LA2155 delivers 150 watts with 25 watts of f.m., s.s.b., or c.w. input. The unit features an array of extras such as a switchable receive pre-amp, a high/low power option, fast-acting protection circuitry, r.f. activated transmit/receive switching with time delay and manual override option, and relative power output metering.



The LA2155 requires 12 v.d.c. at 24 amps maximum. For more information, contact MCM Communications, 858 East Congress Park Drive, Centerville, OH 45459, or circle number 101 on the reader service card.

Heil Ltd RB-1 Remote Base Intertie

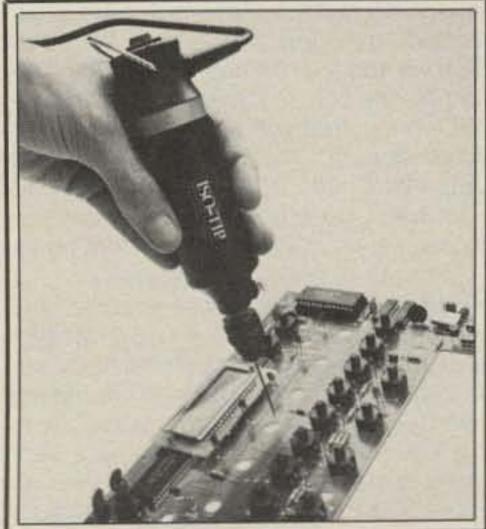
The RB-1 from Heil, Ltd. allows interconnection of two transceivers for remote base operation. For instance, a 220 MHz rig can be intertied with a 146 MHz rig so the operator of a 220 MHz handietalkie can control the 146 MHz "base" rig, which can be connected to large amplifiers, antenna systems, etc. This allows the HT to have much further communications.



Simple to connect and operate, the RB-1 has only two 8-pin microphone-type connectors on the back panel to connect the squelch of rig A to the PTT line of rig B along with proper logic and audio coupling. With the front-panel switch "off," both rigs operate normally. The RB-1 also can be used as a simple, effective repeater control. Size is $4\frac{1}{4}$ " \times $4\frac{1}{6}$ " \times $1\frac{1}{6}$ ". Price is \$49.95. For more information contact Heil Ltd., 2 Heil Drive, Marissa, FL 62257, or circle number 106 on the reader service card.

Wahl Clipper Corporation ISO-TIP Electronic Technician Drill

Wahl Clipper Corporation has introduced a completely redesigned version of its ISO-TIP high-speed electronic technician drill. The new 13,000 rpm drill features an improved 3-jaw chuck. By depressing a small button that holds the shaft steady, the operator can adjust the 3-jaw chuck to virtually any size aperture to accommodate drills and burrs with a shank diameter up to .125 (1/8 inch).



Weighing less than 5 oz., the drill's compact 6 inch length allows it to be used in confined areas and within cabinetry. Its new rugged housing fits more comfortably in the hand, with the on/off switch on top near a swivel ring for hanging between uses. A 9 foot cord provides a wide working radius. Burrs, abrasive wheels, or discs can be added to expand the drill's versatility to carve, shape, form, or route on wood, plastic, leather, and a variety of materials. For more information, contact Wahl Clipper Corporation, Sterling, IL 61081, or circle number 102 on the reader service card.



For the avid DXer, filling in the holes on the needed list is not just a desire, it's an obsession! W9KNI takes us through his quest to capture a 5U7.

A DXer's Log Book

BY BOB LOCHER*, W9KNI

t is a warm evening in September, and my wife and I are enjoying an early evening stroll around our usual walking circuit. With darkness coming earlier, the first stars are already peeking through the twilight glow, and we are enjoying the feeling of the light breeze on our faces.

The completion of the normal circuit is suspended when my 2 meter hand-held, tuned to the DX repeater and always carried on our evening walks, barks out, "5U7SI, that's Five Uncle Seven Sugar India, fourteen-oh-twenty-three, fourteen-oh-twenty-three, listening up ten, here's WD9IIC." A 5U7—that's certainly one I need, and from the sound of it, ace DXpeditioner DJ6SI is probably at the helm.

The pattern fits, even based on the brief information from the DX alert on the local DX repeater. The frequency is the one that DJ6SI always uses, and he likes to operate from the rare African countries. He usually operates through the night, and sleeps, if he does, through the day. A legit 5U7 would be a very nice surprise and a great catch; there has been no rumor in the DX bulletins of anyone on from there nor of any DXpedition.

Needless to say, considerations of this nature occur to me as I am running the shortest route home to the shack. It is a good thing that we were nearly done with our walk so that I don't have far to go. My wife keeps up with me for several blocks, but when she spies a friend in her yard, she stops and bids me luck as I race on.

I know that I was on 20 c.w. last night, so the rig is still tuned up. And I used the linear last week trying to hold my schedule with Colum, my Irish friend, as the band faded, and that was on 20, too. So the linear should be ready without tuning up. After my last QSO last night, I had the antenna on the Pacific. Did I turn it back to the east when I closed down? I can't re-

member. That's one thing to check when I start firing up.

Within a few minutes, I am at the rig waiting for the rush of noise from the old receiver as the tubes warm up. The old 75A-4 is a veteran of many campaigns, some successful, some not. But they were all fun. And the old war horse still has a lot of years left in it. The 32S-3, sitting beside it, comes to life as well, while the antenna turns, agonizingly slowly it seems, from the southwest to the east. I check my second-op. OK, not dead east, but rather a bit north of there, 80 degrees.

I crank the receiver dial to 023 and hear the 5U7 almost immediately; at least I presume that it's the 5U7 when I hear a "K9MM 5NN BK." MM lives not too far from me; I should be able to find him easily. I jump the receiver up 10 kHz and start quickly looking for him. But before I can find him, I hear MM shouting over the 2 meter DX net, "Thirty seven, thirty seven!" I hop the receiver back to 023; yes, there's the station signing, "QRZ DE 5U7SI UP TEN." I blindly jab the transmitter v.f.o. to 037, not having had a chance to set myself up on MM's frequency.

I stroke out my call on the gleaming Bencher paddle just once. That's DJ6SI operating for sure; all the characteristics are there, and that means short calls like "DE W9KNI K." I listen again. Yes, there he is, "WB4OSN 5NN K." I jump the receiver back up to 037 as a starting point to look for WB4OSN. Nothing there. I start to move the receiver up higher. Yes, there he is just above 038. I pull the transmitter v.f.o. up and set it a couple of hundred Hertz above 4OSN. It's a good thing that I do it quickly, as even as I get the v.f.o. there, WB4OSN turns it back to the 5U7.

I don't have time to move my receiver back down to the 5U7's frequency; he's going too fast for me to get down there again for him. Instead I wait, listening to the WB4OSN transmit frequency, which is relatively quiet. Besides, I might as well see what kind of a pileup we have here.

Suddenly the frequency explodes.

Wow! I call, but what I thought was going to be an easy chip shot clearly is already a knock-down, drag-out, pier-six brawl. Apparently, by the time that the 5U7 was called in by our side, the rest of the world was already in there slugging it out. And I don't have reservations, either. I pop the receiver back to the 5U7's frequency. Ah, just in time, 'W9LM 5NN K.'' Rats. As I heard the W9 part, my hopes rose, only to be dashed an instant later. Oh well. W9LM's in Madison; he'll be on backscatter. I look for him, but in the few seconds that I have before I know that the 5U7 will be back, I am not able to find W9LM.

Help arrives from another quarter. My 2 meter rig opens up: "Thirty nine, thirty nine!" I recognize K9MM's voice; nice of him to wait and help spot now that he has his QSO in the log. I move the v.f.o. up to 39, then about a half kilohertz higher. Obviously, the 5U7 is moving up after each QSO. Yes, that's always the way that DJ6SI does it. And yes, it is DJ6SI; "R QSL VIA DJ6SI DJ6SI QRZ UP 10 DE 5U7SI K." Besides, there are very few DXpedition operators who are that good.

My fingers effortlessly stroke my call out on the polished lucite paddles; my mind is away concentrating on strategy. I open the receiver. He's coming back to a one; it's W1HZ. I look back up around my own frequency; yes, there's W1HZ, with a good loud signal, too. And he's very close to my transmit frequency. I set up about 500 Hz above him; that should be about right, and I get the receiver back down quickly, just in time to hear the 5U7 call his QRZ. I call again.

I listen; he's back. His transmit frequency is fairly clear for a change, and he's reasonably strong, a pleasant change from that recent DXpedition to Mount Athos. Of course, conditions are a lot better to start with, and besides, this is an easier path. Who's he back to? OK, it's W4QQN. I move the receiver back to just below 040.

I listen. There's no sign of 4QQN. That's funny; he should be loud here. He always is. Maybe he didn't hear the 5U7

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come back to him. I quickly move the receiver back to 023, but no, there's the 5U7 signing clearly with W4QQN. I set the v.f.o. at 040, and call.

OK, he's back—to K5LM. There, he turns it back to the five. Quick, move the receiver back to 040. Got to find LM. Where the heck is he? I ought to be able to hear him, too. I look quickly between 038 and 043, but no luck. Maybe K5LM didn't hear the 5U7 come back. I move my receiver back down. At the speed that DJ6SI moves, you can't sit around thinking about it; he'll work six fellows while you take a swallow of coffee.

Yes, K5LM was OK. The 5U7 confirms and calls QRZ again. I call, but I don't like this one bit. My confidence factor has done nothing but go down since I started into this pileup. I thought that I had his tuning pattern figured out, in which case with a little luck it would be only a matter of time before I had the 5U7 in the log, but I've lost the thread somewhere, and I'm misfiring. My timing for the 5U7 is fine, just about perfect; when I listen he transmits, and when I'm transmitting he's listening. But that's not good enough in this mess; I have to also be calling on the right frequency, and I'm not.

I listen again. There, he's logging K2MGR. Boy, the whole eastern part of the country is getting him, and it's no wonder. That's a path where we are all nearly equal. Things are a bit tougher for the west-coast boys, but then they get their opportunity to get even working the BY's. Where's MGR? I look, but again without any luck. This situation is revolting. I keep trying to listen higher, but there's nothing there.

He must have switched receive frequency and started listening much lower, although he still keeps sending, "UP TEN." I better start looking about 6 or 7 kHz above him. OK, who's he working now? K8MFO. Quick, look for a backscatter signal again. I move the receiver to 029 and start moving up. Hah! Paydirt! I hear 8MFO, not strong, but it's definitely he. I move my v.f.o. back down 10 kHz to just above MFO's frequency. All that time during the last five or six QSO's I was way too high.

But good for DJ6SI. Apparently, he is determined to keep the pileup not more than about 10 kHz wide, which for a pileup this huge is reasonable. There have been a few incidents recently where pileups have gotten completely out of hand due to the pattern set by the DX station, so that 50 and even 100 kHz were used for a pileup. That sort of situation gives DXers and DXing a black eye, as other users of the band get blown away by the QRM.

The 5U7 clears with MFO. I call. He's back. Blast, someone is tuning up on him. I can't copy the call. Could it have been me? There, the tuner-upper stops, and there's the 5U7 again calling K9AJ with a repeated call. I hop back up to my trans-

mit frequency when the 5U7 turns it over and find AJ almost exactly where I was calling. Alright! I'm ready now. I move the v.f.o. a hair above AJ and pop back to the 5U7's transmit frequency. Yes, he clears with AJ, and I call.

I listen again. My confidence is returning now that I've found what frequency people are calling him on. He's back to another 8; it's W8VSK. I listen for VSK—there, just above my transmit frequency. Right, guess I should have called up a little higher. I move above VSK about 300 Hz. I'm ready. Back to the 5U7.

Arghhh! "R 73 ES TNX MUST QRT NOW ES GET SOME SLEEP BK QRV AGN TMW 73 SK W8VSK DE 5U7SI CL." Blast! Darn! Ugh! But it's true. I listen carefully, and try a couple more calls in the fervent hope that somehow he will suddenly realize that he needs another W9 in his log more than he need a few more minutes of sleep, but my hope proves to be in vain. Oh well; he'll be back tomorrow, and for sure so will I.

The next day is a string of frustrations at work. It seems as if Murphy is out to get me with a vengeance, and his aim is pretty good, too. As 5 p.m. rolls around it becomes more and more clear that for me quitting time will have to be a good deal later than usual. I do my best to remain bright-eyed and cheerful throughout the ordeal, but I suspect several people are on to me. Maybe it's the twitch of my fingers in a rhythmic fashion. Perhaps it's my agonized glances at the clock.

Finally, at 7:20, I'm out the door running for the car. As I start the engine, I'm already clutching the 2 meter microphone and calling into the DX repeater, "Hey, any sign of the 5U7 tonight? Here's W9KNI."

"You mean you didn't get him? Gosh, Bob, that's a shame. He went QRT about 10 minutes, no, now it's 15 minutes ago. I thought everyone who needed him got through. Sorry about that. Here's K9HMB. Are you sure that you really needed him?"

I relax; now I know I'm OK. On our DX repeater the fine art of leg pulling is second only to chasing DX together. "Gosh, Frank, how would you know? He sends way too fast for you ever to copy. Did you go out and buy one of those code-reader gadgets?"

"Naw. You're OK so far, KNI. He hasn't showed up yet."

"OK, Frank. Thanks. Here's W9KNI."

"Roger. But keep the greasy side down, and be careful, too. Remember, it's a QSL that you want, not a summons." Frank's right. I glance at the speedometer and slow down. I was going too fast. I really would like to get home before the 5U7 comes back on; it's certainly a lot easier to nail a DX station before the madding hordes get on to him. But even so, with the pileup that he had going last night there's sure to be a host of eager DXers listening primed and ready for battle.

I'm too late after all. I'm still several miles from home when the mobile rig pipes up, "OK, boys and girls, fun and games. 5U7SI, fourteen-oh-two-two, Five Uncle Seven Sugar India, fourteen-oh-twenty-two, go get him, here's Whiskey Alpha Nine Echo Yankee Yankee." Phooey! I almost made it home in time.

Within five minutes I am at the rig, once again waiting for solid-state technology to do its thing. By the time the receiver rushes to life, I am ready and loaded for bear. Again I find the 5U7 almost immediately. There seems to be more QRM on him tonight; apparently, the traffic cops have woken up to the idea that someone might be working some rare DX without them. But I am able to copy the 5U7 none-theless.

There, he's working K1ZZ. I jump the receiver up to start looking around 032. I get lucky; it seems that K1ZZ knows DJ6SI personally, as he sends him a brief greeting, and while he's doing it I spot 1ZZ and get my v.f.o. set a bit above him. I pull the receiver back down to the 5U7's frequency when K1ZZ turns it back. Yes, the 5U7 turns it back. Yes, the 5U7 turns it back. Yes, the 5U7 is responding.

Wait a minute. If I had time to find K1ZZ because of his longer transmission, I'd best figure that most of the other people in the pileup managed the same trick. I know that DJ6SI normally moves up 300 or 400 Hz after each QSO, and now I know too that he will only go up to about 39; then he'll move back down to perhaps 29 or 30 and start tuning his receiver back up higher from there.

But now there's sure to be a pretty good pileup around K1ZZ's frequency because of that longer transmission, and there should be a very good chance that the 5U7 will tune up higher than normal. So, the bottom line is that I'd best set up my v.f.o. perhaps the better part of another kilohertz higher to avoid the mob.

Just after I move the v.f.o. up, the 5U7 and K1ZZ sign. I call, and instead of my usual one-time call (DE W9KNI K) I send a 2X (DE W9KNI W9KNI K), and it works! I nail him! Nothing fancy, mind you, just a simple "W9KNI 5NN K," and my response, "R TU 5NN 73 DE W9KNI," but that's all that was needed. I'm in his log, and he most certainly is in mine. I take care to write down the GMT time immediately, before I forget to do it and then have to guess, reducing my chances of getting a quick card.

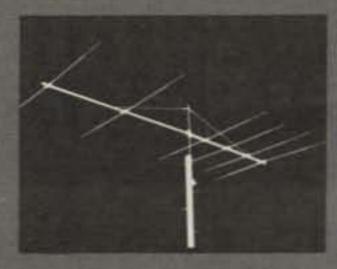
I glance over at the 2 meter rig. It is off. I don't remember whether I ever turned it on tonight, or if I turned it off to stop local QRM. I turn it on, just in time to hear K9MM saying, "Good work, Bob!" And I smile. It was, too. I finish up the log entry, then mark off my DX need list, always a very pleasant ritual.

My wife calls down the basement steps, as yet unaware of my triumph. "Bob, will you want some dinner?" You know, suddenly I'm really hungry.



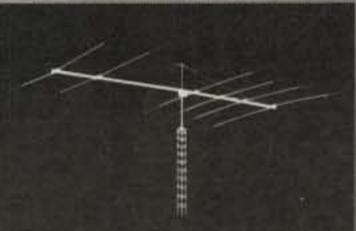
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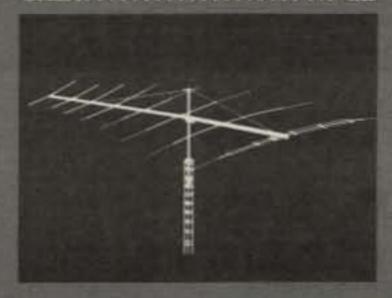


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VSWR: 1.5:1
F/B: 30 dB
FEED IMP: 50 ohms
ELEMENT LENGTH: 25 ft.
BOOM LENGTH: 36 ft.
WINDLOAD: 8.5 sq. ft.
GAIN: 10.5 dBd



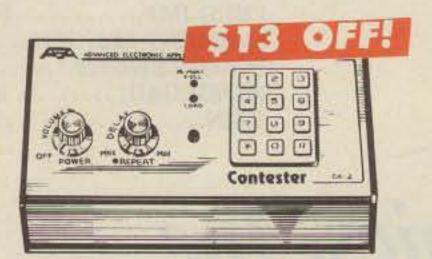
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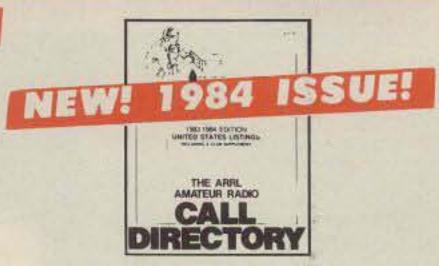
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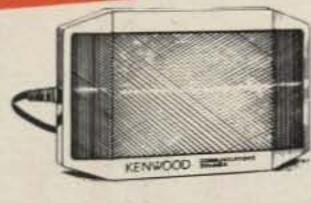


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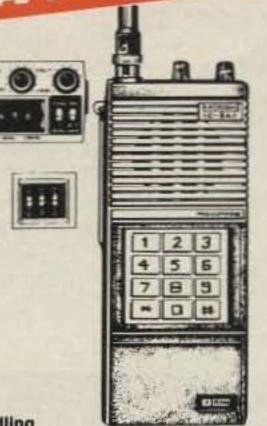
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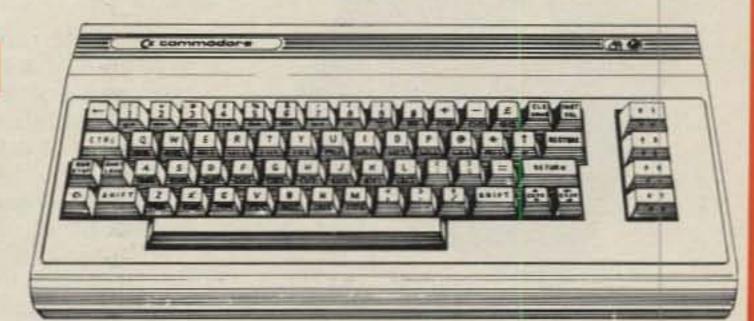


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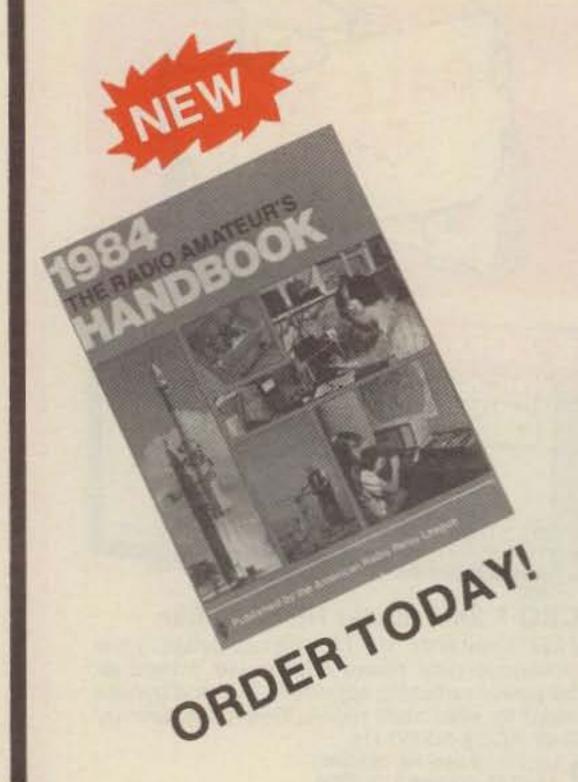
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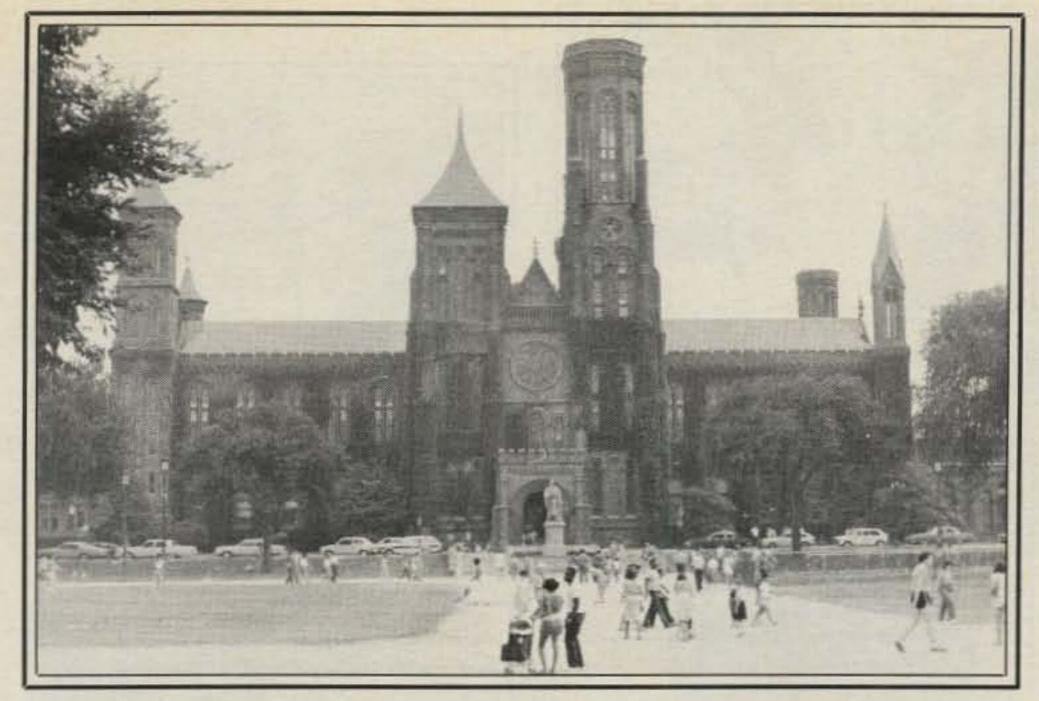
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To an earlier generation this is the Smithsonian—the old red sandstone "Castle on the Mall" building. The structure was designed in the Norman style of architecture by James Renwick, Jr., who also designed Grace Church and St. Patrick's Cathedral in New York City.



Main entrance to the Smithsonian's National Museum of American History, Washington, D.C.

There is something for everyone at the Smithsonian Institution in Washington, D.C., including many exhibits of interest to the radio amateur and the electronics enthusiast.

Communications And Electronics At The Smithsonian

BY KARL T. THURBER, JR.*, W8FX

The Smithsonian was described by Mark Twain as the "attic of the nation," as it preserves more than 75 million items of scientific, historical, and artistic note, and displays about 1 percent of them. Author Thurber points out that many of the Smithsonian's historical exhibits are of real interest to amateur radio operators and others involved in electronics, communications, and computing.

ad, I want to visit Washington and see the Smithsonian!" This request from my 13-year-old son initiated my family's four-day visit to see the sights in Washington, D.C., last summer. While what resulted was a "classic" tourist visit to the Washington attractions—the White House, Capitol, National Archives, monuments, zoo, and the like—a premier opportunity to visit the electronics exhibits

of the Smithsonian's National Museum of American History presented itself.

In this article we will first take a look at just what the Smithsonian is, surveying some of the twenty-odd major elements of this unusual institution. We will also examine some of the Institution's historical aspects. Then we will look at the communications, computing, and electronics exhibits at the National Museum of American History, with focus on amateur radio. Finally, we'll mention some other attractions on or close by the National Mall—the grassy sweep from the Capitol to the Washington Monument.

The Smithsonian

The Smithsonian Institution is a truly unique and vast museum complex, educational institute, and research center which houses the historical, cultural, and scientific collections of the United States. Sponsored by the federal government and centered in the nation's capital, the Smithsonian was founded in the mid-19th century in accordance with the

terms of the will of the eminent British scientist, James Smithson. He bequeathed to the United States more than \$508,000 (£104,960) for "an establishment for the increase and diffusion of knowledge among men."

After considerable debate as to whether the United States could accept the Smithson bequest (because of its overseas origin), the Smithsonian was created by Act of Congress on August 10, 1846, some 17 years following Smithson's death. It today fulfills historical, scientific, and artistic purposes by doing basic research and publishing the results; acting as a repository for more than 75,000,000 items of interest in many fields; displaying about 750,000 items; maintaining various educational programs; and exchanging scholarly publications on an international basis-naming some of the more noteworthy tasks.

The Smithsonian is administered as a private foundation under a government trust, being supported mostly by Congressional appropriations. The governing

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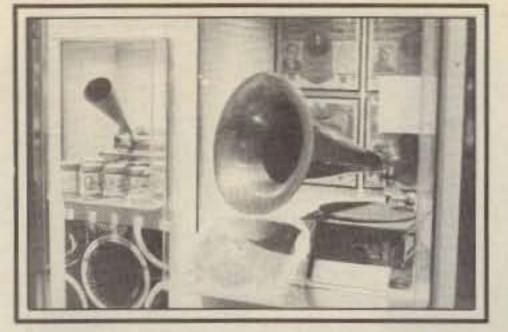
authority is known as the "Establishment," which consists of the president and vice-president of the United States, the chief justice of the supreme court, and the Cabinet (the heads of the executive departments). The Institute's actual governing body is the Board of Regents, which consists of the vice-president, the chief justice, three senators, three representatives, and nine citizen-members (selected by Congress). Actual administration is in the hands of an executive secretary. Interestingly, the first secretary was the distinguished physical scientist Joseph Henry, who served from 1846 to 1878; it is for him that the practical unit of inductance, the Henry, is named.

Today, there are some twenty-odd major activities which make up the Smithsonian complex. These can roughly be broken down into areas of science; history and art; public service and other activities; and self-governing bodies. Let's briefly run through them.

The best-known of the Smithsonian's scientific activities is the National Museum of Natural History, which houses some 56 million items. Other major scientific activities include the National Zoological Park, which is home for more than 2500 animals; the Smithsonian Astrophysical Observatory, founded in 1890 with headquarters in Cambridge, Massachusetts; the Smithsonian Tropical Research Institute, the Radiation Biology Laboratory; and the National Air and Space Museum, which includes premier exhibits such as the 1903 Wright Flyer, the Spirit of Saint Louis, and the 1969 Apollo II command module, Columbia.

In the realms of history and art, Smithsonian activities include the National Museum of American Art, the Freer Gallery of Art, the Arts and Industries Building, the Renwick Gallery, the Museum of African Art, the Joseph H. Hirshhorn Museum and Sculpture Garden, the National Portrait Gallery, and the Cooper-Hewitt Museum of Decorative Arts and Design (in New York City). The earliest and bestknown of the Smithsonian museum group is the National Museum of American History, formerly known as the National Museum of History and Technology. This museum documents U.S. civil and military history and demonstrates national progress in science and technology; within it lie most of the communications, computing, and electronics exhibits.

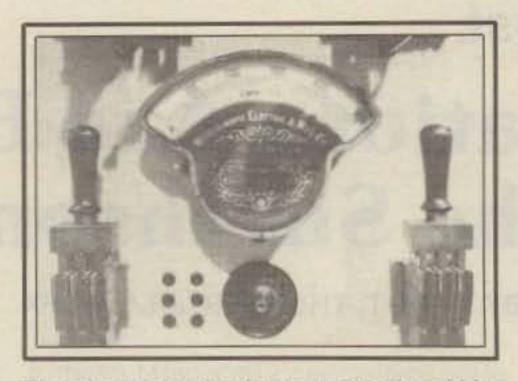
Public-service and related activities are carried out by a wide range of institutions and functions. These include the International Exchange Service of scholarly material; the Science Information Exchange; the Smithsonian Institution Libraries, with over 950,000 volumes; and the Archives of American Art. The Smithsonian magazine is published by the Smithsonian Institution Press, and the Institute also sponsors the Anacostia Neighborhood Museum, as well as the Smithsonian Associates (for interested



Early Gramophone and cylinders (left) and Victrola are shown in this Smithsonian display.



Amateur code breakers will be interested in this three-rotor German "Enigma" electromechanical cipher machine of World War II fame. The machine has no print capability, but it employs a 26-character light board to display, in turn, each ciphertext letter.



The electricity display in the National Museum of American History features this truly impressive 5000 ampere ammeter manufactured by Westinghouse Electric.

members of the public). The latter is a public education program; both individuals and families can participate in the organization.

In addition, three activities of the Smithsonian have their own board of trustees. The National Gallery of Art collects the best examples of American and European painting, sculpture, and graphic art; the John F. Kennedy Center for the Performing Arts contains superb facilities for opera, theater, concerts, and cinema; and the Woodrow Wilson International Center for Scholars sponsors a program for the scholarly study of political, social, and intellectual issues with an emphasis on problem-solving.

Let's look closer at the Smithsonian activity of most interest to electronics



This early, 1956-model Burroughs guidance computer was the first operational unit to use transistors rather than tubes. The Burroughs computer was known as the Atlas Guidance Computer, Mod I.



Resembling something from a sciencefiction movie, shown here is a portion of a one-million volt Van de Graaf accelerator of 1933 vintage.

hobbyists; the National Museum of American History, housed in a modern building on the north side of the Mall at 14th St. and Constitution Ave. N.W.

The National Museum of American History

Founded in 1846, the museum documents the country's civil and military history, and it dramatically illustrates American progress in industry and science. On hand in the museum are literally millions of items; most are the gifts of individuals, public and private institutions, or foreign countries. Many objects were transferred from government agencies—for example, coins, stamps, and patent models. More than any other of the museums, this one is largely responsible for Mark Twain's nicknaming the Smithsonian "the nation's attic." Included in the three

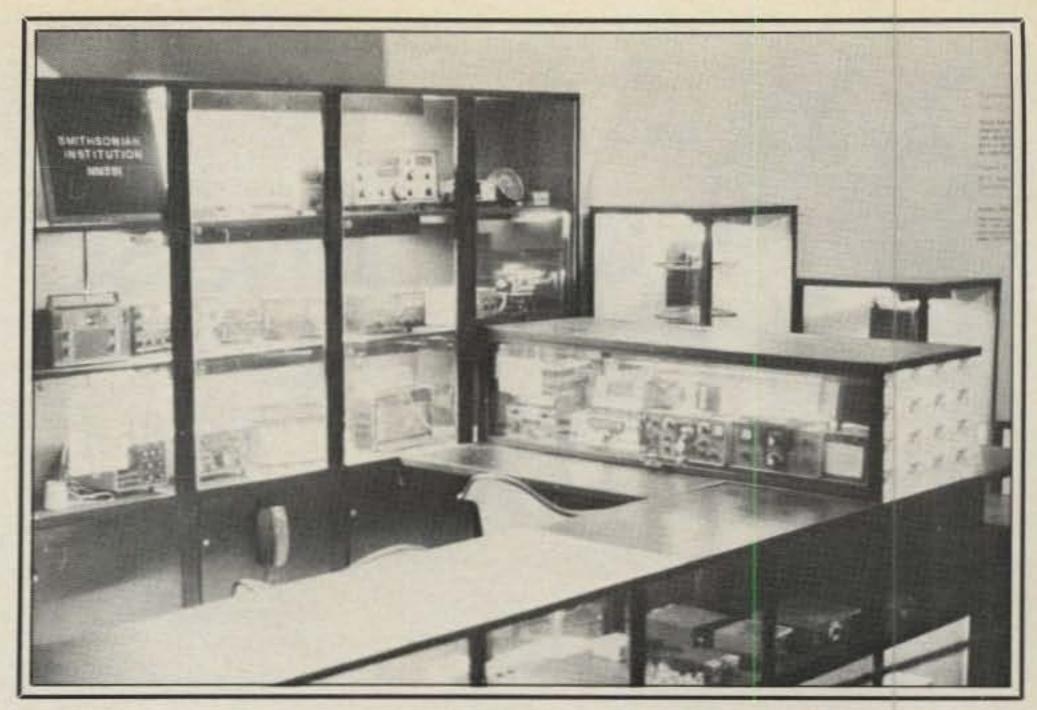
floors of exhibits are original models of Whitney's cotton gin, Bell's telephone, and Edison's phonographs, all on display.

Looking at the museum on a floor-byfloor basis, the lower level includes special exhibits, such as a display of American clothing that spans 200 years. The main, or first, floor includes detailed exhibits of American automobiles; railroads; tools; clocks, phonographs, and typewriters; physical sciences; nuclear energy; computing; and electricity. The computing displays focus on instruments for measuring and computing in the fields of architecture, astronomy, and ordnance; also included are a cross-section of computing aids, from the ancient abacus, to early 20th-century punchcard systems, to state-of-the-art solid-state devices. The display also treats electronic computer and software development since the late 1940s. Of special interest are the electricity exhibits, which lean heavily on the historic development of concepts, theories, and applications of electricity up to the 19th century. Contemporary displays highlight developments in laser and maser technology.

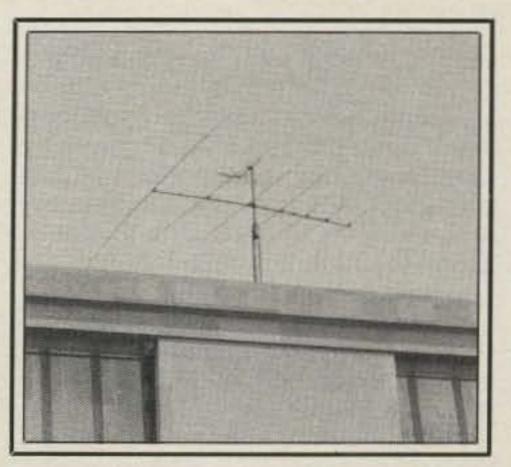
Heading upstairs, we find that the second floor houses the most popular exhibit of all, the collection of First Ladies' inaugural gowns, which are reflective of the women who once wore them, as well as the changes that have occurred over the past 200-odd years. The "A Nation of Nations," also on the second floor, is a huge exhibit that contains more than 5000 objects and graphically and forcefully documents the wide diversity of people who migrated to America. Of particular interest to amateurs is amateur radio station NN3SI, which was originally set up as a special-events station as a part of the "Nations" exhibit. The station, operated by the Smithsonian Amateur Radio Club Volunteers, sports a complete operating setup to demonstrate amateur radio capabilities across the h.f. and v.h.f. bands using a variety of operating modes, including f.m., RTTY, and SSTV. A regular schedule of operation and traffichandling is maintained so that the public can observe a cross-section of amateur operation.

Adjacent to the amateur radio exhibit is an interesting shortwave broadcasting and listening display which includes a large collection of foreign broadcasters' pennants (which are often issued along with the broadcaster's QSL cards). The display also includes the original Moscow-Washington "hot line" printer, a Russian-language machine manufactured in East Germany and installed in the Pentagon on August 30, 1963.

Climbing to the top floor of the museum, we find a number of other interesting exhibits, including those dedicated to Armed Forces history, ordnance, photography, money, printing and the graphic arts, stamps and the mails, and news reporting, among others. Surprisingly,



View of the Smithsonian Amateur Radio Station NN3SI. The station includes two independent operating consoles, one on each side of the platform. Capabilities include slow-scan TV, radioteletype, and amateur satellite communications.



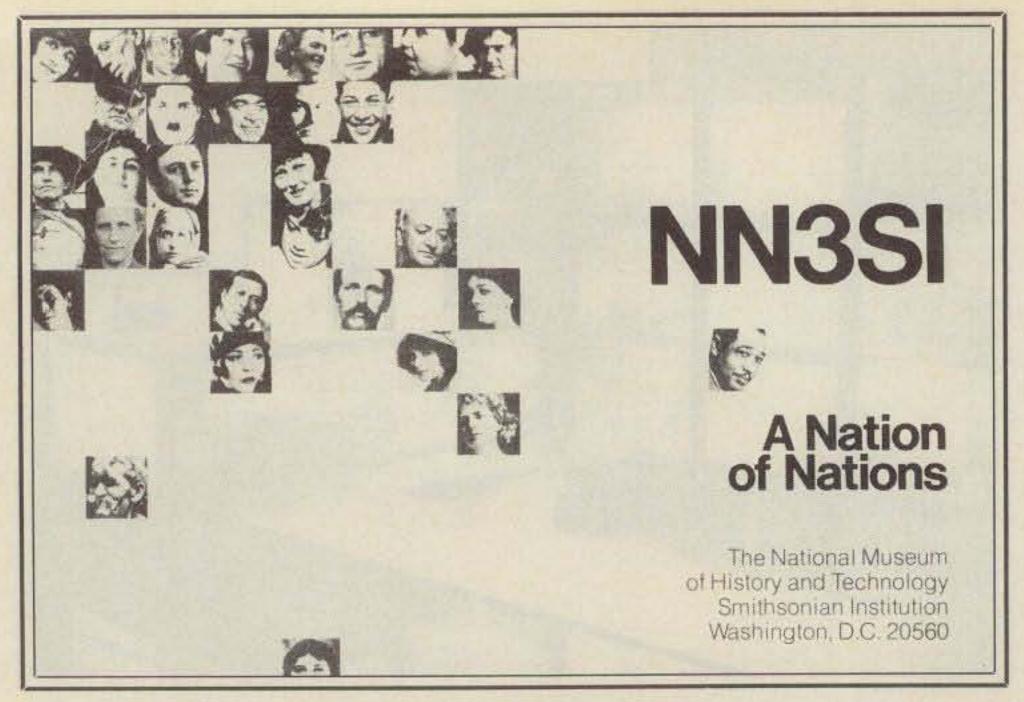
V.h.f. and h.f. beam antennas used by NN3SI atop the Smithsonian's National Museum of American History.

Original Moscow-Washington "hot line" printer. The Russian-language teletype machine was made in East Germany and installed in the Pentagon in August 1963.





All-purpose QSL (verification) card used by the Voice of America, which broadcasts more than 800 hours each week of news, features, and commentaries in 38 languages. Headquarters is at 330 Independence Ave. S.W., in Washington, a few blocks from the Smithsonian.



QSL card from amateur radio station NN3SI, which is located in the Smithsonian's "A Nation of Nations" exhibit on the second floor of the National Museum of American History. Note the former name of this museum as indicated on the QSL card.

many of the third-floor exhibits of particular interest to the electronic hobbyist are grouped in the "news reporting" exhibits. These demonstrate the wide-ranging changes that have occurred in communications technology, to illustrate the impact of technological invention on news reporting. Included are newsreels, radios, television sets, teletype machines, and telegraph equipment, all of which are in continuous operation. Space satellites, as well as rare newspapers, still photographs, and prints, are also on display.

At this writing the museum is open from 10:00 a.m. to 5:30 p.m. daily Eastern time. A cafeteria and snack bar are located on the lower level. There is no admission charge, and specialized tours for

school and adult groups are available by appointment. Several information desks are located in the museum. In addition, there is a visitor information facility located in the old, red sandstone "Castle on the Mall" building, which, incidentally, was designed in the Norman style of architecture by James Renwick, Jr., who also designed Grace Church and St. Patrick's Cathedral in New York City. The Great Hall in this venerable old building also features exhibits relating to the Smithsonian's history.

For general information on the Smithsonian, you can write to the Visitor Information and Associates Reception Center, Smithsonian Institution Building, Washington, D.C. 20560. The Smithsonian's phone number is 202-357-2700. For recorded daily announcements on Smithsonian activities and events, the "Dial-A-Museum" number is 202-357-2020.

Nearby Attractions

A worthwhile visit to the Smithsonian National Museum of American History can take a day or more, and a serious examination of the seven Smithsonian buildings on the Mall can take up to a week. Depending on one's interests and orientations, there are some other stops one might wish to make in the Mall area which would appeal to many readers.

One of these is the Voice of America located on the second floor of 330 Independence Ave., S.W., in the Health and Human Services Building. At this writing, tours are given at 8:45, 9:45, and 10:45 a.m., and at 1:45 and 2:45 p.m., Mondays through Fridays. Interestingly, the VOA's Washington facilities include 26 studios in addition to the master control for the worldwide, 105 transmitter network.

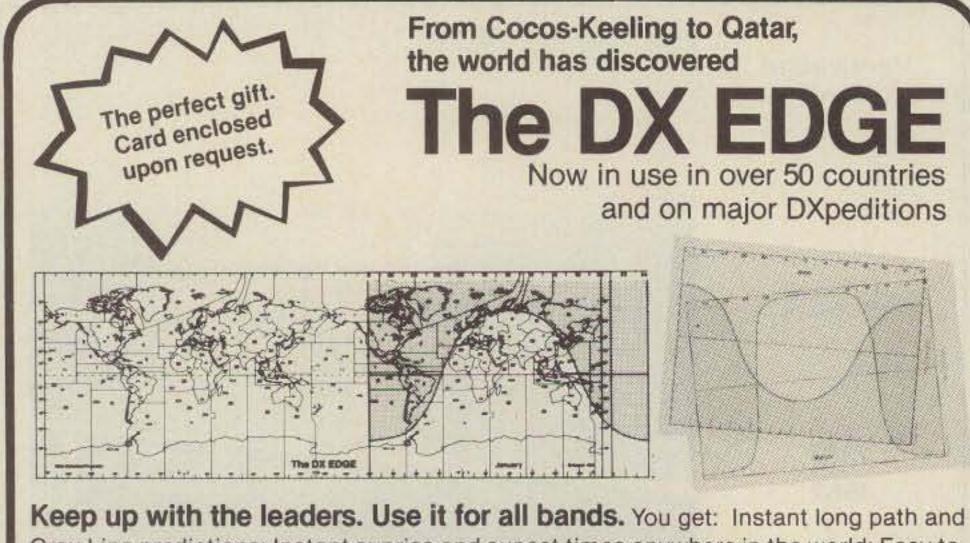
Other important government headquarters in the Mall area include the National Aeronautics and Space Administration and the Federal Aviation Agency, both south of the Mall on Independence Ave. Also, the National Archives are located just north of the Mall on Constitution Ave.

Naturally, a comprehensive visit to Washington would include a stop at several of the five other Smithsonian buildings that are in off-the-Mall locations: the Capitol, the White House, the Washington Monument, the Lincoln and Jefferson Memorials, the Bureau of Engraving and Printing, the Supreme Court, and the Federal Bureau of Investigation, to name but a few of the countless, free or almost-free Washington attractions. Those with children will especially appreciate the 2500animal National Zoological Park located in Washington's 1754-acre Rock Creek Park, which is, as mentioned previously, a part of the Smithsonian. More than 600 species of animals can be found at the beautiful 165-acre zoo, which houses the famous Chinese giant pandas.

Summary

In this article we have taken a look at the Smithsonian Institution, its history, and its current status. We have especially emphasized the electronics, computing, and communications exhibits, as well as amateur radio station NN3SI of the National Museum of American History. We have also highlighted some of the nearby facilities that might be of interest to the electronics enthusiast.

Regardless of your specialized interests, it's likely that you will thoroughly enjoy the attractions of the vast museum complex. If you are "into" electronics, the scientific and technological exhibits should be definite "musts" for any Washington visit. Don't miss the Smithsonian, and allow ample time to properly enjoy the multitude of "only here" exhibits!



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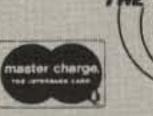
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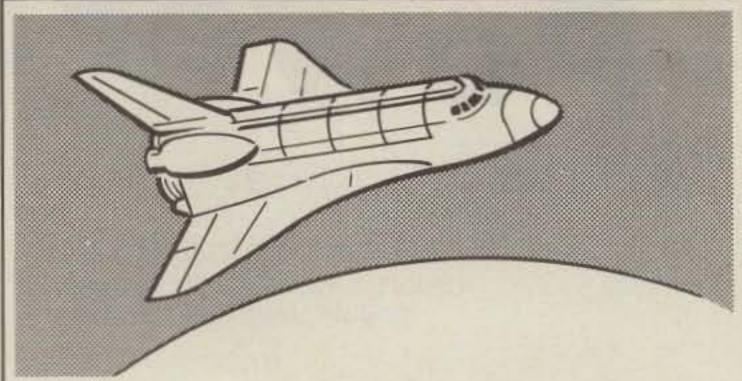


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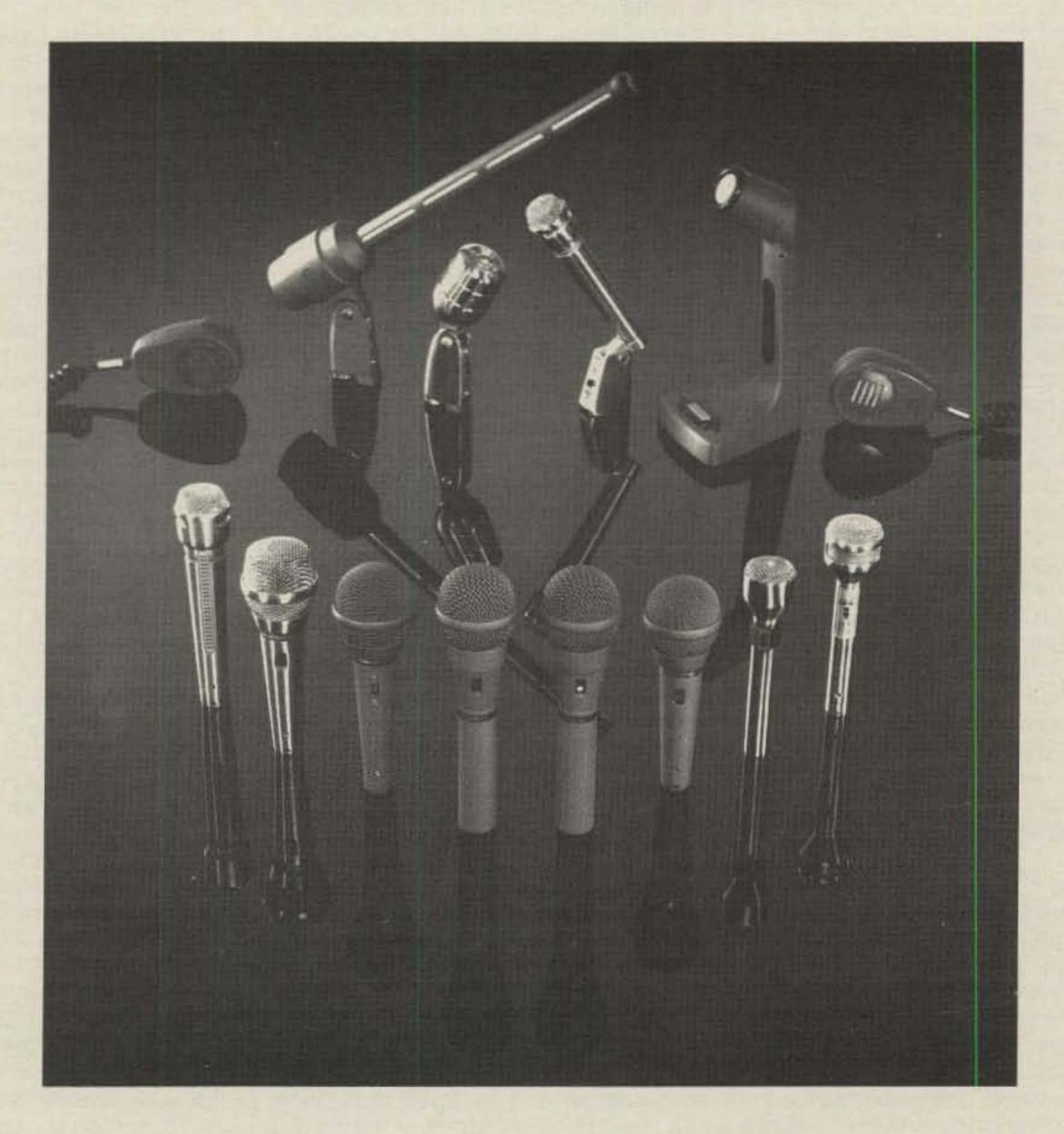
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Those Who Have Gone Before—N6HY

had just returned from a summer trip back east, where I'd pushed my Honda 550F through the torrents of traffic flowing along the east coast freeways and streets while I made my way to various libraries possessing copies of an old 1604 book I've been researching. I hadn't had much time to prepare for the trip due to an all-out effort at getting The QRP'rs Guide to Antennas/Transmission Lines, Propagation, and DX'ing in the mail before I left. After it went out on June 10, I hastily readied the cycle for the trip and headed down the highway about 45 minutes behind a thunderstorm. Luckily, I caught up with only one storm all summer. However, at times the 100° heat made me wish that it was raining instead.

In the haste of packing, I tossed my latest 20 meter transceiver design into the suitcase just in case I'd find an opportunity to get on the air from a motel. All summer long the little QRP rig kept me in touch with the world of QRP, either by pulling in QSO's or by just sitting there in various motel rooms. It reminded me of the QRP spirit from the early days, when everyone built their own rigs. Not knowing whether they could get out on 200, then 100, then 80 meters, and on down, they'd put the homebrew construction on the air and listen and call until someone answered. I was reminded of that sense of exploration, that curiosity about how the rig could be improved to achieve better results.

Operating the little transceiver from motel rooms showed me the weaknesses in the design, just as in the pioneering days. Our QRP ancestors discovered that a d.c. battery-powered rig produced a much more readable signal than did the raw-a.c.-type supply then in general use. Then one watt signals from 199 receiving tubes, pure-toned and rock-steady, began slicing clear paths through the dense forest of QRM generated by 150 watt raw-a.c. buzzers, pushing the power versus distance limits farther out and then beyond anything that anyone dreamed possible. And the radio world took notice.

The "watt burners" and "tribe of ampere hounds" and "thunder factories" all came under the attack of the ARRL in the pages of QST. Editor K.B. Warner editorialized on the subject in the March 1925 issue, noting that range was no longer di-

rectly proportional to power as in the spark-gap days: "Today, with C.W., all that is changed, and the '5-watter' gets as many cards (QSL's) from the opposite coast as the big fellow with the two 250's (250 watt tubes). Power doesn't cut much ice anymore. The 5-watter gets in all the tests and often as not grabs the bacon from his big brothers and goes home with it." (Yes, such rational sentiments actually appeared right up there in front in the QST of those days!)

It seems to me that QRPers have to be reminded every now and then of the real spirit of amateur radio. Sure, collecting QSL's for WAS QRPp or DXCC QRPp with store-bought rigs and store-bought antennas is alright, but only as long as this approach doesn't smother the true QRP spirit that each of us experienced when we made our first, amazing low-power contacts. That spirit has to do with a dedicated sense of exploration, of testing frontiers, of learning more about propagation and radio so that we can do more with ever less.

So, when I flipped through the July 1983 issue of the QRP Quarterly and came upon the notice on page 7 "Dan Lewis II, N6HY, QRP Recordholder, is Killed in California Car Crash," a wave of sadness flowed through me as I thought, "Damn, another true QRPer into the ranks of those who have gone before. Another who carried the QRP spirit in his heart and worked to show others what it is all about." The second sentence struck me: "The 31-year-old Lewis was on his way home after speaking on QRP to the Fresno ARC." Somehow, this doesn't make the QRP world's loss any more tolerable, but it does leave room for imagining that Dan's fatal trip home was clothed in a sense of satisfaction at having shared something he loved. And hopefully, he'd been rewarded at the Fresno ARC meeting by seeing the flame of the QRP spirit flicker and come alive on the faces of a few of the listeners. I think he probably felt this sense of satisfaction. He was a teacher in the vocational arts program and coached track at Templeton High School, and as a teacher myself, I just know that he probably drove back with that sense.

"But," I thought, "that shouldn't be the end of it," remembering that N6HY had been dedicated not merely to enjoying his QRP hobby personally, but also to spreading the spirit through his talks and contributions to the QRP Quarterly and

other publications. What better way to complete his work than by dedicating a column to his efforts, sharing his sense of the QRP spirit with the rest of our gang. The logical place to begin is with the report he sent to me on February 6, 1983. The cover letter explained the nature of the report. It reads:

"Enclosed is a copy of a request to the QRP ARC I for an award for transmitting/ receiving information via c.w. using less than 100 microwatts (0.0001 watt) over a distance of about 1500 miles. This works out to more than 15 million miles per watt. Feel free to use any of the information in your publication if you wish to. I feel that experiments like the one described in the attached letter are great fun and can really show what can be accomplished with an extremely small amount of power. Just think: 100 watts would be enough to power every ham station in the world at a level of 100 microwatts (100 × 1/1000 = 1,000,000 stations!)."

The enclosed application letter to Bill Harding, K4AHK, Awards Manager of the QRP ARC I, details the efforts that went into establishing the new KM/W record. Dan wrote:

"I wish to apply for the KM/W, 1000 miles-per-watt award. I don't know if the award requires that the power output claimed must match the power output used to establish contact or not, but I do feel that the following accomplishment should be acknowledged in some manner.

"I have done quite a bit of experimentation with ultra-low power outputs, but have never approached the levels reached on January 9, 1983 between 2255 and 0001 UTC with Charlie C. Ebert, located in Kansas, OK, on 28836 kHz. Charlie was running barefoot and seemed to be coming in very strongly, so I knew that the time was right for a low power experiment. Charlie was open to the suggestion, so we proceeded by attenuating my 2 watt s.s.b. signal in steps of 10, 20, and 30 dB. He still copied me solid at a level of several milliwatts. We had varying degrees of success with various levels of output, and then decided to reduce to the 50-100 microwatt range on c.w. and wait for a peak in propagation. When the propagation peaked, Charlie gave me the 'go' and I transmitted the 4-digit number of 6735 at 2339 UTC. Charlie correctly responded with 6735, and I transmitted 'eureka' back on 2 watts s.s.b. It was difficult copy for Charlie, but we did meet with success. Fortunately, he had a good set

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of headphones. The conditions deteriorated rapidly as 0000 UTC neared, so we signed off. We both ended up with a great feeling of accomplishment. I particularly admired Charlie's ability to copy a signal of less than one ten-thousandths of a watt. The experiment also underscored the QRP capability of the 10 meter band. The method of obtaining the ultra-low power is as follows.

"When I fed a 50.7 ohm dummy load with 28.7 MHz and rectified the r.f. signal with a 1N191 (as per Ade Weiss's article in the January 1981 QRP Quarterly), I obtained a d.c. voltage reading of 12 volts on my Fluke 802 after 8 seconds. When I inserted a 30 dB attenuator, I obtained a d.c. reading of 0.34 volts after 8 seconds. These voltage readings correspond to power measurements of 1.42 watts and 0.00114 watts (1.14 mw) for a power ratio of 1246:1, or slightly less than a 31 dB drop. The same procedure was followed using a d.c. voltage to the dummy load, and an attenuation of slightly over 30 dB was observed. The conclusion is that the attenuator is doing its job properly and should be dropping a 1.5 watt signal by at least 30 dB. It follows that lower power signals will be attenuated by 30 dB also. (I would expect that the rectifying diode circuit cannot be expected to accurately measure r.f. voltages much below those measured in the above procedure.) (Ed. note: Hence N6HY's setting transmitter output to a measurable level, and then inserting the 30 dB attenuator.)

"For the actual experiment, the c.w. output level of the Argonaut 505 was adjusted to less than 0.1 watt as measured on an MFJ Power Sentry equipped with a 2 watt slug. For a power output value of 0.067 watts (67 mw) 2.6 volts were measured across the dummy load. Using the 30 dB reduction figure obtained earlier with a measured output of 0.067 watts before attenuation, attenuated power is 67 microwatts, which can probably be taken as a 'liberal' figure. When one acknowledges that the antenna is not a purely resistive load and that standing waves contributing to transmission line attenuation were on the line, the actual power reaching the antenna was below the measured 67 microwatts. The antenna used for the experiment is a random Vee-beam with legs about 115 ft. long in an east-west orientation. Even so, I would like to submit the 67 microwatt level for the award and will continue to attempt to find more accurate methods of measuring these extremely low power levels. I realize that the system used above has its limitations."

Dan's KM/W record of 21,597,015 miles-per-watt will be a difficult one to beat. He approached his hamming with that curiosity characteristic of the early QRP pioneers summed up in the proposition "I wonder whether it can be done." His article in the July 1982 QRP Quarterly reflects this approach. Entitled "1000 Miles per Cubic Inch?", Dan described

the results of his efforts at miniaturization by posing some interesting questions and offering a challenge to QRPers:

"How about working 1000 miles per cubic inch rather than 1000 miles per watt? Homebrew subminiaturized highfrequency transceivers are a reality, but who has the record for the greatest distance from the smallest rig? The rules are arbitrary, of course, but perhaps the radio should be completely self-contained, including the battery. The only external devices allowed would be the antenna, the ground, and an earplug. The battery requirement would virtually eliminate use of the higher powered rigs in the 2 watt class. Perhaps two classes could be incorporated, one class with the battery cubic-inch size added to the cubic-inch size of the radio, and another class allowing the use of an external power source. The latter class would probably be the most popular, but the self-contained battery class does have possibilities.

"Just how small can a radio transceiver be? Some of the latest readily available components should allow for some really tiny radios. A few transistors, some tantalum capacitors, % watt resistors, and a small chunk of perfboard should make a transceiver stuffed into a 2 cubic-inch box a tangible item. Perhaps point-to-point wiring would produce the smallest rig. It would look like a lump of parts soldered together, but it would probably

work! The greatest breakthrough would be if someone designed an IC chip specifically for this application. Imagine an h.f. transceiver designed into a chip with a few toroids and resistors tied in for good measure.

"The ½ watt rig used here measures 2¼ × 1¼ × 4¼ for 11.9 cubic inches without the battery. It has allowed contacts of up to 59 miles per cubic inch, but it is probably capable of 300 miles per cubic inch on 40 meters under ideal conditions. To keep this in perspective, an Argonaut working a station 6000 miles away would be accomplishing about 14 miles per cubic inch. Can you beat the 59 miles per cubic inch achievement? If so, write in to the *QRP Quarterly* and tell us about it."

I'd be interested in finding out what the fellows are doing in this area, too. Seems like the G-QRP Club thinks along these lines also. Last year G3RJV, Editor, instituted a competition of a similar nature among club members. The award went to the QRPer whose homebrew rig, consisting of no more than 20 components, achieved the greatest distance averaged from several contacts. SPRAT bristled with the resulting designs and records for a couple of issues after the deadline. Ingenuity was obvious in all cases. Like Dan's proposition, G3RJV's inclined QRPers to think about what it takes and with how little one can get by. Oddly



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enough, their resulting circuits looked as simple as those appearing in QST, Radio Broadcast, and other radio magazines back in the pioneering days when c.w. was in its infancy and the assault on the high frequencies was underway. It is the only way to learn, from ground up, what is inside one of those fancy new rigs such as the ICOM 720 with all the knobs and switches, and how it all works together. That's what the QRPer ought to aim for in his pursuit of our branch of the hobby.

Another aspect of QRP that interested

Dan was the portability of QRP gear. This is one of QRP's main attractions. He shared his expertise in this area in the April 1982 issue with a "QRP in the Mountains" article which provides very worthwhile advice.

"Backpacking and QRPp go hand in hand, provided the camper/operator knows how to plan a trip properly. Rigs of more than 5 watts are impractical for backpacking because of the weight of the power source. If backpacking is the primary purpose, then a minimum rig such

as a crystal-controlled, ultra-lightweight unit that will fit in the palm of your hand should be used. But even this is a trade-off in that the advantage you gain in weight is offset with a loss in flexibility. On the other hand, if your goal is to combine a backpacking experience with efficient operation, a full-blown, v.f.o.-controlled sideband rig such as the Argonaut is your best option.

"One convenient way to haul heavy gear is to backpack in groups. The chief op carries the rig, while others in the party divide the remainder of the equipment among them. My personal philosophy is to haul the extra weight but keep the milesper-day traveled down to a comfortable, manageable level. Consider your priorities: Would you rather take a larger battery and extend your operating time, or would you rather bring along an extra canister of gas for the stove? I have always enjoyed breaking out a can of peaches or pears at the summit of a mountain while others choke down freeze-dried food!

"But don't shortchange yourself on cold-weather or pure survival gear for the sake of taking a rig along. Radio equipment must not displace these items, or your survival is at stake. Of course, you do have the advantage of being able to radio for help in an emergency with the

rig along.

"A good antenna for backpacking is an end-fed wire or a dipole fed through a lightweight transmatch. If you are below treeline, a rock tied to a cord and thrown across a limb can be used to pull your antenna into place. If you are above the treeline, consider a collapsible mast. Sometimes a convenient ravine helps get the antenna above ground level, if you have enough lightweight nylon cord to span the distance.

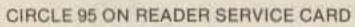
"Plan your excursions to allow plenty of time for slow walking speeds and ample operating time. Consider also that altitude sickness takes most of the fun out of any mountain experience. Try to acclimate yourself for at least a week if you will be at more than 6,000 feet. Make sure you apply well in advance for whatever permits needed to enter wilderness and other areas. Some popular areas, such as the Mt. Whitney region, require permit applications several months in advance. Fig. 1 gives a 'schematic' and 'parts list' for a QRPp backpack for weekend excursions. I expect to be in the Mt. Whitney area and on the air QRPp the weekends of July 1-3 and August 1-3. I will be using the QRP ARCI band plan and will be listening for QRP and QRO stations alike."

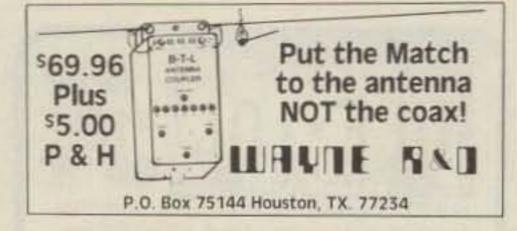
And so, Dan Lewis II, N6HY, has gone from our midst, but hopefully his efforts at sharing the QRP spirit will continue to inspire others. Next time you're on the air and remember Dan's attitude and commitment to QRP, slide onto the QRP calling frequency and without fanfare quietly sign off with him. QRP signals go a long way, and who knows . . .

N6HY 73 de WØRSP









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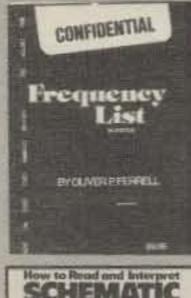
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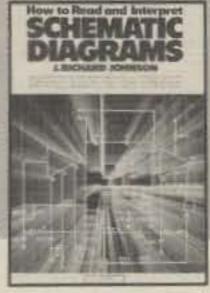
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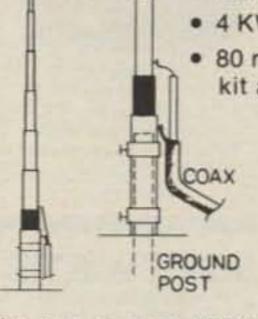
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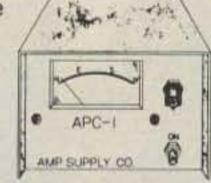
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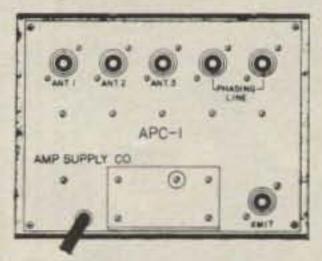
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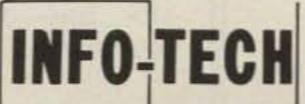


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The "AIRWAVES" that is, thru the Microlog AIR-1, a single board terminal unit AND operating program in ROM that needs no external power supply or dangling extras to put your computer on CW & RTTY. And what a program! The famous Microlog CW decoding algorithms, superior computer enhanced RTTY detection, all the features that have made Microlog terminals the standard by which others are compared. Convenient plug-in jacks make connection to your radio a snap. On screen cross tuning indicator and audio pitch reference tone make it easy to use. The simple, one board design makes it inexpensive. And Microlog know-how makes it best! There's nothing left out with the AIR-1. "HARD-WARE" front end has: AFSK, PTT, ± CW/FSK keying

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Note: VIC-20 is a trademark of Commodore Electronics, Ltd.

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"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

History of the Novice License—Conclusion

he first two parts of this article, which appeared in the October and November columns, should be read to fully appreciate this concluding part.

Applications and Examinations

The application form (610), examination procedure, and the Novice license exam have all changed during the past 32 years. Most of the changes have been improvements.

FCC Form 610 Application for Amateur Radio Station and/or Operator License. This form has undergone many changes. The August 1980 version is easier to use than previous issues of this form. The information that is usually required of an applicant appears on the front side of this form. The volunteer examiner's written examination request and eligibility certification, plus other data, appears on the reverse side of the form. The three printed pages attached to each form 610 provide detailed instructions regarding proper use of this form. If you need a form 610 and are having trouble getting it, you are welcome to request one from me, making sure that you enclose the usual self-addressed, stamped envelope with your re- | selected answers of like-numbered quesquest. I only have enough of these forms to answer individual requests.

Written Examination Answer Form, This form has been revised several times since it was first put into service. It is now easy to use. It still has the odd requirement that the examination number must be written on the back side, even though it is stamped on the front side of the same form. However, this form was sillier in the past. Among other things, it used to include a requirement for the volunteer examiner to state whether or not the applicant had successfully passed the code receiving and sending tests associated with the class of license being sought. This was not the true situation, because the applicant had to pass the code tests before the form 610 was forwarded to the FCC with the request that the written examination be sent to the volunteer examiner. In other words, the applicant had to have passed the required code tests several weeks before the written examination was received. The written examination answer form should not have included a code test statement; it was eliminated shortly after I pointed out this undesirable situation.

This form provides spaces to mark in

0,0 00

Steven M. Davis, KA8PCT, of Lansing, Michigan, got his Novice license in March of 1982 when he was 8 years old. He expects to have a General license about the time this picture is printed. He has worked 35 states and 12 countries using a Kenwood TS-520 transceiver. His antenna system consists of a Hy-Gain TH6DXX triband Yagi-Uda, 80 meter dipole, 40 meter dipole, and a 10-80 meter trap dipole. Steven shares the use of this station with his dad, Jerry, KC8VK. In addition to amateur radio, Steven enjoys video games.

tions printed in examinations. One must take care to mark the answer form in the spaces that correspond to the numbers printed on the examination form. In other words, if the written examination questions are numbered 21 through 40, mark your answers beside those numbers on the answer form. There is always just one correct answer to each question; do not select more than one answer. Use a soft lead pencil to mark your answers on the form furnished with the FCC written examination. It is a good practice to leave your original answer selections untouched, unless you are positive you made a mistake. I have often noted that students erased correct answers and replaced them with incorrect ones. If in doubt, leave your original selection alone.

Written Examination. This has always been a 20-question examination with 5 questions printed on each page. It has usually consisted of a single B-size (11" x 17") sheet folded in half to provide four pages. The applicant is required to sign all four pages, despite the fact that she/he is usually signing the same piece of paper at four points. Each question used to be accompanied by five multiple choice answers, but that arrangement was changed more than a year ago. Each question is now accompanied by four multiplechoice answers, only one of which is completely correct. Novice written examinations are now easier to understand than they were prior to June 1981. They do not contain trick questions, and each question now stands on its own. Answers such as "all of the above" and "none of the above" have been deleted. The "all of the above" answer used to require knowing three or four facts about one subject to answer such a question.

The turnaround time for receiving written examinations and licenses from the FCC is presently about four weeks. These waiting periods have ranged from 10 days to 32 weeks during my years of conducting Novice examinations. Amateur radio applications and examinations are expedited if they are mailed to the Federal Communications Commission, P.O. Box 1020, Gettysburg, PA 17325.

Upgrade Credit. Prior to October 1978, if one passed the code test required for a higher class license, but flunked the associated written examination, she/he was required to pass the code test again the next time she/he attempted to upgrade to a higher class license. A credit slip is now issued in such cases, and it allows the applicant to take the written test at a later date without having to pass the code test again. This change allows the applicant to concentrate on preparing to pass the written examination, without having to be concerned about passing the code test again.

Technician License. I advise my students to upgrade from Novice to the Technician license as soon as they are able to pass the Technician/General written examination. The Technician code test requirement is 5 w.p.m., which is also the Novice requirement. The Novice licensee just has to pass the Technician/General written examination to upgrade to Technician. My students are strongly urged to continue operating on the Novice bands to increase their code proficiency to the point where they can pass the 13 w.p.m. General/Advanced code test. Technicians who operate on voice bands, such as 2 meter f.m., are unlikely to upgrade to General (or higher) licenses. The Technician who continues operating code on the Novice bands should be able to develop enough proficiency to soon pass the 13 w.p.m. code test, and that is all she/he has to pass to upgrade to General.

Prior to 22 November 1968, it was legal for an amateur to hold valid Novice and Technician licenses at the same time. The callsign suffix was the same on both licenses, but the prefix was different. As

2814 Empire Ave., Burbank, CA 91504

an example, a Novice callsign of WN6FNM and a Technician callsign of WA6FNM could be issued to an amateur. Technician examinations have been conducted by FCC examiners (only) since July of 1976.

FCC Examination Elements. These elements are:

Element 1A, 5 w.p.m. code test Element 1B, 13 w.p.m. code test Element 1C, 20 w.p.m. code test

Element 2, Novice written exam

Element 3, Technician/General written exam

Element 4A, Advanced written exam Element 4B, Extra written exam

Summary

I hope this article has given you an improved understanding of what the Novice license was, is, and could be. If you agree that Novice/Technician high-frequency code segments should be expanded, I hope you will support the suggested changes with letters to the FCC and to the ARRL (preferably, through your ARRL Division Director). The changes I have again recommended in this article would increase the Novice h.f. spectrum from its present 300 kHz to 450 kHz, which would be a more representative allocation of these frequencies. Two new Novice bands would be established, one on 20 meters (14.10-14.15 MHz) and the other on 30 meters (10.10-10.15 MHz). The 40 and 80 meter Novice bands would be expanded 25 kHz below their present bottom edges to become 7075-7150 kHz and 3675-3750 kHz, respectively.

Amateur Radio Wall Calendar

Large wall calendars are scarce. Consequently, an amateur radio club has obtained a supply of 13.5" x 19.5" calendars which have room to write in events of importance, such as contests and club meetings. Amateur radio is printed in large letters on the top half of each sheet. Send a self-addressed mailing label and \$3.50 to W6LS, 2814 Empire Avenue, Burbank, CA 91504 for each calendar you want sent to friends, relatives, and/or yourself. Payment may be in the form of U.S.A. cash/postage, IRC's, money order, or check made payable to W6LS. The price includes U.S.A. mailing costs. Each calendar is sealed in its own mailing wrapper. This is a great surprise gift item!

Novice Band Power Limit

Prior to 18 July 1983, any American amateur operating in an American Novice band was limited to 250 watts input power to the transmitter's final radio frequency amplifier stage. The FCC has redefined transmitter power measurements to output power. The Novice band power limit is now 200 watts peak-envelope-power (PEP).

When input power was the standard, amateurs were required to have the



Jordon Hillrich, VE5AGC, of Regina in Saskatchewan, Canada, has been an amateur since February 1983. His station includes a Yaesu FT-102 transceiver, Kenwood R-1000 receiver, MFJ antenna tuner, and a vertical antenna. He also uses a Yaesu 208R 2-meter f.m. hand-held transceiver. Jordan operates on the 10, 15, and 20 meter bands where he has contacted several foreign amateurs.

equipment needed (voltmeters and ammeters) to measure it. This requirement has been eliminated in regard to output power.

This change should not be a matter of concern to Novice band users. In general, one should continue operating as before. The major difference is that higher input power levels may now be used on the higher frequencies where output power (final amplifier efficiency) is lower.

The power limitation that applies to General (and higher) class licensees, other than on the Novice bands, is 1500 watts PEP.

Amateur Licenses in America

As of 1 June 1983, 418,559 amateur radio licenses were valid. More than 99 percent of them (414,973) are issued to individual operators. A breakdown by class of license shows that more than 40 percent of American amateurs are Novices or Technicians. The figures are listed herein for your information.

License Class	Number	%
Novice	91,558	22
Technician	76,040	18
General	119,100	29
Advanced	95,353	23
Extra	32,922	8

The 3,586 other licenses are as follows:

Station Type	Number	%
Club	2,592	72
Military	203	6
Races	535	15
Secondary	256	7

Emission Designations

You can expect to see new emission designations in FCC rules, plus amateur radio publications. The following list shows emission types of primary importance to amateurs. The changes involve many more emission types that are generally of less importance to amateurs, and these are not included in this list. The old (present) and new (future) designations are listed, plus a common description of each emission.

Old	Description	New
AØ	unmodulated pure carrier	NON
A1	Morse telegraphy	A1A
A1	teletype telegraphy	A1B
A2	tone modulated Morse telegraphy	A2A
A2	tone modulated teletype telegraphy	A2B
АЗ	dsB a.m. telephony	A3E
A3J	s.s.b. telephony	J3E
A4	a.m. facsimile	A3C
A4J	s.s.b. facsimile	J3C
A5	dsB a.m. television	A3F
A5J	s.s.b. television	J3F
FØ	unmodulated pure carrier	NON
F1	Morse telegraphy	F1A
F1	teletype telegraphy	F1B
F2	tone modulated Morse telegraphy	F2A
F2	tone modulated teletype	F2B
	telegraphy	
F3	telephony	F3E
F4	facsimile	F3C
F5	television	F3F

Each current emission designation that starts with the letter A is an amplitude modulated (a.m.) emission. Except for the single sideband (s.s.b.) emissions, the letter A is the first letter in each of the new designations. The letter J starts the new s.s.b. (a.m.) designations.

Each current and new emission designation that starts with the letter F is a frequency modulated (f.m.) emission. The letter P has been used to indicate phase modulation (p.m.), but it is now more commonly used to indicate pulse modulation.

Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Operating activities and achievements plus a self-introduction are needed with each picture. Send an s.a.s.e. if a picture must be returned. A free one-year CQ subscription or renewal is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, enclose the mailing label (or copy) from your latest issue of CQ.

DX amateurs who frequently work the American Novice bands are also urged to submit photographs. I have not received pictures from Novices in Connecticut, Hawaii, Louisiana, New Hampshire, Oregon, Rhode Island, South Carolina, Utah, and Vermont.

73, Bill, W6DDB

Antemas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Reader Report

In this month's column, author Thurber uses some reader mail as a point of departure to present some interesting antenna and tower ideas. He also highlights a simple but handy antenna design program for the computer buff.

ast month in CQ, we concluded the "Random Headings" series with a discussion featuring the Wayne B-T-L antenna coupler and an unusual TVI problem reported by PY1APS, in addition to presenting some computer software ideas and other odds and ends. This month's column will use some reader mail as a jumping off place to present some antenna and tower construction ideas. We will also make note of one letter that takes us to task for some advice we provided, and we'll present a simple but useful public domain Quad antenna design program for the Vic-20. First, a follow-up on the correspondence regarding the description of WB9KUV's mobile home antenna in the May 1983 issue.

More on the Mobile Home Problem

Our mention of WB9KUV's 80 meter antenna in the May issue continues to draw a good deal of reader mail. Many of the letters are in the "they said it wouldn't work but it does" vein. These piggyback on the comment we made in the May column that a key consideration be that one find an antenna that works in a difficult situation, regardless of what commonly accepted theory and practice may dictate.

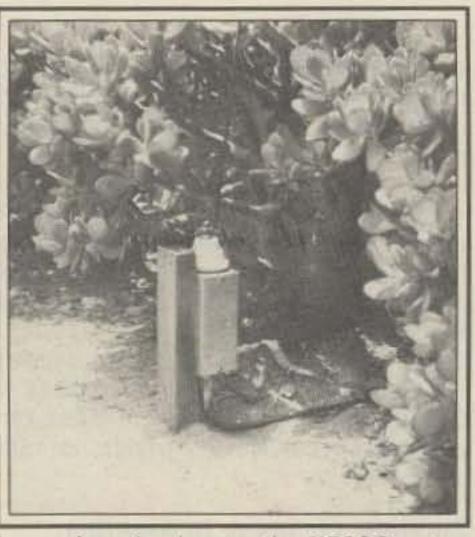
We received an interesting letter from Vernon C. Starr, KE6CQ, which describes another mobile home antenna project. The antenna he advocates has worked very well for him, and he offers to share it with others who have a "mobile home problem." Writes KE6CQ:

"Here is a nearly invisible antenna that I have used at my mobile home for the past two years with good results on 80, 40, and 20 meters. Basically, it is a top-loaded, 12 foot vertical of #14 wire fed at the bottom with 52 ohm coax. It is tuned to frequency with a separate capacitor for each band between the top of the antenna and the top loading structure, which in my case is the aluminum sheeting covering the edges and undersides of the eaves of the mobile home.

317 Poplar Drive, Millbrook, AL 36054



Upper junction box on the KE6CQ mobile home antenna system described in the text. See figs. 2 and 4 for detailed information. (KE6CQ photo)



Lower junction box on the KE6CQ antenna. Fig. 3 shows details. (KE6CQ photo)

'The appropriate values of capacitance required to tune to resonance (minimum s.w.r.) are: 80 meters, 250 pF; 40 meters, 100 pF; 20 meters, 10 pF. These capacitors, with their switching relays, are contained in a weatherproof box tucked under the eaves. I use 30 buried radials varying in length from 6 to 12 feet in addition to a 4 foot ground rod.

"When tuned to the middle of the 80 meter band, s.w.r. readings between 3500 and 4000 kHz were less than 2:1. S.w.r. readings for 40 meters did not exceed 1.7:1, and for 20 meters they were less than 1.2:1. In the case of mobile homes with metal siding, it might be feasible to have the bottom end of the antenna at some distance from the home and operate it as a sort of sloper working against

ground. For those homes without metal-work on the upper parts, one could add thin aluminum sheeting painted over to match the decor. One-sixty meter operation should be possible also, although I did not have the facilities to try it. I would be interested in hearing of variations of this scheme to fit other mobile homes with metal siding." (Vernon C. Starr, KE6CQ, 5540 W. 5th St. #116, Oxnard, CA 93030—ed.).

Shown in fig. 1 is the simplified schematic of the KE6CQ antenna system, while fig. 2 is a pictorial view of the antenna installation at the rear of the mobile home. Fig. 3 shows details of the junction box, and fig. 4 is the electrical schematic of the antenna system.

The WB3GXV Tower

An unusual Quad design article which appeared more than a year ago in CQ prompted Ed Long, WB3GXV, to develop an equally novel tower to support the 7 band, 2 through 20 meter boomless Quad which he built. Writes Ed in a letter forwarded to me by CQ Editor Al Dorhoffer, K2EEK:

"Your readers may be interested in my design of a roll-over tower hinge arrangement which I built; I am pleased with its performance. Please note the Quad, top side, was built from the design by Richard James, Jr., W4DQU, which appeared in April 1982 CQ. ('A Seven Band Boomless Quad,' p. 17—ed.)

"Rather than go into great detail of design and construction, see the photos and captions, which tell the whole story.

"Since my tower extends 40 feet above the hinge point, I installed a sec-

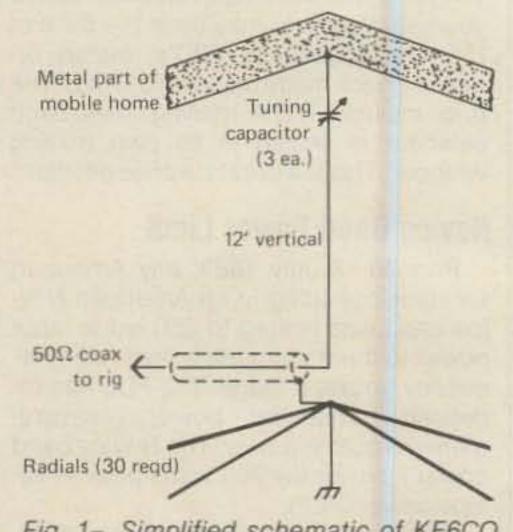


Fig. 1- Simplified schematic of KE6CQ antenna system.

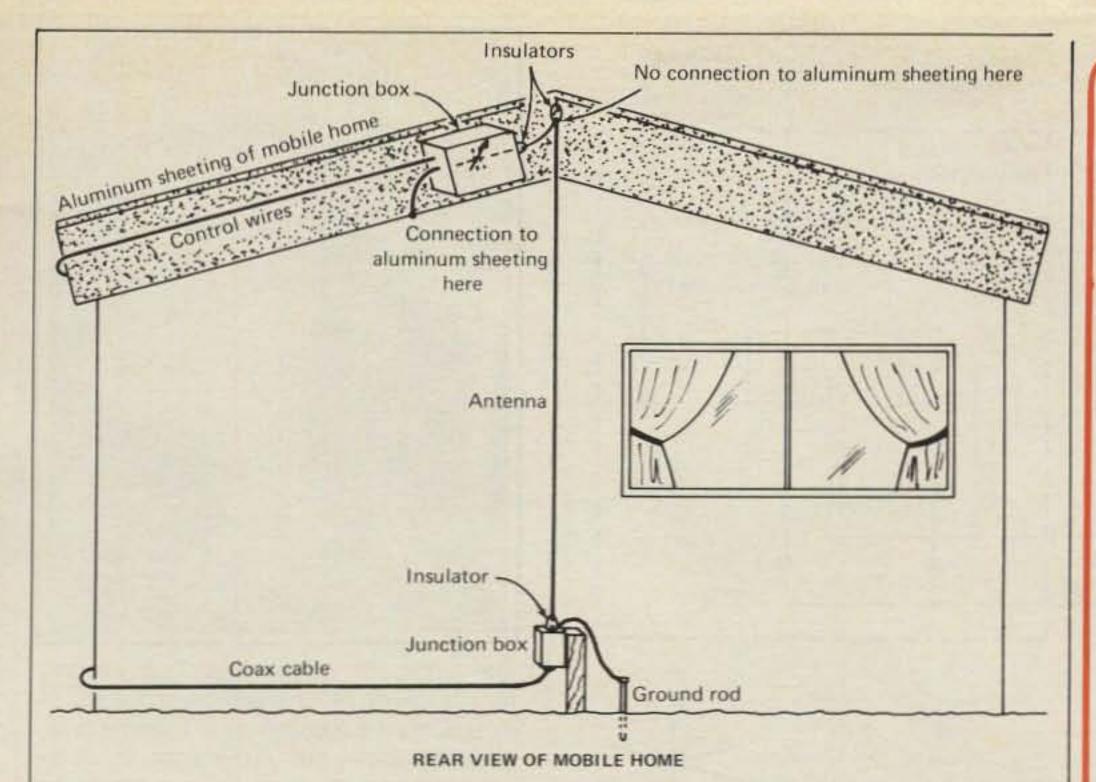


Fig. 2- Pictorial view of KE6CQ antenna.

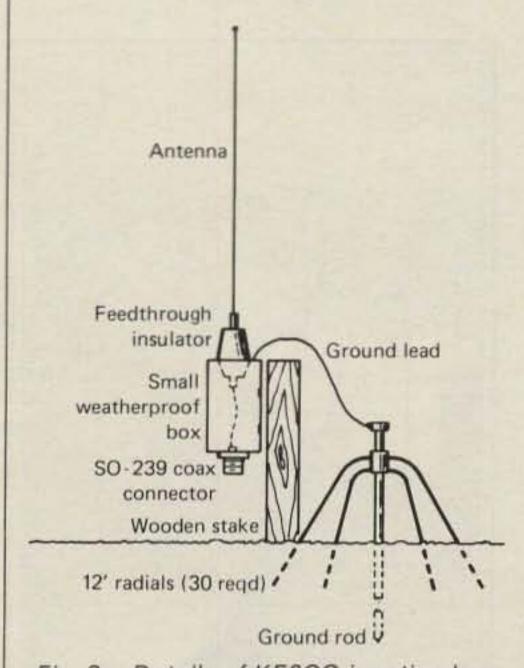


Fig. 3- Details of KE6CQ junction box.

ond winch as a backup for safety reasons, controlled by another person during up and down operations. The bending motion of the tower is controlled by the cable arrangement shown. . . . If in your opinion the photos would help other amateurs develop a roll-over tower, feel free to use this material as you see fit."

We thank Ed for his contribution to the Antennas column, and we think that the photos are largely self-explanatory. Readers who wish to construct such a tower may contact Ed Long, WB3GXV, 9801 Watts Branch Drive, Rockville, MD 20850, for additional information. Perhaps if Ed receives enough correspondence about his tower, he will be persuaded to write a full-blown construction article for CQ at a future date!

Incidentally, the W4DQU Quad that Ed built is of a very interesting and unusual

design. Aside from the fact that it covers seven bands and is boomless, it uses no traps, is fed with a single open-wire feed-line, and requires no adjustment at the antenna. Built around the three-piece hub manufactured by MFJ Enterprises, it makes use of either fiberglass, bamboo, or PVC pipe spreaders. Admittedly, there are compromises involved in the design of such an antenna, but in the words of the author, "... it is beautiful and it performs beautifully."

To the Whipping Shed

Our thoughts on tandem use of lowpass filters for an extra measure of harmonic suppression in the February column drew fire from at least one reader.



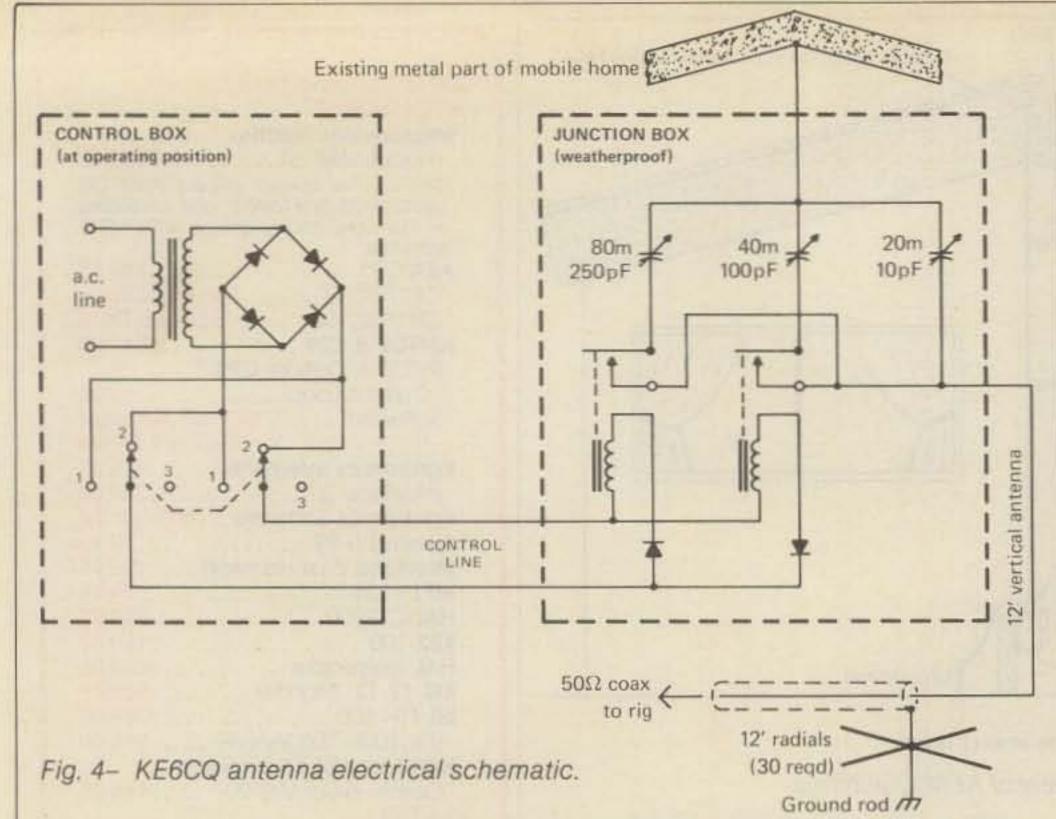
WB3GXV tower showing back side of hinge plate pad.

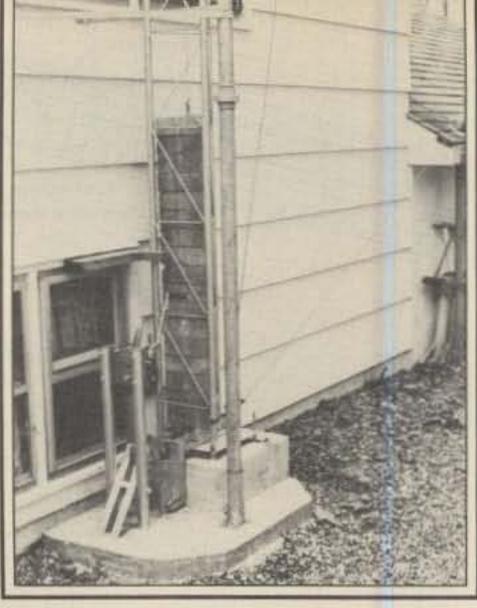
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The concrete counter-balance weights for the tower. Note tower base plate is elevated above the concrete foundation to accommodate nut jacks (not in view), which, when adjusted, take pressure off the hinge.



WB3GXV tower, front side view of hinge plate pad with A-frame structural arm.

CQ received a letter from John P. Weber, Jr., K4JW, which was published in the June "Our Readers Say" column on p.6. In case you may have missed his letter, we'll reprint it here:

"The series of articles on Antenna Accessories for the Hamshack (October '82 through April '83 CQ, by Karl T. Thurber, Jr., W8FX), was excellent, with an exception to a comment made in Part V, February 1983. He advocates a 'belt and suspenders' approach to the use of lowpass filters for TVI elimination by using a filter between the exciter and the linear.

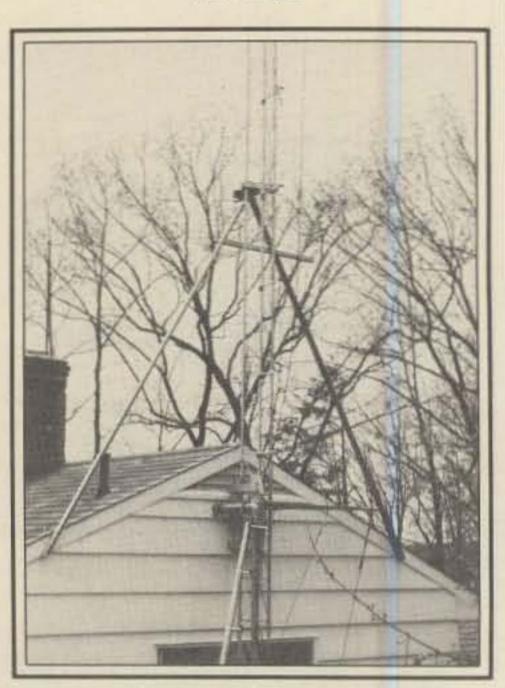
"The lowpass filter is designed to work into a termination of 50 ohms resistive. Many linear amplifier input circuits are anything but 50 ohms resistive at the op-

erating frequency. Thus, the insertion loss may be considerably greater than intended and may cause difficulty in getting enough drive to the linear; and also, the filter cut-off frequency may be shifted below its intended value. Unless a swamping resistor is used, I would suggest not using a filter between the exciter and linear amplifier.

"For the same reasons outlined above, it is obvious that the v.s.w.r. of the antenna should be close to 1:1 or a Transmatch should be used to present 50 ohms resistive termination for the filter, because at the high power level, excessive voltage may appear across the filter's components, causing damage if the termination varies from the design value."



High support pipe of WB3GXV tower.
Pipe extends into the structural frame of
the house.



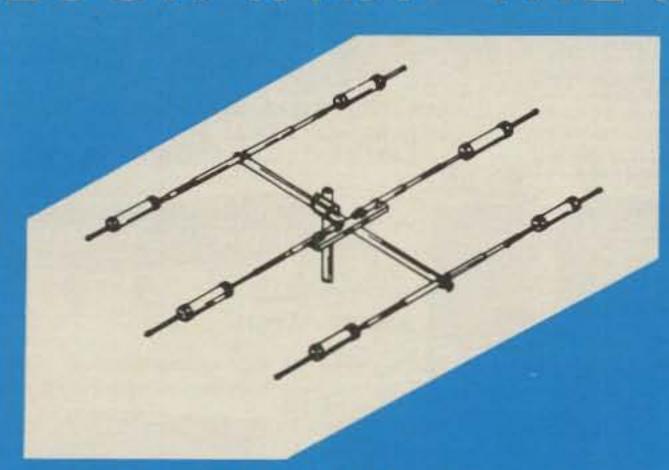
A-frame brace with tower locking bar.

K4JW's points are well-taken, and my suggestion to use a second lowpass filter between the exciter and linear amplifier probably does represent an overly cautious approach. The risks he mentions are there, to be sure. An impedance imbalance may exist between the exciter and the amplifier (which may vary from band to band), filter insertion loss may indeed be more than anticipated, and the expected filter cut-off frequency may be upset. Due to the additional harmonic suppression that the two filters can provide, however, I would prefer to use two, provided that none of the undue consequences K4JW mentioned actually occur. If starting from scratch and custom designing the station's r.f. plumbing,

Mosley...

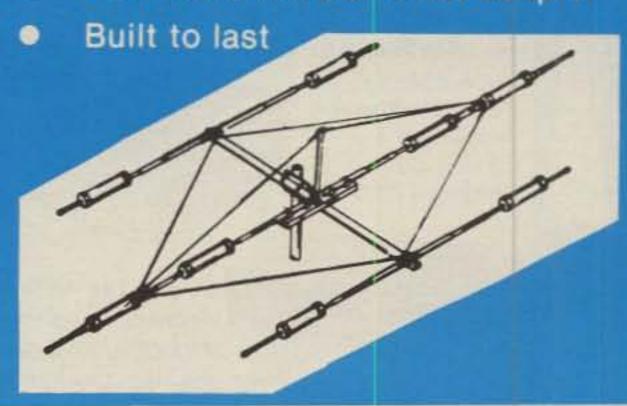
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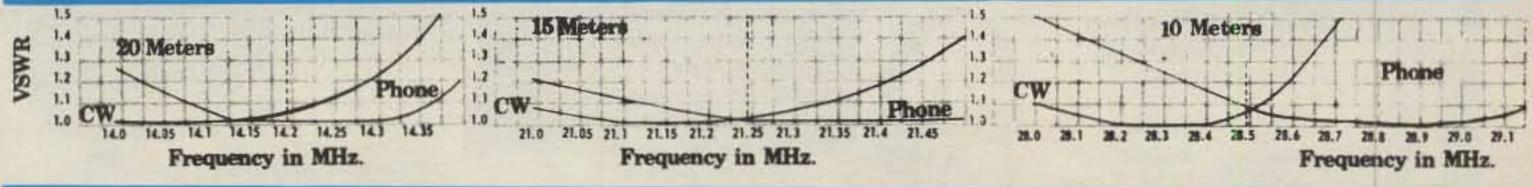


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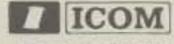


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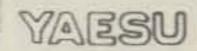
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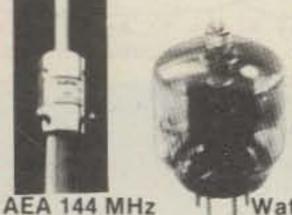
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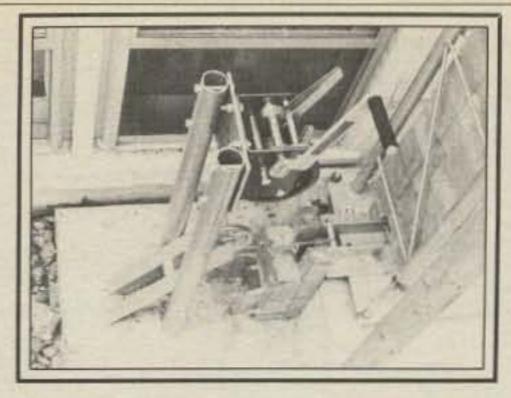
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Side view, hinge plate and A-frame structural arm.

probably would not provide for a second lowpass filter between the exciter and the linear amplifier. However, many hams add a linear amplifier after the exciter has been in use for some time, and the exciter customarily has a lowpass filter mounted at its r.f. output connector. I would suggest leaving the filter there experimentally, checking for any amplifier loading anomalies. If all appears to be well, you may elect to leave it there, adding a second filter at the amplifier's output connector, as you like. But make sure that the filter installed at the amplifier's output "sees" close to a 52 ohm resistive termination for proper performance, as described by K4JW. Have any readers systematically evaluated the use of a second lowpass filter? The results would



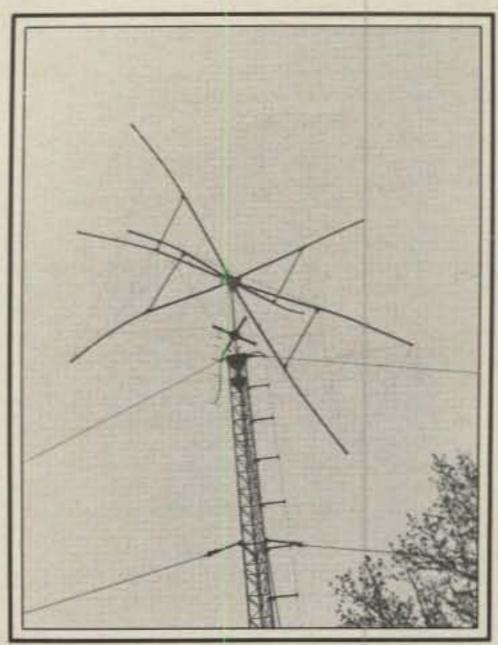
View of winch and cable arrangement, also base plate bumpers.

be of interest to us, and we would like to share them with other CQ readers.

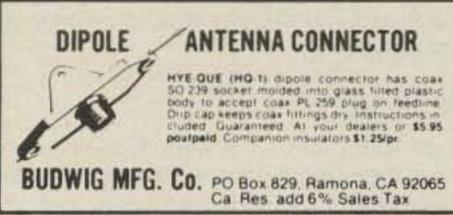
We appreciate letters representing technical criticism of the Antennas column. We don't claim to be an undisputed authority on any specific subject, and we look forward to developing the column along the lines of both a tutorial and a forum.

Vic-20 Quad Design Program

In a previous column we made mention of the increasing variety and scope of amateur radio, antenna, and electronic software coming into use as a fallout of the personal computing revolution. We also mentioned several sources of software, including one of our low-cost favorites for Commodore/PET Programs, Public Domain, Inc., 5025 S. Rangeline Rd., West Milton, OH 45383. In one of the \$10 Vic-20 software collections offered by the firm, the Vic collection #3 mentioned in last month's column, there are several ham programs of interest. One of these is a short program to visually provide construction details for a two-element Quad antenna. In this program the user simply inputs the desired frequency in MHz, and the program automatically determines



Tower guying arrangement (also used to stabilize the mast).



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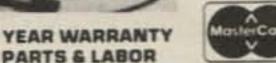
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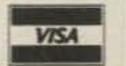
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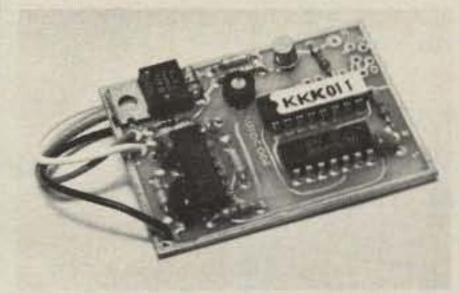




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CIRCLE 24 ON READER SERVICE CARD

```
6 PRINT""
10 PRINT"CUSTOM DESIGNING YOUR OWN HIGH GAIN ANTENNA."
12 INPUT "CENTER FREQ. IN MHZ=";F
25 PRINT" : PRINT" CUBICAL QUAD ANTENNA"
30 PRINT
40 E=.985#F
50 G=1.033WF
60 D=1000/F
100 R=1032/F
140 B=118/F
180 X=(2#(R#R/64))
190 GOSUB 10000
195 S≈Y
200 X=(S#S+(B#B/4))
210 GOSUB 10000
215 P=Y
220 X=((R#R/64)+75/(F#F#4))
230 GOSUB10000
235 T=Y
240 X=((R#R/64)+125/(F#F#4))
242 GOSUB10000
245 U#Y
260 W=468/F
520 PRINT"THE DESIGN CENTER FREQ IS" ;F; "MHZ.
525 PRINT"THIS 2 ELEMENT QUAD
                             SHOULD EXHIBIT A
                                                     STANDING WAVE RATIO"
530 PRINT"OF 2:1 OR LESS OVER THE FREQ. RANGE FROM "JE;"TO"
535 PRINTG; "MHZ WHEN USED WITH A 50 TO 75 OHM FEED LINE"
540 PRINT" #HIT RETURN TO CONTINUE"; INPUT AS:PRINT"]"
541 PRINT"-----";
570 PRINT"THE BOOM LENGTH CAN VARY BETWEEN"; 75/F; "FEET AND"
575 PRINT 125/F; "FEET WITH LITTLE EFFECT.A LENGTH OF"; B
580 PRINT"FEET IS OPTIMUM."
590 PRINT"-----"
620 PRINT"TOTAL LENGTH OF THE WIRE IN THE DRIVEN ELEMENT IS"; D
625 PRINT"FEET, WHICH COMES TO ", D/4; "FEET ON EACH SIDE."
630 FRINT
640 PRINT"MHIT RETURN TO CONTINUE"; INPUT A$:PRINT"□"
641 PRINT"-----"
650 PRINT
                                                     ELEMENT IS" ;R
660 PRINT"TOTAL LENGTH OF WIRE IN THE REFLECTION
665 PRINT"FEET, WHICH IS"; R/4; "FEET ON EACH SIDE"
670 PRINT" HIT RETURN TO CONTINUE"; INPUT A*: PRINT""
690 PRINT"THE MINIMUM LENGTH OF BAMBOO, FIBERGLASS,
                                                     OR OTHER"
695 PRINT"WILL BE"; S; "FT, MEASURED FROM THE
                                            CENTER OF THE BOOM."
697 PRINT"IF A SPIDER (BOOMLESS) QUAD MOUNT IS USED,"
700 PRINT"EACH SPREADER WILL HAVE TO BE AT LEAST ";P; "FEET."
730 PRINT"#HIT RETURN TO CONTINUE"; INPUT A: PRINT""
740 PRINT"THE TURNING RADIUS FORTREE CLEARANCE, ETC.
                                                     WILL VARY BETWEEN"; T;
745 PRINT"FEET AND"; U; "FEET, DEPENDING ONTHE LENGTH OF THE BOOM. "
755 PRINT
756 PRINT"----"
760 PRINT" WHIT RETURN TO CONTINUE"; INPUT A: PRINT""
770 PRINT
790 PRINT"THIS QUAD ANTENNA WILL WORK WELL EVEN AT
                                                      LOW HEIGHTS"
795 PRINT" ABOVE THE GROUND BUT IT WORKS BEST WHEN UP IN THE AIR"
800 PRINT"A HALF WAVELENGTH
                               ";W;"FEET,OR MORE."
810 PRINT"HIT RETURN TO CONTINUE"; INPUT AS: PRINT""
811 PRINT"-----"
840 PRINT"THE FRONT-TO-BACK
                                                     REDUCE UNWANTED"
                               RATIO (ABILITY TO
845 PRINT"SIGNALS FROM THE
                               OPPOSITE DIRECTION
                                                     SHOULD EXCEED 10"
850 PRINT"DB FROM ABOUT"; .97#F; " TO"; 1.03#F; "MHZ."
855 PRINT"APPROACHING 25 DB AT ";F; "MHZ."
860 PRINT
880 PRINT" TOWN WHEN WHO DOD DX WANGAMA"
881 PRINT" ----"
900 PRINT PRINT" TO REPEAT HIT
                                          ANY KEY. "
910 GETE$: IFE$=""THEN910
928 GOTO6
9999 END
10000 REM #SQUARE ROOT
                               SUBROUTINE#10010 IF X>=0 00T0 10040
10010 IF X>=0 GOTO10040
10020 PRINT" NO SUCH THING AS THE SQUARE ROOT OF A
                                                        NEGATIVE NUMBER!!"
10030 END
18848 Y=X/2
10050 Z=0
10060 W=(X/Y - Y)/2
10070 IF W=0 THEN RETURN
10080 IF W=Z THEN RETURN
10090 Y=Y+W:Z=W
10100 GOTO 10060
       [Ed. Note: The odd-looking graphics symbols in lines 540, 640, 670, 730, 760,
       809, 881, 900, and 10020 are used to set text colors and may be of your choice.]
```

Fig. 5- Quad antenna design program.



Proud owner photographed as the tower is raised.

the reflector and driven element lengths. Boom length and useful bandwidth are also calculated. This short (3K) Public Domain program, which will easily fit in the unexpanded Vic-20, is shown in fig. 5 (I have modified it slightly for an improved screen presentation).

The same collection contains at least nine other simple programs of ham interest, most being accommodated by a "bare" (unexpanded) Vic. Other ham programs are scattered about the other Vic-20, PET, and Commodore 64 program collections.

Wrap-Up

In this month's Antennas column we have included a number of reader-generated topics. We followed up on our previous mention of mobile home antenna problems with a novel idea from KE6CQ, depicted WB3GXV's interesting tower, and took ourselves to task for a lowpass filter recommendation made in a previous column. We also presented a simple Quad design program for the popular Vic-20 computer.

Next month in CQ we will present several additional antenna topics of current interest. See you then.

73, Karl, W8FX

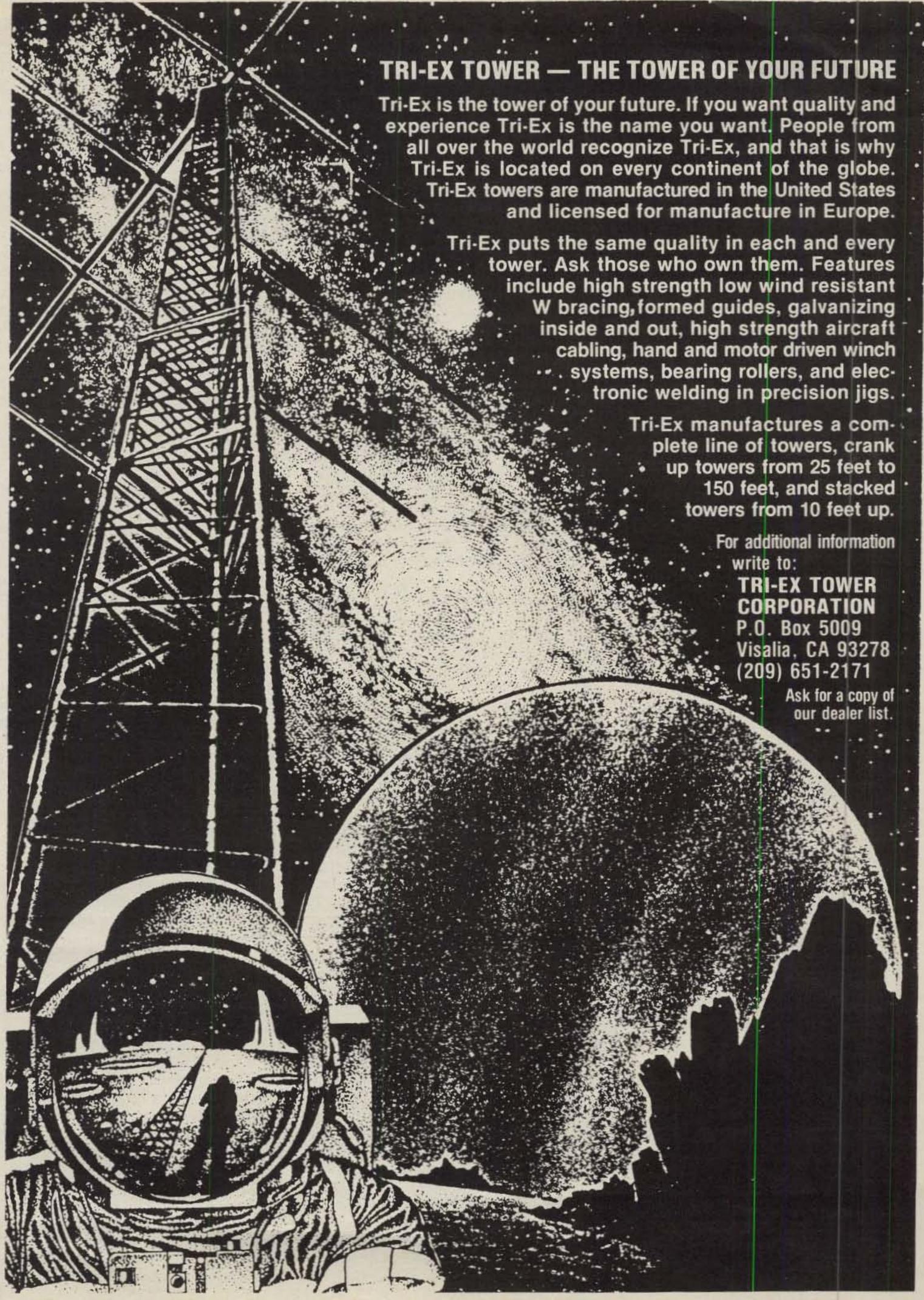
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Thurber, Karl T., Jr., W8FX. "Antennas: Random Headings," in the Antennas column, CQ, May 1983. (WB9KUV mobile-home antenna for 80 meters.)

Thurber, Karl T., Jr., W8FX. "Antenna Accessories for the Hamshack: Part V," in the Antennas column, CQ, February 1983.

Weber, John P., K4JW. Letter to the Editor, in the "Our Readers Say" feature, CQ, June 1983.



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THE INS AND OUTS OF THE WASHINGTON SCENE

Commission Adopts Final Report and Order on Volunteer Examiner Program

Top the presses! In the matter of Docket 83-27 regarding volunteers for amateur examinations, on 22 September 1983, as we went to press, the FCC adopted a Final Report and Order with provisions along the lines proposed in the Notice of Proposed Rule Making. Specifically, amateur examinations are to be conducted in the field by three-person amateur teams who will report to Volunteer Examination Coordinators (VEC's). However, while it was originally thought that such coordination would be conducted on a national basis by the ARRL, the Commission instead will use regional VEC's. A region will be defined as a callsign area, and as such a minimum of 13 VEC's will be required. The Commission will open negotiations with organizations seeking to become VEC's on 1 December 1983.

In a related matter, the FCC again requests amateurs to submit questions which could be used for the Advanced and Extra class examinations. Such questions should be submitted in accordance with Bulletin 10-35 of the Private Radio Bureau.

President Signs Final Protocol for WARC 79

On or about 6 September 1983, President Reagan signed the Radio Regulations and Final Protocol developed in Geneva by delegates to the 1979 World Administrative Radio Conference. With this treaty document now signed by the United States, the FCC can proceed with implementation of the WARC Decisions that affect U.S. frequency allocations (Docket 80-739). It is likely that this matter will have been addressed in part by the time this column is read.

ARRL Files for Expedited Action on CATV Operations

As noted in *The ARRL Letter*, the League has filed a Motion for Expedited Action on RM-4040, its petition for Rule Making in the matter of removing cable TV operations from channels E (144–150 MHz) and K (222–228). The petition was

Media-Tech®, 8603 Conover Place, Alexandria, VA 22308 originally filed in January 1982, and was based on the large number of amateurs who reported interference from leaky CATV distribution systems.

While the RM-4040 was being considered by the Commission, the League entered into discussions with the National Cable TV Association (NCTA) in an attempt to resolve ongoing CATV problems as well as to develop a joint policy statement that would clarify the nature of the problem for CATV operators and the public. According to the ARRL, however, NCTA "is no longer inclined to promulgate such a policy statement as it perceives no present benefit to itself from doing so."

Having exhausted all options in its bid to work with the NCTA on resolving the CATV problem, the League was apparently left with no alternative but to seek early action on its Petition for Rule Making.

The League's action brought a fast response from three CATV firms and the NCTA. Landmark Cablevision, for example, called the ARRL's action "overkill," while Storer Communications claimed that the League's arguments were based on "outdated information. The NCTA, on the other hand, claimed that it had mounted "comprehensive efforts to cooperate with the ARRL and its members to identify and resolve cable/amateur interference problems."

The League's reply to the CATV industry was just as swift in coming. Leveling a blast at Storer, for example, the League's council not only defended the timeliness of the ARRL's comments, but (according to The ARRL Letter), "rebutted an affidavit filed with the Storer document by a Storer staff engineer." The engineer, it seems, called for amateurs to cooperate with CATV operators when interference occurred by (according to the League) calling on hams to turn their beams away from the interference, drive vehicles with equipment installed away from leakage spots, and avoid frequencies where leakage is the greatest. These suggestions, of course, are absurd, and are unworthy of serious consideration.

Perhaps someone should educate the CATV industry to the fact that access to the frequencies they use is based on the

requirement that their systems remain "closed"—that is, that they not radiate signals into the air. In the case of CATV channels E and K, these frequency bands are, in part, allocated to the Amateur service, and it is the Amateur service, and it is the Amateur service that has "first rights" to them for over-the-air telecommunications (in the band 220–225 MHz, of course, amateurs may not cause interference to government radio-location operations).

The CATV industry has not shown itself to be a "good neighbor." Various operators around the country have been derelict in ensuring the signal integrity of their systems, while at least one operator in the midwest operated on frequencies that endangered "safety-of-life" communications maintained by the Federal Aviation Administration (FAA). Until such time that the CATV industry demonstrates that it intends to consider CATVI problems as matters of the highest priority, and that it intends to work in good faith, the operators in the Amateur service, amateurs in general, and the League in particular have no alternative but to seek early, favorable action on RM-4040.

League Responds to CHARS Filing on No-Code Docket

As noted in this column last month, the Capitol Hill Amateur Radio Society filed "Reply Comments" with the Commission in support of creating a no-code license (P.R. Docket 83-28). CHARS argued on a number of points against the League's position, leading the ARRL to file a Motion for Leave to File Supplemental Reply Comments.

In the Supplemental Reply Comments, Chris Imlay, League Counsel, rebuted the CHARS comments filed by David Siddall, Esquire, CHARS' President. Specifically, the ARRL stated that "the most important basis for the international treaty requirement for amateur knowledge of Morse Code transcends language barriers as a result of the code terms universally understood by amateurs worldwide."

The League also noted that while CHARS stated it was "no longer absolutely necessary to know the Morse Code in order to communicate upon the air-

waves" (CHARS' comment), "a rudimentary, passing acquaintance with the Morse Code (which is all that is now required for an amateur license granting all VHF/UHF privileges) represents a necessary acquired capability which makes amateurs uniquely able to communicate in any situation" (ARRL's comments).

The League also rebutted CHARS' arguments that those who demonstrate a technical expertise in experimentation should be granted full operating privileges by stating "that (while) Morse Code knowledge is not specifically applicable to one aspect of Amateur Radio does not render it unnecessary as a universal element of amateur licensing, any more than technical proficiency is unnecessary to a given amateur who chooses to devote all of his spare time to public service traffic handling instead of engineering research and testing."

The League also persisted in its argument that the Commission's Notice in the matter "presumed throughout that a nocode license would be implemented, and the proposal was made in a manner as to create in the minds of a great many potential commenters a misapprehension that a no-code license was a virtual certainty." CHARS had voiced the opinion that the FCC had enhanced the rulemaking process and had clarified what action it was considering by issuing a Notice which contained the parameters of the codeless license types it was considering.

Readers of the League's Supplemental Reply Comments will find that they addressed most—but not all—of CHARS' comments (a notable omission was the absence of any rebuttal to CHARS' assertion that the Society was "unable to find, in a review of (QST) columns over the past 18 months, one single instance in which Morse Code was reported to have been used in an emergency communications situation.").

In sum, it would appear that the League's position may best be stated as follows: "The need to retain a pool of trained (CW) communicators is just as important a uniform requirement for radio amateurs as is the need to encourage technical proficiency among all licensees."

CQ Interviews Dr. Fred W. Decker, W7ANX, U.S. Department of Education

Elsewhere in this issue readers will find an exclusive interview with Dr. Fred Decker, Deputy Assistant Secretary, Office of Educational Research and Improvement, Department of Education. Dr. Decker is primarily concerned with the administration of Department efforts dealing with research, development, demonstration, evaluation, and assessment of educational programs. In particular, he seeks amateur participation in the National Diffusion Network (NDN), a fed-

erally funded system that makes exemplary educational programs available for adoption by schools, colleges, and other institutions. For an in-depth look at education in the U.S. today, and a discussion on how amateurs can contribute to the NDN, don't miss this month's exclusive interview with Dr. Fred Decker, W7ANX.

Commission Waives Rules to Permit Retransmission of Space Shuttle Communications

The FCC has granted a waiver of Section 97.113 of its Rules to permit retransmission of Space Shuttle communications on amateur frequencies for the use

of amateur licensees. Commercial interests are precluded from using the waiver to obtain Shuttle communications.

The waiver, which was signed by Robert S. Foosaner, Chief, Private Radio Bureau, and which was secured through the assistance of the ARRL, includes the following provisions:

(1) Permission for the retransmission of Space Shuttle communications must be obtained from NASA prior to any such retransmission;

(2) Both audio and video communications from the Space Shuttle may be retransmitted;

(3) The retransmitted communications are for the exclusive use of licensed radio

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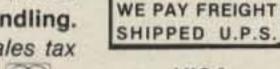
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amateur operators ONLY, and they may NOT be used by other persons;

(4) The waiver will continue in effect for the duration of Space Shuttle flights launched under the auspices of NASA.

Amateur Charged with Attempting to Obtain Operator License by Fraudulent Means

According to Raymond Kowalski, Chief, Special Services Division, Private Radio Bureau (PRB), Vincent J. Beard, N2EDW, apparently willfully violated Section 97.129 of the Commission's Rules (obtaining or attempting to obtain a license by fraud) by bringing unauthorized material into an amateur examination room. The violation was observed by a Commission examiner, who found Beard using unauthorized materials to answer the questions in the Morse code test.

Beard has been ordered by the Commission to present evidence why his license for amateur radio station N2EDW should not be revoked. Further, his Technician class amateur radio operator license was suspended for the remainder of its term. The latter order will be held in abeyance (until the case is decided) if Beard requests a hearing or submits a written statement concerning the suspension matter within 30 days from the date he was notified of the Commission's Show Cause and Suspension Order.

R.F.I. Complaints Continue to Reach ARRL R.F.I. Task Group

Based on information obtained from the ARRL Radio-Frequency Interference (R.F.I.) Task Group, complaints were recently received on a variety of electronic equipment used in the home. Of late, the problems have involved horizontal oscillator radiation from a television receiver; video cassette recorder (VCR) interference; harmonic radiation from cordless telephone systems operating near 1750 kHz (with harmonics in the lower portions of the 80 and 40 meter amateur bands); and radiation in the 2 meter band from a digital clock radio.

If you are encountering r.f.i. from any source, it is of the utmost importance that a report be filed with the ARRL R.F.I. Task Group and the FCC. Unless the nature and magnitude of r.f.i. problems can be quantified, it wil not be possible to secure the assistance required to resolve these matters. Write to ARRL R.F.I. Task Group, c/o ARRL, 225 Main Street, Newington, CT 06111; and Field Operations Bureau, Federal Communications Commission, 1919 M St., NW, Washington, DC 20554.

Ex-Ham, Inventor of Printed Circuit, To Be Honored by IEEE

The Institute of Electrical and Electronics Engineers (IEEE) Board of Directors has named Harry W. Rubinstein, ex-9EEV, of Milwaukee, WI, as the recipient

of the 1984 Cledo Brunetti Award. The award, which recognizes Rubinstein's early contributions to radio technology, carries the following citation: "For early key contributions to the development of printed components and conductors on a common insulating substrate." Simply, Rubinstein invented the printed circuit!

"The printed circuit board was born more of necessity than genius," said the 78-year-old inventor in an interview with Anne Curley, Business News Editor of *The Milwaukee Journal*. It was late in WW II, and the anticipated use of trench mortar shells with proximity fuses during the then-planned invasion of Japan was 50,000 shells per day. But there was no way to keep up with the production of shells because of the numerous wires that had to be individually soldered within each fuse.

Called to Washington, DC, by the head of the proximity fuse laboratory, Rubinstein, Chief of Globe-Union's Centralab Division, was asked if he could solve the production problem . . . by the next morning! Rubinstein did! He suggested that the government use a silk-screen technique developed in his division which allowed silver paste to be deposited at specific points on a ceramic surface. Using this technique, Rubinstein suggested, would permit the government to bond strips of conducting metal onto certain materials to form what we know today as "printed circuits."

Rubinstein hurriedly made a trip back to his laboratory in Milwaukee, and returned to Washington two days later with a prototype board. Needless to say, it worked! And within a short period of time, Globe-Union was turning out the circuits by the thousands.

The planned invasion of Japan, of course, never occurred. And with the war's end, Globe-Union, according to Curley, turned its attention to using printed circuits in devices such as compact hearing aids. Rubinstein, meanwhile, left Globe-Union with two colleagues to form Herlec, Inc. Herlec made a new type of capacitor especially designed for use with printed circuits. Years later, Herlec was sold to Sprague Electric Co., and when Rubinstein finally retired from that corporation, it had 14,000 employees and 31 plants worldwide.

Today, Harry Rubinstein, ex-9EEV, and his wife of 53 years, Else, still enjoy an active life in Milwaukee.

Heartiest congratulations, OM, on this well-deserved recognition of your achievements! (Harry Rubinstein is Ted Cohen's uncle, and was responsible for introducing Ted to amateur radio in 1951—ed.)

AMSAT-OSCAR 10 "Lookin' Good"

According to QEX, the ARRL Experimenters' Exchange newsletter, the final orbit of AO-10 may not be the one planned by AMSAT, but "it is nonetheless a

useful one that should provide years of long-distance, long-duration communications." On the air since 6 August 1983, AO-10 is being used consistently by stations with little more than conventional 2 meter transceivers and simple antennas.

The final orbit achieved by AO-10 differs from the intended orbit in two major aspects: perigee height and inclination angle. Because of the higher-than-desired perigee, deterioration of the solar panels by radiation from the Van Allen Belt will be accelerated, although it will be many years before this becomes a problem. As for the lower inclination angle (26 degrees instead of 57 degrees), the effect here will be to limit stations in North America to 10.5 hours of access per day instead of 16 hours.

Regardless of the orbital problems (caused by a collision between AO-10 and the Ariane launcher roughly 53 seconds after separation), everyone's hat is off to AMSAT for a "job well done!".

Vic Clark, W4KFC, and Other Amateurs Elected "Fellows" in the Radio Club of America

Among those elected to the status of "Fellow" in the prestigious Radio Club of America (RCA) was Vic Clark, W4KFC, President of the ARRL. Other amateurs elected to the same position by the Club's Board of Directors include: Dana Atchley, W1CF, Alan Biggs, K4AA, William Kelly, K2ZTQ, Harry Mayo, WB2EDS, Hazard Reeves, K2GL, Benji Hara, K4JUN, Kenneth Hopper, K2VAM, Ulrich Rohde, DJ2LR, Paul Dane, W6WOW, Bob Hertzberg, K4JBI, Jack Janicke, K2JFJ, and Frederick Macklin, K4UZI. The new Fellows received their certificates at the Annual Awards Banquet which was held in New York, NY, on 18 November 1983.

The staff of CQ and your Washington Editor extend congratulations to those honored by the Radio Club of America.

CCIR Concerned with Preparation of Documents for Amateur/ Amateur-Satellite Services

The CCIR is the technical arm of the ITU that advises the parent body on issues pertaining to matters of frequency allocation. Within the CCIR, and, specifically, within the U.S., amateur/amateur-satellite matters are handled by CCIR Ad Hoc Study Group 8E.

Given the large number of frequencies allocated to the Amateur and Amateur-Satellite services (the ITU recognizes two amateur services!), it is in our best interests to ensure that the CCIR takes our concerns into its deliberations. Accordingly, if you would like to participate in the formulation of the U.S. position on amateur matters within the CCIR, contact Mr. Frank L. Rose, Convenor, Ad Hoc 8E, Federal Communications Commission,

Office of Science and Technology, 2025 M Street, NW, Washington, DC 10554.

Radio Marti Makes It Through The Senate

According to The Washington Post, the Senate has approved by voice vote a bill to transmit U.S. broadcasts to Cuba for 14 hours a day. The issue of the broadcast service known as Radio Marti has been extremely controversial, and the bill approved by the Senate is a compromise version of the administration's original submission to the Congress.

Under the terms of the Senate-passed measure, Radio Marti would be set up within the Voice of America and thus would be mandated by law to deliver "objective" news. Currently, the VOA broadcasts to Latin America for 51/2 hours per day; broadcasting hours would be boosted to 191/2 with the addition of Radio Marti's service. Programs broadcast by Radio Marti would be transmitted from a station in Marathon, FL.

The House version of the Radio Marti bill would place this radio service under the Board for International Development. The Board operates Radio Free Europe and Radio Liberty, both of which are considered propaganda outlets.

Radio Marti is named for a Cuban patriot. Its creation has caused in uproar within the U.S. because its broadcasts would be transmitted in the standard a.m. broadcast band. Cuba has indicated that it will jam U.S. commercial broadcast stations if Radio Marti comes on the air.

Prediction of Engineer Shortage Draws Criticism

As noted in The Institute, a monthly publication of the IEEE, "A recent study conducted by the American Electronics Association (AEA) predicting 'a shortage of some 113,500 electrical and computer-science engineers over the next five years' has drawn criticism from engineers and labor experts." At the root of the criticism are concerns relative to the procedures used by the AEA in processing industry growth data. But others criticized the report for playing into the electronic industry's hands in the matter of salaries and immigration laws.

More specifically, Eli Fromm, chairman of the IEEE's Manpower Task Force, is quoted as saying that "the electronics industry (wants) to increase the number of available engineers and thus to force salaries down." Fromm also accused the industry of wanting "to water down immigration laws" and to permit foreign engineers to enter industrial and academic positions which might otherwise be filled by U.S. graduates. The AEA, however, denies that salaries were of interest in the study. According to Pat Hill Hubbard, vice president of the AEA and chief author of the 1983 study which is under fire: "the studies were intended to serve as trend

indicators, to help universities and legislators formulate academic and national policy relating to the electronics industry."

Meanwhile, Betty Vetter, a researcher for the Scientific Manpower Commission, Washington, DC, told the IEEE that she has seen no evidence "that the economic interests or security of the United States has been harmed by an alleged shortage of electronics engineers." Vetter did say, however, that "the lack of qualified engineering professors had become real and acute." She also accused some engineers of "forecasting gloom and doom" to discourage students from becoming engineers (thereby ensuring their own continued employment).

One key indicator as to whether there is a real shortage of engineers in this country is that of salaries. According to a recent IEEE survey, "members reported salaries that had not kept pace with inflation over the past 10-or 12-years." Put another way, says David Lewis, a physicist for the Office of Naval Research and chairman of the IEEE's Career Activities Council: "if there is such a shortfall, why are salaries so low?"

World Communications Year a Success

World Communications Year 83 is intended to promote the development of international telecommunications. And the campaign has turned out to be more important that it was ever envisioned by its creater, Werner Wolter. According to The Institute, "The worldwide recession,

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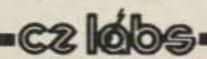
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the breakup of the U.S. telecommunications industry, and the growing fear among Third World countries that the boom in communications technology is leaving them behind have made WCY 83 more timely than ever."

The WCY was created by the United Nations' General Assembly in 1981, with the International Telecommunications Union (ITU; an arm of the UN) designated as the lead agency. Funding is on a voluntary basis, with the United States being a major contributor. According to the IEEE, U.S. contributions have largely been the work of Dr. Carol Lee Hilewick, formerly a Federal telecommunications consultant and now the executive director of the U.S. Council for WCY 83.

Working with two colleagues, Dr. Hilewick persuaded leaders in government and industry to help the council further the goals of WCY 83 as this would "enhance the image of the U.S. communications and information industry in the United States and around the world." Her successes were many! Among the contributors to WCY singled out for praise by Dr. Hilewick were GTE (which is building an h.f. radio link between Zimbabwe and Mozambique), IBM (which is assisting a number of Caribbean island nations in building a data-processing system for storm analysis), and Control Data (which has proposed creating a computerbased, telecommunications instruction system).

Your Washington Editor wishes everyone a Joyous Holiday Season and a Happy New Year.

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NEWS OF CERTIFICATE AND AWARD COLLECTING

he story of the month for December as told by Bill is:

William "Bill" M. Smith, W7GHT All Counties #185 5-25-78

"I was born October 17, 1922, raised, educated, and expect to die, all in Idaho. My interest in radio first was sparked while I was a pre-schooler. A family in our neighborhood bought one of those old battery radios made mostly of oak wood. You could hear through earphones only. Occasionally my parents would let me visit that family, and I would stand in the background, anxiously awaiting the time when the owner would let me listen for a few moments.

"My radio interest became intense when I was in the sixth grade. A kid brought a crystal set to school for 'show-and-tell.' Afterwards, I made crystal sets, and one- and two-tube 'blooperdines.' Three years later, in 1937, I was licensed W7GHT. I still carry scars from soldering-iron burns. I must add that it is a good thing that the only power source available, even after I went on the air, was a 90 volt 'battery eliminator,' for otherwise I wouldn't be here.

"During WW II, I first was an operator on the high-speed c.w. nets, and later a Signal Corps officer assigned to OSS. Upon release from the service, I finished my education, and in 1951 I was admitted to practice law.

"Making a living was of prime importance, and thus my hobby saw very little of me the first decade following 1951. After that, I gradually called a little time my own, and slowly I returned to my hobby.

"My first award was 5B WAS. While working for this, I bumped into Ralph, W5QEP, who invited me to check into the 3943 kc county hunters net. Later Hearned there was a 20 meter net and still later, a c.w. net. Both the s.s.b. and the c.w. gang helped me to finish 5B WAS. By this time, I discovered and acknowledged a horrible truth. I was 'hooked.' I was addicted to county hunting.

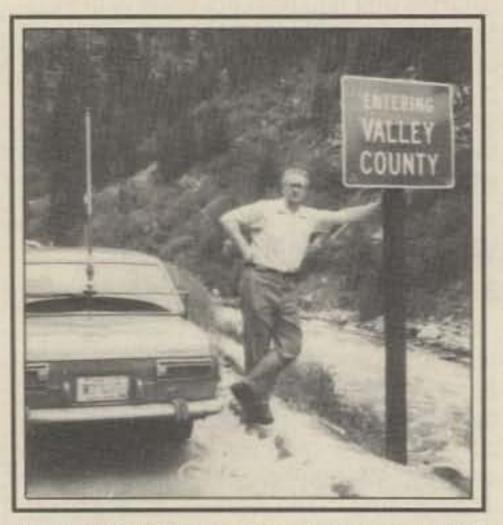
"In 1971 I became a judge, and more importantly I also became the administrator of the courts in five Idaho counties. This meant that I must travel, and I thus was afforded considerable time to monitor the nets. Without this golden opportunity to work mobile, I could not have confirmed all counties in only 7 years.

"My last 'mixed mode' was Madison, NC. WA7PHD gave it to me May 16, 1978.

333 South Lincoln Ave., Mundelein, IL 60060



Bill Smith, W7GHT, All Counties #185 (photo via N7APC).



W7GHT holding up Valley County, Idaho, sign post.

Jim made this 'slight' detour on his way back to his home in the state of Washington from the state of Louisiana. Since that time, I have worked all counties from a mobile (Lincoln, TN, July 26, 1980 from N9TN) and all s.s.b. (Garden, NE, Aug. 9, 1980 from WA9WIF, now KBØYU). I am now working for an all c.w. endorsement. I do not intend to work for endorsements beyond my present quest, nor to go the second time around until after I retire.

"The County Hunter Gang constitutes a unified group, each member helping all others. This is unique. Where else does one find individuals willing, and yes, anxious, to do things for others. Where else does one expend large amounts of energy and time (and car and motel expense) merely to help another, and for pay amounting to a mere 'thanks.' In that regard I have tried, and I still try, to help others in the hopes that I may in some small way repay the host of County Hunters who helped me. In fact, I am deeply indebted to the entire group, and I feel my obligation is a continuing one.

"It is impossible to single out and thank anyone in particular. I will not do so, ex-

cept in the sole instance of a non-ham County Hunter, my wife. Oly always has been someone special. She experiences the same joys, agonies, anxieties, and pains that I do. She knows county hunting in and out, and she, more than anyone else, helped me earn USA-CA #185. Thanks to all, and especially, thanks to her."

Special Honor Roll All Counties

#429 Jim Preston, WA6UFY, 8-18-83. #430 Mike Baird, W0RSR, 8-25-83. #431 Jim Armes, WD0CFZ, 8-26-83. #432 James Hood, W0PUD, 8-31-83.

Awards Issued

Jim Preston, WA6UFY, kept a sharp eye on the mobiles and then qualified for All Counties #429, endorsed All 20 meters, All Mobile.

Mike Baird, W@RSR, took time to complete his paperwork and came up with All Counties #430, also endorsed All 20 meters, All Mobile.

Jim Armes, WD@CFZ, claimed All Counties #431, Mixed. Jim's endorsement will be changed to All 20 meter Mobile as soon as KB7QO returns to the mainland from Hawaii to sign all the cards he must have waiting.

James Hood, W@PUD, added the last two seals to his certificate and then completed All Counties #432, Mixed.

Don Skaife, W7ULA, claimed USA-CA 3000 #459 to add to his collection.

Bob Dyson, KØAYO, Trustee, collected USA-CA 3000 #460 for WDØDPD, the MARAC club station.

Charlie Jacobsson, SM0CHA, added a new endorsement to his USA-CA 2000 #544—All Mobile. Charlie also increased his total by adding USA-CA 2500 #518, All S.S.B.

George W. Lee, K5HT, added USA-CA 2000 #575, All 20 meter S.S.B. to his fine collection.

Fred Van Aalst, WD4RAF, claimed two

3000		2000		WAGUFY	791
W7ULA	459	WAGUFY	572	W4ILE	792
VBODPD	460	WORSE	573	WORSE	793
VABUFY	461	WDØCFZ	574	WDØCFZ	794
VØRSR	462	K5HT	575		
VADCEZ	463	WD4RAF	576		
VOPUD	464			500	
		1500		AK5NHA	1862
2500		WA6UFY	641	WA4NQG	1863
SMOCHA	518	WA6VJP	642	JA11BX	1864
VA6UFY	519	WORSR	643	WAGUFY	1865
VØRSR	520	WDØCFZ	644	KAØGZS	1866
VDØCFZ	521	WD4RAF	645	WØRSR	1867
VØPUD	522			W4RTE	1868
		1000		WDØCFZ	1869
		DL6UR	790	UASYE	1870

new seals for his certificate—USA-CA 1500 #645 and USA-CA 2000 #576.

Edward Sanders, WA6VJP, qualified for USA-CA 1500 #642, All C.W.

Wilhelm Huett, DL6UR, obtained USA-CA 1000 #790.

Regis Kramer, W4ILE, added USA-CA #792, All C.W., All QRP to his award.

USA-CA 500 certificates were issued to the following:

Ronald "Bing" Vernon Crosby, VK2NHV, USA-CA 500 #1862, All 10 meters, first USA-CA award issued to an Australian Novice. (Maximum power allowed to Australian Novices is 30 watts PEP.)

William R. Aglea, Jr., WA4NQG, USA-CA #1863, Mixed.

Shin-Ichi Nob Yoshida, JA1IBX, USA-CA 500 #1864, Mixed.

Jim Preston, WA6UFY, USA-CA 500, #1865 All 20 meter Mobile.

Larry J. Hale, KAØGZS, USA-CA 500, #1866, All C.W. Larry worked these first 500 counties as a Novice.

Mike Baird, W@RSR, USA-CA 500 #1867, All 20 meter Mobile.

John Embry, W4RTE, USA-CA 500 #1868, Mixed.

Jim Armes, WD0CFZ, USA-CA 500 #1869, All 20 meter Mobile.

Yuri Retin, UA9YE, USA-CA 500 #1870, Mixed.



Middle Tennessee DX ARC Award.

Awards

Middle Tennessee DX ARC Certificate. Make contact with any 7 (5 for DX) MTDXC members and receive a certificate for your achievement. Send calls worked with \$1.00 or 4 IRCs to Bill Fulcher, N4WF, 217 Bluegrass Drive, Hendersonville, TN 37075. Members are on at 0130 UTC Wed. #1 3805, Wed. #2 7180, Wed. #3 14180, Wed. #4 21280, Wed. #5 28280 of each month.

All QST Award Sponsored by CRRL. As most of you already know, the "QST" suffix has been assigned to CRRL in all Canadian call areas. VE-QST calls are used by Official Bulletin Stations across the country. These stations are active during League contests and public service events, and they provide regular bulletin services to local nets and on a nationwide basis to Canadian amateurs.

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able in five categories: c.w., phone, RTTY, mixed and QRP, with four endorsements: VEØ, VO2, VE8, and VY1.

To qualify, one must work all the eight stations from VO1, VE1 through VE7. Once you have all eight "QST" QSL cards, you can send them to CRRL, Box 7009, Station E, London, Ontario, N5Y 4J9, or directly to the award manager, John Gowron, VE4ADS (address ok in 1982 or later *Callbook*).

The licensees who control the use of "QST" calls and maintain log books for QSL purposes are: William Kremer, VE7CSD (VE7QST); Bill Gillespie, VE6ABC (VE6QST); William Munday, VE5WM (VE5QST); Peter Guenther, VE6ABC (VE6QST); Dick Reiber, VE3IBV (VE3QST); Welling, VE1WF Don Clarence (VE1QST); and Mitchell, VO1AW (VO1QST). The four endorsement calls will be active from time to time.

The Japan DX Radio Club Awards. The Japan DX Radio Club issues the WJDXRC and HJDXRC (Worked and Heard Japan DX Radio Club) awards to licensed amateurs and s.w.l.'s all over the world.

Requirements: (1) All contacts must be made after 29 July 1952. (2) Stations outside Japan must work (or hear) 5 of their members. Stations in Japan must work (or hear) 10 of their members. (3) QSLs need not be sent. However, a certified list of claimed contacts signed by any recognized radio club or two amateurs must be sent. (4) The fee is 6 IRCs, \$3.00 U.S., or 500 Yen. (5) If QSLs are sent to the JDXRC, you must include sufficient postage for their return. (6) Address for the application is JDXRC Award Manager, Ken-ichi Suzuki, JA3BG, 1601-2 Ohkubo, Ohkubo-cho, Akashi-city, 674, Japan.

Members list for the award is: JA1: AA, AB, AG, AS, BF, BK, BN, CC, CJ, CO, CR, DM, EA, EF, EM, JM, KF, LL, NP, TD, TJ, VP, ZZ, AAW, BAU, DLB, ELY, JRK, KAB, KSO, LYK, NCA, NLX, NRH, NSA, PAQ, PXO, VDJ, XAF; JE1JKL; JF1: IST, PJK; JH1: ECG, HWN, JGX, MCX, OCO, VRQ; JI1VLV; JJ1IHS; JR1AIB; JA2: AW, BL, DN, JW, LC, SM, UU, WB, APA, CXF, HGA, KLT; JA3: AA, BG, CV, DJ, F 'GM, IW, UI, ART, BGF, BXF, CWV, GZN, IXL, KWJ, RRN; JH3TKM; JR3BHW; JA4CX; JR4OZR; JA5: AB, AI, HD; JA6: AD, AO, HK, OL, TA,

WIRE & CABLE	
RG-213 mil. spec	
RG-214 mil. spec	\$1.35/ft
RG-8U foam, 95% braid	23.5¢/ft
RG-8X foam, 95% braid (Mini 8)	
RG-58AU mil. spec.	10.5e/ft
DC 474 missa mil sacc	9 5e/ft
RG-174 micro. mil. spec	104/6
RG-11U foam, 95% braid	11196111
RG-11AU mil. spec	24¢/11
RG-59U foam, 95% braid	
RG-59U mil. spec	
RG-59U foil TV type	6.9¢/ft
300 ohm ladder line poly ins	
450 ohm ladder line poly ins	
450 ohm ladder line bare, 100 ft	\$11.00
8 conductor rotor cable (2 #18/6 #22)	
8 conductor rotor cable (2 # 10/0 #22)	24mift
8 conductor rotor cable, heavy duty	
4 conductor rotor cable, 100 ft	30.50
14 Ga. Stranded Copperweld, 70 ft roll	
14 Ga. Stranded Copperweld, 140 ft roll.	\$9.00
12 Ga. Solid Copperweld 50 ft multiples.	8¢/ft
14 Ga. Solid Copperweld 50 ft multiples.	
18 Ga. Solid Copperweld 50 ft multiples.	4c/ft
14 Ga. Stranded Copper	Be/ft
8 Ga. Solid Aluminum 50 ft multiples	Relft
ANTENNA ACCESSORIES	12000
Amphenol PL-259	75¢ ea
Ceramic insulators dogbone/strain	
ALPHA DELTA PROD	BIG DISCOUNT
Coax seal, roll	\$1.95
W2AU balun 1:1 or 4:1	
W2AU END-sulator	
W2AU traps 10, 15, 20 or 40 mtr	
W2AU new 30 mtr traps	
WZAU new 30 mtr traps	\$25.00ipi
W2AU traps 75 or 80 mtr	
VAN GORDEN Hi-Q 1:1 balun	
VAN GORDEN Center insulator	
AMERITRON RCS8 remote coax switch	\$112.95
B&W 375 or 376 coax switch	\$21.15
B&W 593/595 coax switch	\$23.00/\$27.35
B&W 5KW balun 1:1 or 12:1	
B&W 5KW balun 4:1 or 6:1	
DAIWA coax switch CS 201/401	
TOWERS	
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HY-GAIN CRANK UP AND UNIVERSAL	ALUMINUM
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TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower.	\$43.95
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower.	\$43.95 \$59.95
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HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$306.00/\$375.00
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$306.00/\$375.00 11/\$77.99/\$98.50
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HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV\$193. HUSTLER 6BTV new 6 band vertical. HUSTLER G6144B/G7144 VAN GORDEN All Band Dipole (Tuner recommend)	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 ('d) \$24.95
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV\$193. HUSTLER 6BTV new 6 band vertical. HUSTLER G6144B/G7144. VAN GORDEN All Band Dipole (Tuner reconstruction)	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$306.00/\$375.00 \$1/\$77.99/\$98.50 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV. \$193. HUSTLER 6BTV new 6 band vertical. HUSTLER G6144B/G7144. VAN GORDEN AII Band Dipole (Tuner red BUTTERNUT HF6V. BUTTERNUT TBR-160HD.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV\$193. HUSTLER 6BTV new 6 band vertical. HUSTLER G6144B/G7144. VAN GORDEN All Band Dipole (Tuner recommendation) BUTTERNUT TBR-160HD. BUTTERNUT RMK-11/STR-11.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$108.29 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29 \$47.50 \$37.90/\$25.50
TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV. \$193. HUSTLER 66144B/G7144. VAN GORDEN AII Band Dipole (Tuner reconstruction) BUTTERNUT HF6V. BUTTERNUT TBR-160HD. BUTTERNUT RMK-11/STR-11. BUTTERNUT RMK-11/STR-11.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$306.00/\$375.00 11/\$77.99/\$98.50 \$123.25 .\$75.00/\$105.00 'd)\$24.95 \$108.29 \$47.50 .\$37.90/\$25.50 .\$27.00/\$33.65
HY-GAIN CRANK UP AND UNIVERSAL AT TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower 15 ft heavy duty tripod tower FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV\$193. HUSTLER 6BTV new 6 band vertical. HUSTLER G6144B/G7144. VAN GORDEN All Band Dipole (Tuner red BUTTERNUT HF6V. BUTTERNUT TBR-160HD. BUTTERNUT RMK-11/STR-11. BUTTERNUT 2MCV/2MCV-5. MINI-PRODUCTS HQ-1 Mini Quad.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29 \$47.50 \$37.90/\$25.50 \$27.00/\$33.65 \$127.95
TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV. \$193. HUSTLER 66144B/G7144. VAN GORDEN AII Band Dipole (Tuner red BUTTERNUT HF6V. BUTTERNUT TBR-160HD. BUTTERNUT RMK-11/STR-11. BUTTERNUT 2MCV/2MCV-5. MINI-PRODUCTS HQ-1 Mini Quad. B&W 370-15 AII Band folded dipole.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 11/\$77.99/\$98.50 \$123.25 \$75.00/\$105.00 \$108.29 \$47.50 \$37.90/\$25.50 \$27.00/\$33.65 \$127.95 \$130.95
TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV. \$193. HUSTLER 66144B/G7144. VAN GORDEN AII Band Dipole (Tuner red BUTTERNUT HF6V. BUTTERNUT TBR-160HD. BUTTERNUT RMK-11/STR-11. BUTTERNUT 2MCV/2MCV-5. MINI-PRODUCTS HQ-1 Mini Quad. B&W 370-15 AII Band folded dipole.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 11/\$77.99/\$98.50 \$123.25 \$75.00/\$105.00 \$108.29 \$47.50 \$37.90/\$25.50 \$27.00/\$33.65 \$127.95 \$130.95
TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower 15 ft heavy duty tripod tower FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV\$193. HUSTLER 66144B/G7144. VAN GORDEN AII Band Dipole (Tuner red BUTTERNUT HF6V. BUTTERNUT TBR-160HD. BUTTERNUT RMK-11/STR-11. BUTTERNUT 2MCV/2MCV-5. MINI-PRODUCTS HQ-1 Mini Quad. B&W 370-15 AII Band folded dipole. B&W 370-15 AII Band folded dipole. B&W AT-80 10, 15, 40, 80 mtr trap dipole.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29
TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV. \$193. HUSTLER 6BTV new 6 band vertical. HUSTLER G6144B/G7144. VAN GORDEN AII Band Dipole (Tuner recommendation) BUTTERNUT TBR-160HD. BUTTERNUT RMK-11/STR-11. BUTTERNUT 2MCV/2MCV-5. MINI-PRODUCTS HQ-1 Mini Quad. B&W 370-15 AII Band folded dipole. B&W AT-80 10, 15, 40, 80 mtr trap dipole. B&W AV-25 AII Band Vertical.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29 \$47.50 \$37.90/\$25.50 \$27.00/\$33.65 \$127.95 \$130.95 \$45.50 \$89.95
TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower 15 ft heavy duty tripod tower FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN New Explorer Triband. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV\$193. HUSTLER 66144B/G7144. VAN GORDEN AII Band Dipole (Tuner red BUTTERNUT HF6V. BUTTERNUT BR-160HD. BUTTERNUT BR-160HD. BUTTERNUT RMK-11/STR-11. BUTTERNUT RMK-11/STR-11. BUTTERNUT RMK-11/STR-11. BUTTERNUT BR-160HD.	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$306.00/\$375.00 11/\$77.99/\$98.50 \$123.25 .\$75.00/\$105.00 ('d)\$24.95 \$108.29 \$47.50 .\$37.90/\$25.50 .\$27.00/\$33.65 .\$127.95 .\$130.95 \$45.50 .\$89.95 .\$89.95
TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower 15 ft heavy duty tripod tower FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TO AND ROTOR, FREIGHT FREE. ANTENNAS AND ROTORS HY-GAIN New Explorer Triband. HY-GAIN AR-22XL/CD-45II. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV. \$193. HUSTLER 66144B/G7144. VAN GORDEN AII Band Dipole (Tuner recommendation) BUTTERNUT TBR-160HD. BUTTERNUT AMK-11/STR-11 BUTTERNUT AMK-11/STR-11 BUTTERNUT AMK-11/STR-11 BUTTERNUT AMK-11/STR-11 BUTTERNUT BR-160HD. BUTT	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$132.97/\$154.50 \$132.97/\$154.50 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29 \$47.50 \$37.90/\$25.50 \$27.00/\$33.65 \$127.95 \$130.95 \$130.95 \$45.50 \$89.95 \$36.95 SEN AND B&W
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TOWERS AT BIG DISCOUNT 10 ft heavy duty tripod tower. 15 ft heavy duty tripod tower. FREE FREIGHT ON HY-GAIN TOWERS. FOR PACKAGE QUOTE ON HY-GAIN TOWERS. HY-GAIN NEW Explorer Triband. HY-GAIN HAM IV/Tailtwister. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH2MK3S/TH3JRS. HY-GAIN TH5MK2S/TH7DXS. HUSTLER 3TBA/4BTV/5BTV. \$193. HUSTLER 6BTV new 6 band vertical. HUSTLER 66144B/G7144. VAN GORDEN All Band Dipole (Tuner red. BUTTERNUT HF6V. BUTTERNUT BR-160HD. BUTTERNU	\$43.95 \$59.95 CALL OR WRITE WER, ANTENNA \$267.95 \$58.95/\$102.75 \$194.95/\$241.50 \$132.97/\$154.50 \$306.00/\$375.00 \$1/\$77.99/\$98.50 \$123.25 \$75.00/\$105.00 'd) \$24.95 \$108.29 \$47.50 \$37.90/\$25.50 \$27.00/\$33.65 \$127.95 \$130.95 \$130.95 \$130.95 \$45.50 \$89.95 \$45.50 \$89.95 SEN AND B&W UNT. CALL OR \$35.00/\$42.75 \$31.05 BIG DISCOUNT \$49.95 \$165.99/\$272.95 \$66.98/\$79.20 \$125.00/\$260.00 \$81.50/\$97.96 \$180.00/\$98.00 \$330.40/\$415.00
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CIRCLE 134 ON READER SERVICE CARD



Shigeo Kanehira, JA1VDJ, Editor of the Mobile Ham magazine in Japan.

ZD, BVU, CTN; JR6EA; JA7: AB, CEK; JA8: AA, AQ, JL, JO, KB, LN, MS, ADQ, CDT, DNZ; JA9: AA, AB, AC, AG, BE, BJ, CG, LJ, AIG, APS, BAB, ESZ; JA0: AA, BR, CA, SX, DSH, NRP.

Five Bands, 5 Continents Awards—Mexico DX Club. The Mexico DX Club offers to all amateur radio stations and s.w.l.'s in the world the 5 Bands 5 Continents program under the following rules:

 The awards will be available in mixed, c.w., or phone. Only contacts made after January 1, 1980 will count.

 Confirmations (QSL cards) must be submitted to the Mexico DX Club for countries claimed, or to the continental check point for verification on QSL's with the official application form, filled in properly and clearly.

All contacts must be "land stations."
 Contacts with ships, anchored or otherwise, and aircraft cannot be counted.

 All contacts must have been made from the same DXCC country on 28, 21, 14, 7, and 3.5 MHz only.

5. Any combination of DXCC countries



SM0CHA, Charlie, in Stockholm working counties with the aid of his second op.



Plaques issued by the Mexico DX Club for their 5 Band Award.

per continent will be accepted. It is not necessary to work the same country on all five bands.

6. The official application form for each continent includes the current DXCC countries for each of them. For this program Antartica will not count, and Turkey and Albania should be in Europe instead of Asia (printing error).

7. The application forms can be obtained from the Mexico DX Club or KB7SB or EA4DO (see checkpoint list).

5 Bands New Continent (5BNC). Applicants must send 40 DXCC countries of America in each band, a total of 200 at least; CQ zone 6, ITU zone 10 (Mexico and Revillagigedo Is. must be worked on all five bands).

5 Bands Europe (5BEU). Applicants must send 40 DXCC countries of Europe per band (200).

5 Bands Africa (5BAF). Applicants must send 30 DXCC countries of Africa per band (150).

5 Bands Asia (5BAS). Applicants must send 25 DXCC countries of Asia per band (125).

5 Bands Oceania (5BOC). Applicants must send 25 DXCC countries per band (125).

Each plaque is a beautiful acrylic and fine wood plaque, printed in four colors, with call sign, date issued, and number of award. The fee is \$10.00 U.S., which includes registered airmail return of the award. However, this fee may change in the future because of changes in the postage rates. The station that can obtain all 5 plaques will be issued a special 5 Band, 5 Continents award at no cost.

The plaques can be worked for by stages, sending QSL cards for any band completed on the different continents, and the applicants will receive a certificate for band and continent worked, with an s.a.s.e. 5.5" × 8.5" minimum. Once the applicant has completed 5 bands of a continent, the plaque will then be sent. The standings of each applicant will be published in a monthly bulletin.

Continental Check Points: America—Mexico DX Club, P.O. Box 21-167, Coyoacan 04000, Mexico. Europe—EA4DO, Isidoro Ruiz Ramos, El Paular 12, Puerta de Sierra 3, Majadahonda, Madrid, Spain. U.S.A. and Canada—KB7SB, Scott Douglas, P.O. Box IARS, Glendale, CA 91206-7609, U.S.A. Africa—EA9IE, Juan Jose Rosales, P.O. Box 410, Cueta, Spain. Cards may also be checked by the local DXCC League (DARC, ARRL, URE, BRE, JARL, REF, etc.). Be sure to include postage for the return of your cards.

Notes

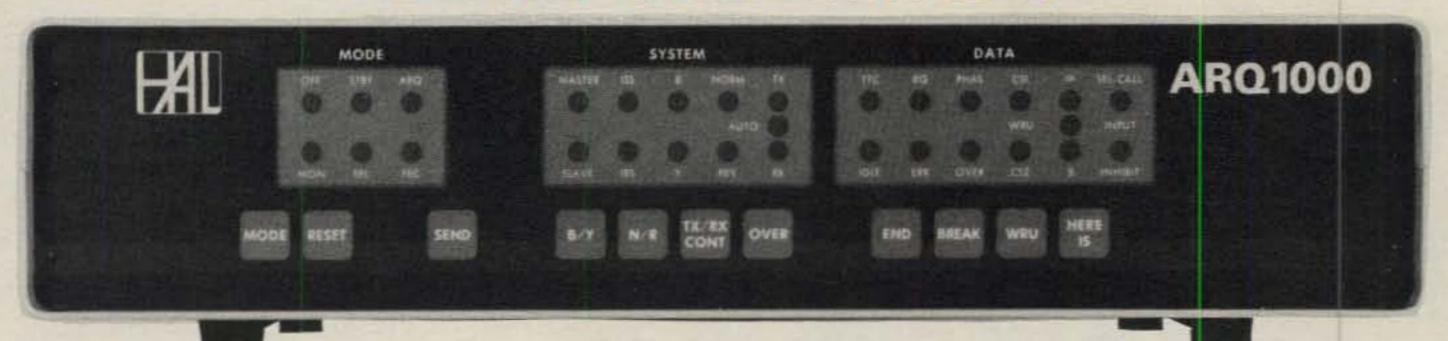
In whatever way you celebrate the holidays, may you have your family close by, joy in your heart, good health, prosperity, and for all of us, peace in our world. Until January 1984!

73, Dorothy, WB9RCY



CIRCLE 149 ON READER SERVICE CARD

AMTOR RTTY



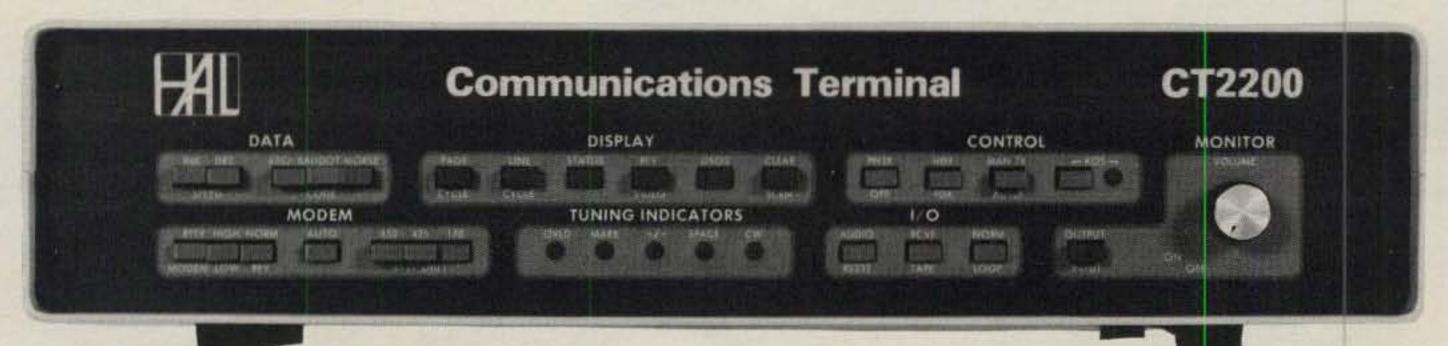
HAL is proud to announce the ARQ1000 code converter. This terminal not only supports the AMTOR amateur codes, but meets ALL of the commercial requirements of CCIR Recommendation 476-2. The ARQ1000 can be used with present and previous generation HAL RTTY products. In fact, any Baudot or ASCII full duplex terminal at data rates from 45 to 300 baud may be used with the ARQ1000. Some of the outstanding features of the ARQ1000 are:

- Send/receive error-free ARQ, FEC, and SEL-FEC modes
- Automatic listen mode for ARQ, FEC, and SEL-FEC
- Meets commercial requirements of CCIR 476-2
- By-pass mode for normal RTTY without changing cables
- Programmable ARQ access code, SEL-CAL code and WRU
- Programmable codes stored in non-volatile EEPROM
- Keyboard control of normal send/receive functions
- 30 Front panel indicators and 11 control switches

- Interfacing for loop, RS232, or TTL I/O
- · "Handshaking" control for printer and keyboard or tape
- Self-contained with 120/240V, 50/60 Hz power supply
- Cabinet matches style and size of HAL CT2200
- · Table or rack mounting
- Built-in M1700 modem option available
- · Encryption option available for commercial users
- 3½" × 17" × 10½"

The ARQ1000 is commercial-quality equipment that will give you the outstanding performance you expect from a HAL product. Write for full details and specifications of the ARQ1000.

BY POPULAR REQUEST



By popular request - the new CT2200. Our slogan is "When Our Customers Talk, We Listen" - and we have been listening. The CT2200 includes these often requested features:

- New AMTOR connections for use with ARQ1000
- Keyboard programming of all 8 "brag-tape" messages
- Programmable selective call code

- Expanded HERE IS storage for a total of 88 characters
- Non-volatile storage of HERE IS, "brag-tape," and SEL-CAL code
- 3%"×17"×10½"

All of the proven CT2100 features are retained. Some of these features are:

- Tuning scope outputs (a MUST for AMTOR)
 Built-in demodulator for high tones, low tones, "103", or "202" modem tones 36 or 72 character display lines • 2 pages of 72 character lines or 4 pages of 36 character lines • Split screen or full screen display
- · Baudot or ASCII, 45 to 1200 baud · Full or half duplex · Morse code send/receive at 5 to 99 wpm · Send/receive loop connection · Automatic transmit/receive control (KOS) · Audio, RS232C, or Loop I/O · On-screen tuning and status indicators
- · Clearly labeled front panel switches, not obscure keyboard key combinations · Separate convenient lap-size keyboard · Internal 120/240, 50/60 Hz power supply . Attractive shielded metal cabinet

In addition, an update kit is available so that all CT2100 owners can update their CT2100's to include CT2200 features. The kit even includes a new CT2200 front panel! Rather than making a proven product obsolete, HAL put even more behind the buttons. Pick up a CT2200 at your favorite HAL dealer and join the RTTY fun. Write for our full RTTY catalog.



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NEWS/VIEWS OF ON-THE-AIR COMPETITION

ust a reminder, deadline for submitting your WW Phone Contest logs is December 1st, and January 15th for your C.W. entries. An extension to the above dates will be given if requested. Your request must be submitted in writing stating the reason. It should be sent to the respective Directors, N6AR for Phone Contest and K3EST for the C.W. Contest.

This year your Phone logs to to: Larry Brockman, N6AR, 7164 Rock Ridge Terrace, Canoga Park, CA 91307. The C.W. logs go to Bob Cox, K3EST, 6548 Spring Valley Dr., Alexandria, VA 22312. And, of course, they can always be sent to the home office: CQ Magazine, 76 North Broadway, Hicksville, NY 11801. Be sure to indicate Phone or C.W. on the envelope if logs are sent to the office.

If you still have any questions about the Contest, complete rules were published in the September issue, with a subsequent follow-up in the October and November Contest Calendars.

The Connecticut QSO Party and Canada Day Contest usually scheduled for December have not been heard from, just in case you are looking for that announcement.

There was a special event held on Thanksgiving Day by the Whitman ARC from the Plimoth Plantation Museum of Plymouth, Mass. Operation by Special Events Station WA1NPO was mostly s.s.b. on 7, 14, and 21 MHz, with some limited c.w. operation on 40 meters. You may also have heard UK Club Station G3PRC. In any event, if you contacted WA1NPO or G3PRC, send your QSL with \$1.00 or 3 IRCs to Whitman ARC, P.O. Box 48, Whitman, MA 02382 for an attractive Mayflower II certificate.

This is being written on a warm fall day in September, but it is for the December issue, and I would be remiss if I didn't extend my best wishes for the holidays to you and yours. Have a happy!

Not to forget the usual reminder, especially with the expected delay in the mails due to the holiday rush, deadline for material for the March issue is December 15th and January 15th for the April issue. Use my home address, please.

73 for this time, Frank, W1WY

ARRL 160 Meter C.W. Contest

2200Z Fri. to 1600Z Sun., Dec. 2-4

This is the 14th year for this top band activity. Exchanges will be between

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

	Nov.	26-27	CQ WW DX C.W. Contest
	Dec.	2-4	ARRL 160 Meter Contest
	Dec.	3-4	TOPS 3.5 MHz CW Contest
		3-4	
1	Dec.	3-4	Spanish Phone Contest
†	Dec.	10-11	
	Dec.	10-11	ARRL 10 Meter Contest
†	Dec.	10-11	Hungarian CW Contest
	Jan.1-	Dec.31	U.B.A. SWL Competition
	Jan.	2-10	New Zealand Scout Jamboree
	Jan.	14	"Hunting Lions" Contest
	Jan.	14-15	White Rose SWL LF Contest
	Jan.	21-22	Michigan QRP Club Contest
+	Jan.	21-22	Hungarian DX Contest
	Jan.	27-29	CQ WW DX 160 C.W. Contest
	Jan.	29-30	Classic Radio Exchange
	Feb.	11-12	QCWA CW QSO Party
	Feb.	11-12	YL-OM Phone Contest
	Feb.	11-12	Dutch PACC Contest
	Feb.	18-19	ARRL DX CW Contest
	Feb.	24-26	CQ WW DX 160 S.S.B. Contest
	Mar.	3-4	ARRL DX Phone Contest
	Mar.	10-11	QCWA Phone QSO Party
		17-18	The state of the s

† Not official.

stateside and VE and DX stations. DX to DX contacts, however, are not permitted.

Classes: Single operator and multi-operator.

Exchange: RST and your ARRL section; country for DX and ITU region for maritime mobiles.

Scoring: Contacts between stations in ARRL sections count 2 points, with DX stations 5 points.

Multiplier: Determined by the number of ARRL sections plus VE8/VY1 (maximum of 74) and DX countries worked (for W/VE participants). (DX use ARRL sections only.)

Final Score: Total QSO points times the ARRL section and DX multiplier.

Awards: Certificates to the top-scoring single operator station in each section and DX country, and to the top-scoring multi-operator station in each ARRL division and continent.

The ARRL 160 band plan requires that W/VE stations transmit only in the 1800–1825 and 1830–1850 kHz segments, keeping the "DX Window" (1825–1830 kHz) clear for DX stations. They will indicate where they will be listening for cross-frequency contacts.

The usual grounds for disqualification—violation of rules, excessive duplicate contacts, etc.—will prevail.

Logs with more than 200 QSO's must include dupe sheets. A large s.a.s.e. to the ARRL will get you the necessary forms to make log keeping easier.

All entries must be postmarked no later than January 4th and go to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, CT 06111.

Telco. Pioneers QSO Party

1900Z Sat. to 0500Z Mon., Dec. 3-5

This is the 19th annual party organized by the Telephone Pioneers of the U.S. and Canada. This year's party is again being sponsored by the John D. Burlie Chapter #89 of Columbus, Ohio.

Members may be contacted on each band and each mode if they are in different chapters, but only one contact is permitted between stations in the same chapter.

Exchange: QSO no., and chapter number (ITPA chapters, name only).

Scoring: One point per QSO on each band and mode, and one multiplier for each different chapter worked. Chapters are counted once only. There are 98 TPA and 10 ITPA chapters.

Frequencies: Phone—3915, 7275, 14285, 21375, 28705. C.W.—3575, 7075, 14075, 21075, 28075. Plus or minus 20 kHz. Also u.h.f. frequencies 50–54, 144–148, 220–225. This year 160 meters and RTTY have also been added.

Awards: None were mentioned, but there probably are awards for high-scoring individual stations and clubs. Logs sheets may be obtained from your Radio Club Coordinator or Administrator. Mailing deadline for all entries is January 15th, and they go to: John D. Burlie Chapter #89, Att: Ted Phelps, W8TP, c/o Western Electric, Dept. 45430, 6200 East Broad Street, Columbus, OH 43213.

TOPS 3.5 MHz C.W. Contest

1800Z Sat. to 1800Z Sun., Dec. 3-4

Activity in this one is in the 3.5 to 3.585 portion of the 80 meter band. In the past, participation has been almost totally confined to Europe. This year, however, the lower 12 kHz has been set aside for DX contacts only. Now at least the U.S. Extras will be able to break through the European curtain.

The contest is open to both single and multi-operator stations world wide. Single operators must take one 7-hour break during the contest. Multi-operators can continue the full 24 hours.

A QRP section has been added this year, maximum input of 5 watts, single operator.

Exchange: RST plus a QSO number starting with 001. TOPS members will include their membership number.



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	A3 3 Element, 10, 15, 20 Meters\$205.90
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ı	R3 10, 15, 20 Meters, Remotely Tuned Vert 260.82
١	AV3 10, 15, 20 Meters Vertical
١	AV4 10, 15, 20, 40 Meters Vertical
ı	AV5 10, 15, 20, 40, 80 Meters Vertical96.06
ı	10-3CD 3 Element, 10 Meters
ı	10-4CD 4 Element, 10 Meters
١	15-3CD 3 Element, 15 Meters
١	15-4CD 4 Element, 15 Meters
ı	A3SK A3 Stainless Steel Hardware Kit
ı	A743 A3 7 Mhz. or 10 Mhz. Add On Kit68.60
ı	A744 A47 Mhz. or 10 Mhz. Add On Kit68.60
ı	A50-3 3 Element, 50 Mhz
ı	A50-5 5 Element, 50 Mhz
ı	A144-7 7 Element, 144 Mhz27.41
ı	A144-11 11 Element, 144 Mhz44.60
١	A147-4 4 Element, 146 to 148 Mhz
ı	A147-11 11 Element, 146 to 148 Mhz
١	A147-20T 20 Element Twist, 144 & 147 Mhz 53.96
ı	A147-22 22 Element, 146 to 148 Mhz 123.52
1	A220-7 7 Element, 220 Mhz
ı	A220-11 11 Element, 220 Mhz
ı	A449-11 11 Element, 449 Mhz37.72
ı	AFM-4D Four Pole, 144 to 148 Mhz
١	AFM-24D Four Pole, 220 to 225 Mhz
ı	AFM-44D Four Pole, 440 to 450 Mhz
ı	ARB-2K Ringo Ranger II Conversion Kit15.06
ı	ARX-2B Ringo Ranger II, 134 to 164 Mhz34.28
ı	The state of the s
ı	District Control of the Control of t
١	ARX-220B Ringo Ranger II, 220 to 225 Mhz 34.28 ARX-450B Ringo Ranger II, 435 to 470 Mhz 34.28
ı	32-19 19 Element Boomer, 144 to 146 Mhz89.20
ı	214B 14 Element Jr. Boomer, 144 to 146 Mhz 75.47
ı	214FB 14 El. Jr. Boomer, 144.5 to 148 Mhz 75.47
ı	BELDEN
ı	8000 Antenna Wire, #14(7x#22) Per Ft. \$.10
	DONG PHILDING STILL, SITUANGEL
ı	
١	8214 RG-8/U Foam Coax
	8214 RG-8/U Foam Coax
	8214 RG-8/U Foam Coax
	8214 RG-8/U Foam Coax
	8214 RG-8/U Foam Coax
	8214 RG-8/U Foam Coax Per Ft38 8216 RG-174/U Coax Per Ft12 8235 300 Ohm, 1-KW., Twin Lead Per Ft16 8240 RG-58/U Coax Per Ft12 8241 RG-59/U Coax Per Ft12 8262 RG-58C/U Coax Per Ft16
	8214 RG-8/U Foam Coax Per Ft38 8216 RG-174/U Coax Per Ft12 8235 300 Ohm, 1-KW., Twin Lead Per Ft16 8240 RG-58/U Coax Per Ft12 8241 RG-59/U Coax Per Ft12 8262 RG-58C/U Coax Per Ft16 8267 RG-213/U Coax Per Ft46
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	8214 RG-8/U Foam Coax
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La Rue Electronics

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PHONE (717)343-2124

CIRCLE 22 ON READER SERVICE CARD



Plimoth Plantation, location of the Thanksgiving Day operation by the Whitman ARC Special Event station WA1NPO.

Scoring: QSO's between stations within own country, 1 point. (Each call area in W, VE, VK, PY, and UA is counted as a separate country.) With other countries but same continent, 2 points. With other countries in other continents, 6 points. QSO's with TOPS stations earn 2 bonus points. If between member stations, 3 bonus points.

Final Score: Total QSO and bonus points times number of different prefixes worked (prefixes as in CQ WPX).

Awards: Certificates to winners in each country. Include an addressed envelope and IRC for results. Mailing deadline for logs is January 31, 1984 to: Bertil Arting, SM3VE, Bergesvegen 26, S-823 00 Kilafors, Sweden.

(In the 1982 list of results only VO1AW made the list, no W/Ks. Making the DX section above 3525 MHz would be my suggestion to improve W/K participation—ed.)

Spanish DX Contest

Phone: Dec. 3-4 C.W.: Dec. 10-11 2000Z Saturday to 2000Z Sunday

It's the world working the Espanoles with separate weekends for phone and c.w. Only single operator operation is permitted, all bands 3.5 through 28 MHz.

Exchange: RS(T) plus a three-figure QSO number starting with 001.

Scoring: Contacts between EA stations and the following prefixes are worth 3 points: DU, CE, CM/CO, CP, CX, HC, HI, HK, HP, HR, KP4, LU, OA, PY, TG, TI, XE, YN, YS, YV, ZP, or equivalent prefixes.

Between EA and all other non-Hispano and non-European countries, 2 points.

Between EA and Europeans, 1 point (WAE boundaries).

Multiplier: For EA, each DXCC country

worked on each band. All others use EA call districts worked on each band.

Final Score: Total QSO points from all bands times the multiplier from each band.

Awards: Gold, Silver, and Bronze medals to the first 3 places, phone and c.w., in Spain and to overseas winners. Certificates to first-place winners in each country. A minimum of 100 points is required to qualify.

Include a summary sheet with your log showing the scoring and other pertinent information, the usual signed declaration that rules and regulations have been observed, and your name and address in block letters.

Your entry must be postmarked no later than February 15th to: U.R.E. International Contest, P.O. Box 220, Madrid, Spain.

Hungarian C.W. Contest

1600Z Sat. to 1600Z Sun., Dec. 11-12

It's the world working the HA's on all bands 3.5 through 28 MHz on c.w. only.

Operation will be in three classes: Single operator, single band and all band, and multi-operator all band. (Club stations are considered multi-operator.)

Exchange: RST plus a contact number starting with 001. In addition, the HA's will send two letters to identify their county (BA, BP, BE, BO, CS, FE, GY, HA, HE, KO, NO, PE, SA, SO, SZ, TO, VA, VE, ZA, total of 20 on each band).

Scoring: One point for each HA contact, and a multiplier of one for each different county worked on each band. (Same station may be worked once on each band for QSO and multiplier credit.)

Final Score: Total QSO points from all bands times the sum of the county multiplier from each band.

Awards: Certificates to the first place winners in each class in each county.

Include a summary sheet with your entry including the usual signed declaration. Send within six weeks from the end of the contest to: Radio Amateur League of Budapest, P.O. Box 2, H-1553, Budapest, Hungary.

ARRL 10 Meter Contest

0000Z Sat. to 2400Z Sun., Dec. 10-11

This is the 11th annual 10 Meter Contest organized by the ARRL. It has become very popular because of the choice of entries available, so plan your strategy while conditions still prevail.

It's a worldwide activity in which DX stations are permitted to work other DX stations. You are not limited to working W/K's and VE's only.

The same station may be worked once on phone and again on c.w.; no cross-mode, however. A maximum of 36 hours operating time is permitted out of the 48-hour contest period for all stations.

Categories: Single operator, mixed mode, phone only or c.w. only. Multi-operator mixed mode only.

Exchange: W/VE stations (including KH6 and KL7) send RS(T) and state or province. DX stations (including KH2, KP4, etc.) send RS(T) and QSO number starting with 001. Maritime mobiles send RS(T) and ITU region. Novice and Tech. stations must identify /N or /T.

Scoring: Phone QSOs are worth 2 points, c.w. 4 points, and Novice 8 points.

Multiplier: Fifty U.S. states, VE call areas, DX countries, and ITU regions.

Final Score: Total QSO points times the state, province, DX country, and ITU region multiplier.

Awards: Certificates to the top single operator in each category for each ARRL section and DX country, and to the top multi-operator station in each ARRL division and each continent.

Indicate the multiplier only the first time it is worked. Dupe sheets are required for logs with 500 or more QSO's. The usual disqualification criteria will be observed. A large s.a.s.e. will get you log and instruction forms. Mailing deadline for all entries is January 12th to: ARRL Communications Dept., 10 Meter Contest, 225 Main Street, Newington, CT 06111.

U.B.A. SWL Competition

Jan. 1, 1984 to Dec. 31, 1984

This competition is open to all registered s.w.l.'s in the world organizations recognized by the IARU.

The ARRL country list will be used as the standard on all 5 bands 10 through 80 meters.

There are three categories: c.w., phone, and RTTY, single operator only.

You are allowed to enter any one category or all three categories.

Points and Multiplier: Each country heard on each band is counted once for each band. However, each country counts only once as a multiplier regardless of how many times it is recorded.

To enter the contest it is necessary to report your points calculation (no log) at least 3 times during the year: March 1st, June 1st, and September 1st. Final submission is January 20, 1985.

Make up your own log forms, 7 columns to the sheet: date, a column for each band, and a multiplier column. List calls of stations heard, each country once only on each band, but only use the country prefix in the multiplier column.

A summary sheet showing the scoring, etc., and signed declaration are requested.

It is strongly recommended that you send an addressed envelope and two IRCs for official log forms and instructions. Address all letters to the SWL Contest Manager: Marc Domen, ONL 6945, Gebr. Blommestraat 14, B-2200 Borgerhout, Antwerpen, Belgium.

ZL Scout Jamboree on the Air

January 2-10

New Zealanders will be holding their version of the Boy Scout Jamboree on-

the-air activity on the above dates. This is in conjunction with the 10th Scout Jamboree being held at Fielding this year. An expected attendance of about 10,000 Scout personnel will participate in a varied program, including a review of a wide range of electronic equipment, amateur radio gear, computers, etc.

Amateur radio station ZL2JAM will be on the air during the above period using the International Scout frequencies of 3740, 3940, 7090, 7290, 14290, 21360, and 28990 kHz. Activity mostly will be on c.w. and s.s.b., but also look for some RTTY, SSTV, and Oscar operation.

QSL's and requests for additional information should be addressed to Jim Parnell, ZL2APE, 87 Duncan Terrace, Wellington 3, New Zealand.

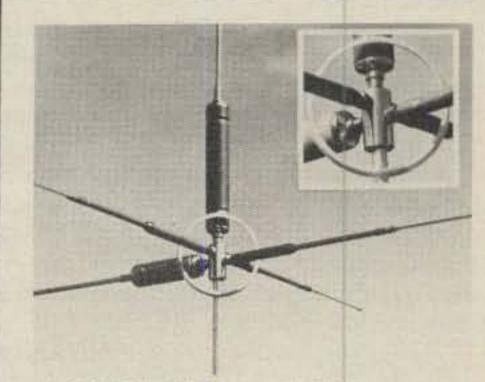
1983 Bermuda Contest Winners

A little late, but for the record, the winners for the Bermuda Contest were W1RR for the U.S., G3UKS for the United Kingdom, DL7OK for West Germany, and VE3JSZ for Canada. The top scorer in Bermuda was VP9IX; VP9TAD was high on c.w. Hopefully, they all made it to the Annual Banquet and received their awards last October.

Homebrew Headquarters COMPONENTS Amphenol connectors B&W coils, switches, antennas Hammond and LMB enclosures Jackson dials and drives lambic paddles J.W. Miller parts Wire and cable Knobs and shaft couplers Millen components Multronics roller inductors Padders and trimmer capacitors Resistors, capacitors, inductors Toroids, cores, beads, baluns Transmitting/Receiving Capacitors Air Variables: Cardwell - E.F. Johnson Hammarlund - Millen Doorknob: Centralab — Jennings PROJECT PACKS Direct from England, Featured in Radio & Electronic World GaAs FET 2 Meter Mast Head Pre-Amplifier 123.50 2 Meter Pre-Amplifier 6.50 2 Meter Converter 37.50 UHF (70 cm) Pre-Amplifier 9.50 UHF (70 cm) Converter 38.50 UHF (70 cm) to VHF (TV) Converter 60.50 23 cm Converter 43.50 Air Band Receiver 162.00 FET Dip Oscillator 52.50 OTHER KITS CPP1 Code Practice Processor/Electronic Keyer 47.00 General Coverage for Drake R4C, B, A Receivers Split Band Speech Processor 69.95 Smart Squelch 49.95 R-X Noise Bridge 33.45 L Meter 25.50 40 Meter QRP Transceiver 101.95 * Shipping & Handling \$2.50 * 1983 Catalog 50 cents Box 411C, Greenville, NH 03048

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QTH_____Call___

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CIRCLE 67 ON READER SERVICE CARD



NEWS OF COMMUNICATIONS AROUND THE WORLD

Merry Christmas and a Happy New Year!
Feliz Navidad! Frohliche Weihnachten!
Joyeus Noel! Buon Natale! Kellemes
Karacsonyt es Boldog Ujevet Kivanunk!
Hauskaa Joulua! S Rozhdestvom
Khristovym! Shinnen Omedeto!
Glaedelig Jul! Nodlaig Mhaith Chughat!
Kull Am Wa Antum Bekhir! Wesolych
Swiont! Chanuakh Lesinchah! St'astne
Vanoce! Ch'ing Chu Yeh Su Sheng Tan!
to DXers the world over from the staff of
the CQ DX Department.

De Extra: This month's editorial comment is by Steve Rock, N4SR, and concerns the controversial Spratly Islands.

"I read with great interest the comments by K5NW concerning the 'ill-fated Spratly expedition.' In all the 'hoop-de-la' that has been raised over this incident, I have yet to see anybody take the ARRL to task for a very basic fact. That fact is that for a long time the League has chosen to 'selectively enforce and ignore' some of its own rules.

"The criteria for DXCC acceptance of any DX operation includes the requirement that proper licensing and documentation of that licensing must be obtained before the QSL cards will be accepted. This licensing must be granted by the recognized government having jurisdiction over the territory involved. Much heart-burn and hard feelings have been generated by this rule, which, in my opinion, is a reasonable rule.

"However, I wonder how many QSLs have been accepted for Turkish contacts over the past few years? It's a fact that Turkey has authorized no amateur operations for many years. I questioned a League official about this and got the usual blank stare and a shrug of the shoulders.

"Now, it is a fact that at least 5 nations claim the Spratly Islands. No one knows who actually owns them. How could it be possible that anyone could obtain the usually required permission? The Spratly operation was no secret. Everyone knew that it was about to go. Had the League acted as a responsible organization, it would have indicated that because of the impossibility of meeting the proper licensing requirement, no QSLs would be acceptable for DXCC purposes. I am sure that knowing this, the group would not have gone to the Spratlys and the two lives would not have been lost.

P.O. Box 205, Winter Haven, FL 33880



John, EA8PP, is a big signal out of Tenerife, Canary Islands. (Tks DJ9ZB)

"I firmly believe that countries which are, and have been, so much in dispute should be put in a 'temporary deleted' status as far as DXCC is concerned. This would offer NO reward for DXpeditions to visit those areas and would put some life into the Honor Roll program. The loss of a country, or temporary deletion, wil not adversely affect anyone, while keeping countries for which there is no chance of meeting licensing requirements surely will, and does, affect Honor Roll seekers.

"The League must realize that it sets the standard for the DX world and must act in a mature and responsible manner toward it. If we are going to have rules, they must apply all the time, not just when it is convenient. The German group would not have gone to the Spratly Islands if they had known that their contacts would not be allowed for DXCC purposes.

"Now we hear that the Spratlys may be deleted! WHY?? Have they sunk to the bottom of the ocean? Has the League decided for everyone who actually owns them? No, the islands are still there and the ownership question is still hotly debated.

"Perhaps the best answer is a 'temporarily deleted' status for such countries. For better or worse, these are my views. Enjoy your magazine and QST also."

These comments by N4SR were in response to the De Extra which appeared on page 90 of the September issue of CQ.

Here and There

Amsterdam Island: Mike, FB8ZP, operates almost daily near 14220 kHz from 1100 UTC.

Aves Island: The Radio Club of Venezuela plans an Aves operation in early 1984. Normally, only YV operators can obtain permission for a legal operation from this island country.

Chatham Island: ZL4OY/C is a regular weekend visitor to the Family hour on 21345 kHz at 0001 UTC.

Clipperton Island: FO8IW has a license and landing permission for Clipperton and is expected on the island in March or May 1984. The callsign is not yet known.

DX Report: A bulletin entitled simply *DX Report* is being published biweekly by Alan Leith, VE3FRA/VE1AL. It is a one-page, one-side report on legal-size paper styled in a manner suggestive of Geoff Watt's *DX News Sheet*, which is now being published by the RSGB.

French Polynesia: Jay and Jan O'Brien, W6GO and K6HHD, will be on Moorea from November 19th signing FOØJO and FOØOJ. They plan to operate until the first week in December with FOØJO concentrating on c.w. in the 40/80 meter bands during the CQ WW C.W. Test the last week in November. Before and after the tests both Jay and Jan will be operating all the available bands. There is a possibility of some 160 activity as well as action on the 30 meter band. QSLs go to the home QTH, Box 700, Rio Linda, CA 95673. S.a.s.e. or s.a.e./IRC requested.

Honduras: HR3JJR will go QRT at the end of the year after 29 years in Honduras. Until then he can be heard daily from 2000 UTC on 21237 and from 2100 UTC on 14127.

Gabon: TR8DR is heard regularly on Thursdays after 2230 UTC on 21300 s.s.b. and Wednesdays after 2230 UTC on 7005 c.w. QSL to W2PD. TR8JLD has a strong c.w. signal on 21020 kHz after 2100 UTC and 14020-030 after 2300 UTC. QSL to Box 484, Libreville, Gabon.

Guinea: 3X4EX was heard on 14220 s.s.b. at 2230 GMT and 21220 s.s.b. at 1220 UTC. QSO's after June 6, 1983 are valid for DXCC.

Ivory Coast: Tom Gregory, N4NW, is on the air from Abidjan as TU2NW. He plans 80% s.s.b. and 20% c.w. operation on all bands with 28555, 21300, and 14155 ± 10 kHz, 7070 and 3795 ± kHz listed as preferred frequencies for s.s.b. On c.w., he will be 20 kHz up from the bottom edge of the bands, listening up. All QSLs go to Mike Hayden, AK3F, P.O. Box 573, Gettysburg, PA 17325. TU2NW will take part in no list operations.

Kampuchea: XU1SS (JA1UT) and KU1KC were active during August on 10, 15, and 20 meters. They were training a group of local operators. When heard, they were working mostly Asian stations. The first U.S. contacts were KH6WW, KD7Z, and KZ6E. QSLs go to JA1HQG, Box 22-25, Ram Intra, Bangkok 10220 Thailand. The DXCC status of these stations is uncertain at present.

Kermadec Island: A combined amateurradio/scientific expedition to Kermadec, organized by Jim Smith, VK9NS, may

The WPX Program

Mixed							
	IØAOF KS7T	1069	OK1JDJ AC8W				
S.S.B.							
1617	WA5BWM JM1IFB UJ8JCQ KB4HU	1621	NB5C KB5UP WA0DCQ				
C.W.							
	KA8FFW IØAOF	2224 2225	G3PSM G4GCK				

Endorsements

450 IØAOF, KS7T, AC8W, 500 KS7T, AC8W, 550 Mixed: AC8W, 600 AC8W, 650 WB3DNA, AC8W, 700 WB3DNA, AC8W. 750 AC8W. 800 PY6ABZ AC8W. 850 K5GOE. 950 OK3IF. 1000 DL1AM 1100 WAØTKJ, 1150 WAØTKJ, 1200 WAØTKJ 1250 WAØTKJ S.S.B.: 350 KB4HU, DL1AM, WARDCQ, 400 K2POF, KB4HU, WARDCQ. 450 KKRL, WARCDQ. 500 KKØL, WAØDCQ, 550 KKØL, WAØDCQ, 600 VE7IG, K8ZZU, 750 KC8YM, K5GOE, 850 IØPSB. 900 IOPSB. 1050 W2NC. 1100 9H4G. 1150 9H4G. 1200 9H4G. 1250 9H4G. 1300 VE7CNE, 9H4G. 1350 WD8MGQ, VE7CNE, 9H4G. WD8MGQ, 9H4G, 1450 9H4G, 1500 9H4G, 1550 9H4G C.W.

V. 350 W2YVQ. 450 DL6YH. 500 W9VEN. 550 DJ4EJ, W9VEN, SM5DAC. 600 DJ4EJ, W9VEN. 650 W9VEN, K2PK. 700 W9VEN. 750 AG5C, W9VEN. 800 AK9Z, W1IHN, W9VEN. 900 DL1AM. 950 JA1KRU. 1000 JA1KRU. 1150 I3HDH, N4YB. 1200 N4YB. 1750 N6JV, WA2HZR.

10 meters: UJ8JCQ, KB5UP.
15 meters: JM1IFB, K5G0E, SM5DAC.
20 meters: IØAOF, WAØDCQ, JA1-23967
40 meters: AK9Z.

Asia: K5GOE.
No. America: JA1-23967, JA1KRU, K2POF, WAØDCQ, ON6IT.
So. America: NN4Q.

Europe: ON6IT, JA1KRU, UJ8JCQ, KS7T, WA0DCQ.

Award of Excellence: NN4Q

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

take place in February 1984. Meanwhile, Warwick, ZL3AFH, hopes to be on the air from the island in January.

Kure Island: Jay, N2EDQ/KH7, should be active until next summer. Look for him in the general class sub-bands.

Kwajalein: Don Mears, KX6QO, the QSL Manager for the Greater Kwajalein Amateur Radio Club QSL Bureau, notes that they have been holding some incoming QSLs for as long as 10 years and would like to reclaim some of the storage space. But all this is changing. Commencing with 1984, the club will hold incoming QSLs for six months and then dispose of them. There are large amounts of QSLs on hand for former residents or groups which have operated on DXpeditions to Kwajalein. The local club's address is P.O. Box 444, APO San Francisco 96555. Don also thinks it might be timely to note that KX6A through KX6Z callsigns are not in the Marshall Islands, but rather are in California.

Morocco: New CN prefixes are emerging. CN9 was used last summer by a German group, followed by a CN4DKH operation by CN2AH to celebrate the 4th anniversary of Dakhla, Morocco. QSL to Box 299, Rabat, Morocco.



John Sklepkowycz is past president of the Canadian DX Association and also former editor of Long Skip. He is a delightful host when you pass through Toronto.

More Prefixes: The EH prefix has been used from Spain by EH3ITV, EKØ by EKØKA on Wrangel Island, XP1AB from Greenland, SV8 from the Greek islands, DV9 from the Philippines, while Italian island hoppers such as IA5 and IH9 appear periodically.

Norfolk Island: Jim Smith, VK9NS, used the special call VK9WCY from Norfolk until Nov. 15, 1983.

Taiwan: Tim, BV2A/BV2B, is on Fridays and Saturdays. BV2A is the c.w. station and can be found on 14040. BV2B is the s.s.b. station and is frequently on 14220–230.

Worldwide DXpedition: A group will depart Feb. 18, 1984 for ZS, 3B8, YB, P29, ZL, FO8, CE0Z, LU, PY0T, 9Y4, and other islands. If you would like to be a member of this worldwide expedition, contact N3FM to see if any spots are still open.

Zone 19: UAØLCZ is usually near 21030 kHz after 0100 UTC. He will arrange skeds on 10-80 meters.

News From the DX Clubs and Foundations

The Northern California DX Foundation (NCDXF) reports that its membership has reached an all-time high of 2400, with 500 new members enrolled in the previous 6 months alone. U.S. DXers make up two thirds of the total, but all 50 states and 87 DXCC countries are represented. Surprisingly, the second largest national group of members is the Finns with 133, thanks to an organizing effort by Martti Laine, OH2BH. On a per capita basis, NCDXF members are 10 times more numerous in Finland than in the U.S. The third most active group is the West Germans with 91 members.

Despite the Foundation's success in increasing its numbers, a net loss of \$10,009.16 was suffered during fiscal 1982–83. This resulted largely from support of three major DXpeditions: Heard Island \$10,000, the SMØAGD Pacific Islands operation \$5,000 (including QSLs), and St. Peter and St. Paul Rocks \$2,500. NCDXF joined the International DX Foundation in supporting Heard and St. Peter and St. Paul Rocks.

In addition, the Foundation has ongo-

ing commitments to supply QSLs and spare parts to permanent DX stations such as CEØAE, 3B8CF, 7Q7LW, and 4U1UN. Continued support is also provided to the 20 meter beacon network.

Examples of support to other important activities included 16,000 QSLs to N6ZV for Tromelin, Comoros, Martinique, Guadaloupe, and St. Martin expeditions; 15,000 QSLs plus expenses to DJ6SI for 5V and T5 operations; 12,000 QSLs plus expenses to OH2BH for 4U1, OH0, and FH8 activity; 4,000 QSLs to OE6VEL for ZS6 and 3D6 DXpeditions; and 7,000 QSLs to PY7ZZ for Fernando de Noronha.

DXers interested in joining the Northern California DX Foundation or learning more about its programs may write to P.O. Box 2368, Stanford, CA 94305.

Canadian DX Association (CANAD-X) officers for the 1983–84 season are Jim Montagnes, VE3BIF, President; Tony Ward, VE3IAT, Vice President; Wilf Antheunis, VE3FFA, Secretary/Treasurer; John Sklepkowycz, VE3IPR, Recording Secretary; John Scott, VE3EZU, Membership Chairman; and Directors Dr. Roland Suran, VE3FJE, and Martin Rosenthal, VE3MR.

The WAZ Program

	15 Mete	er Phone	
174 175 176	JA2THS JL1UXH JA1BN	178	JI1WLL JL1NGO K4XG
	20 Mete	er Phone	
472	IT9TGO	473	DU9RG
	15 Met	er C.W.	
95	K4XG		
	20 Met	er C.W.	
200	W2QXA	201	WB4IUX
	40 Met	er C.W.	
45	JA8FKD		
	80 Met	er C.W.	
3	OK2PEX		
	All Ban	d WAZ	
	S.S	.В.	
2742 2743 2744 2745 2746 2747	KB2UC WØPXM AH6AY W6TKF W7GYZ PY4KB KB4HU WA4QHN	2750 2751 2752 2753 2754	AK4T W5RKK I1JQJ N8BNE DL1AX WD8RKT KA1RC
	C.W. an	d Phone	
5630 5631 5632 5633	KN4F W5RKK KA9GMV KT5F KC8PX K3UA JH2ABL	5636 5637 5638 5639 5640	JA1SIN KG3L JI1MRW N4FKZ DL2GT ON5WQ JA8CAQ

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size $4\frac{1}{2} \times 9\frac{1}{2}$ to the WAZ Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is \$4.00 for subscribers and \$10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application.

5 Band WAZ Standings as of September 1, 1983

All 200 zones worked:

1. ON4UN 2. K4MQG 3. SM4CAN 4. AA6AA 5. W8AH 6. W6KUT 7. EA8AK 8. LA7JO 9. EA3SF 10. OH1XX 11. EA8OZ 12. WØSD 13. KØZZ 14. ON6OS 15. OK3TCA 16. K6SSS 17. ZL3GQ 18. OK3CGP 19. SMØAJU 20. OZ3PZ 21. I3MAU 22. I2ZGC 23. 4Z4DX 24. N4KE 25. K5UR 26. K9AJ 27. SM3EVR 28. LA5YJ 29. DL3RK	33. WØMLY 34. IØRIZ 35. ON5NT 36. OH6JW 37. OK1AWZ 38. IV3PRK 39. DJ6RX 40. OH3YI 41. I4RYC 42. ZL1BIL 43. I4EAT 44. ZL1BQD 45. TG9NX 46. XE1J 47. F5VU 48. W3AP 49. YO3AC 50. K3TW 51. XE1OX 52. VE7IG 53. OK1ADM 54. CT1FL 55. WA1AER 56. N4RR 57. UWØMF 58. W4DR 59. OK1MP 60. W1NW 61. OE1ZJ
28. LA5YJ	60. W1NW
29. DL3RK	
30. N4WJ	62. HB9AHL
30. N4WJ 31. G3MCS 32. SM5AQD	63. HB9AMO
32. SM5AQU	

The top 9 contenders for 5 Band WAZ:

1.	N4KG, 199	6.	W8UVZ, 198
2.	JA3EMU, 199	7.	LA9GV, 198
3.	N4WW, 199	8.	K4CEB, 198
4.	W1NG, 199	9.	K7UR, 196
5.	F6DZU, 199		

231 Stations have attained the 150 zone level

CANAD-X is a national organization open to all interested VE amateurs and is administered by the Toronto DX Club. Its services include Long Skip, an excellent monthly bulletin now edited by Garry, VE3GCO; QSL cards with the club logo; an outgoing QSL Bureau; a DX information net; and a DX Alert repeater. The Ontario Contest Club coordinates contest activity for CANAD-X, and with the Toronto DX Club co-sponsors the Canadian Contest Championship and Can-Am Contest. The Toronto DX Club meets the first Monday of each month from October to June at the North York Memorial Hall, 5090 Yonge Street, at 2000 hours local time.

The Western Washington DX Club (WWDXC) monthly bulletin, Totem Tabloid, extends congratulations to Roy Foote, N7AIF, and the rest of the Northwest DX Convention Committee for a first-class event. The banquet speaker was CQ's DX Editor Hugh Cassidy, WA6AUD. A new membership directory is in preparation to enable the 700-plus

members of WWDXC to stay in touch. Washington state area DXers interested in joining the WWDXC should contact Jim Hadlock, K7WA, or Jack Bock, K7ZR.

The 1983–84 officers are off and running at the Northern California DX Club with Chuck Patterson, K6RK, President; Lou Beaudet, K6TMB, Vice President; Josephine Clarke, WB6ZUC, Secretary; Dick Letrich, WB6WKM, Treasurer; and Directors Eric Edberg, W6DU, Stan Kaisel, K6UD, and Jay O'Brien, W6GO. The staff of the monthly bulletin, The DXer, includes Lyle Meek, N6BLN, Editor, plus Len Geraldi, K6ANP, Ron Pipes, WB6NBR, Jim Hicks, KK6X, and Jim Hanlon, KM6N.

NCDXC will host the 1984 Fresno/Visalia/? International DX Convention. At press time some thought was being given to a new site and members were urged to make suggestions to Hal, N6AN. The Visalia Holiday Inn facilities were excellent, but some felt that Visalia was not sufficiently accessible for visitors from overseas.

Southern California DX Club Bulletin editor is Mike Hudgens, W6YQ. Others on the staff include Jan Perkins, N6AW, Stan Brokl, N2YQ, and Chris Conner, KA6ISX. K6NO is a new member of the club, and W6RCL and KB6WI have upgraded to full members. Club members on the Honor Roll are W6AM, W6EE, W6RT, W6ET, JA1BK, W6REH, N6AR, OH2BH, N6AV, K6YRA, W6EUF, K60J, W6TZD, W6BA, W6KZL, W6RKP, W6KG, K6EV, W6YA, W6FW, K6QH, W6HFL, W6ID, W7AO, W6QL, N6UC, W6GC, W6UQQ, W6KZS, YV5BBU, W6HX, N6AW, W6UY, W6SN, W6EJJ, N6RJ, W6MUM, W6AE, W6DN, and WA6TLA.

The Redwood Empire DX Association advises that their new officers are AF6F, President, KB6BT, Vice President, and VP2ML, Secretary.

Th CQ DX Department welcomes news of DX clubs and copies of club bulletins. Please send to K4IIF, P.O. Box 205, Winter Haven, FL 33880.

QSLing To and From DX Stations

These handy hints were prepared by Jack Wichels, W7YF, and first appeared in *Totem Tabloid*, the monthly journal of the Western Washington DX Club (WWDXC).

"Some WWDXC members asked recently how to QSL DX stations without going broke for IRC's. Here's the system I have used for over 15 years of DXing:

"1. Use the QSL bureaus for the majority of your QSLs. Most DX stations will do the same with their cards to you. When he says I QSL 100% via the bureau, he probably means it, and it also means you won't need any expensive IRC's.

"2. Make a habit of QSLing 100% yourself. Don't wait for the DX QSL to arrive first. Many DX operators need your state for Worked All States or your county for the CQ County Hunter's Award. Also,

send him a QSL for that 40 meter QSO even though you've confirmed him on 15 and 20. He may be trying for 5-Band WAS.

"3. Always use the Greenwich date and time on your cards. Don't expect the DX station operator to translate your local time into his own time zone. This is the purpose of GMT, also called UTC and Zulu time. Get a 24-hour clock and use it for all logging and QSLing.

"4. Spell out the month on your cards. If you write November 5, 1983 as 11/5/83, the recipient may read it as May 11, 1983. Avoid confusion with a rubber date stamp from an office supply store. They use abbreviations such as Nov. or Dec. An alternative is to use Roman numerals for the month, as 5 XI 83. Many UA stations do this.

"5. Use the ARRL Outgoing QSL Service for all but DXpedition QSOs. This is much cheaper than mailing a batch of cards to a foreign QSL bureau yourself, and much cheaper than direct mail to Callbook addresses. ARRL charges \$1.00 per pound (about 150 cards) for this service. You should also send them your address sticker from the QST wrapper. Even with the \$1.50 or so to mail the cards to Newington, you have to admit that the price sure is right!

"6. Send DX cards to QSL Managers whenever possible. If the manager is in the U.S., be sure to include a self-addressed, stamped envelope. If the manager is outside the U.S., send a couple of IRC's and a self-addressed envelope. Don't be blackmailed into sending 8 or 10 IRC's for one lousy card! You'll eventually work another station in that same country. Some DX stations ask for 'green stamps' (U.S. dollar bills). Try to avoid that trap also.

"7. A QSL in the hand is worth dozens

CQ DX Awards Program

S.S.B.

1283

G3NDC

K4JDJ

1280 .

1281	KR9F KD2Q	1284	N7RO
	S.S.B. En	dorsements	
310	K6.IG/313	300	VF3MRS/301

310	K6JG/313	300	VE3MRS/301
310	W4UG/315	275	SM4CTT/295
300	N7RO/309	275	WB4UBD/293
300	WA4JTI/304	275	KR90/289
300	K1UO/304	275	W0IYR/277
300	K1MEM/302	275	K4LR/275
300	W6DN/302	200	VK2DPN/M/241
300	WA4WTG/301		

C.W. Endorsements

310	K4CEB/313	275	W7CNL/292
300	K9QVB/302	200	W6DN/201

Total number of active countries is 315. The basic award fee for subscribers to CQ is \$4. For non-subscribers, it is \$10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are \$1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

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- 4						

2522 2469 2406 2201 2200 2190 2150 2075 1978 1896 1888 1866 1776 1772 1726 1714	F9RM YU2DX YU4HA K6JG K2VV W2NC K6XP VE3GCO N4MM W4BQY W9DWQ YU7BCD N6JV N6CW N4NO K5UR	1704 1703 1690 1650 1649 1538 1520 1488 1481 1451 1402 1415 1409 1401 1400 1379	N9AF W7LLC PA@SNG 4Z4DX N2AC YU7AW 16SF SM7TV W8CNL 12PHN K6DT K6ZDL KF2O YU1DZ W@SFU N6FX	1364 1312 1287 1263 1204 1204 1204 1196 1192 1189 1180 1154 1108 1026 1023 1022	K9BG IN3ANE SM3EVR N6AW DA2DC K8LJG JH1VRQ N6JM CT1LN W8RSW W7CB KL7AF DJ2UU N3ED K2QF G4FAM	1014 1013 1011 1005 995 987 975 958 942 937 928 859 856 852 822 817	NN4Q WBILC I2MQP WB8ZRL LA7JO EA9IE KC8CC YU2CBK KA3A N4IB NO8T WD9IIC W6YMH WØJIE G3ZRH N8BJQ	800 783 768 757 747 732 722 718 697 695 690 658 656 651 635 612	YU2CG JA9FAI EA1JO AI8M VE2FOU N2AIF K7CU W6OUL KC8JH KJ7N WD4RAF K8HF K9TI OE1KJW VE2PD K2POF
				S	S.S.B.				
2438 2148 1970 1911 1901 1865 1856 1781 1757 1642 1577 1568 1530 1510 1506 1503 1463	F9RM I0ZV I0AMU K6XP K6JG K2POA K2VV N4MM ZL3NS I4ZSQ I8KDB I8YRK HB9AAA YU7BCD OZ5EV W0YDB K5UR	1446 1458 1400 1399 1391 1301 1294 1289 1271 1247 1243 1238 1158 1107 1099 1098 1091	PARSNG CT1UA WD8MGQ IØMBX W9DWQ WA4QMQ YU7AW N2SS I6ZJC N4NO W4BQY I2PHN PY3BXW KF2O IØNOA F2MO VE1YX	1089 1070 1044 1034 1033 1032 1029 1027 1009 1005 1001 997 973 945 933 924	W2CC CT1FL W2NC JH1VRQ KC4OV N6FX W6YMV WA4OIB WF4V I2MOP G4CHP TG9GI ZP5RS WB8ZRL N2AC KC8CC WB6GFJ	922 903 865 850 846 842 832 805 797 768 764 750 746 732 702 700	TG4NX KL7AF CT4NH NN4Q AC2J WA2FKF K8LJG WBILC W3ARK W6LQC N3ED N4IB W3GXK VK6YL IØSGF EA7AZJ	694 692 670 665 649 646 638 637 616 615 607 604 601 600	ON6IT WØULU JH5FQO DK4AP OEBMOK KB2DE I1POR KB0C WN5MBS VE2PD YB0ACL KC8YM WBRSW W6YMH WD9HAW
					C.W.				
1985 1966 1776 1738 1723 1706 1698 1656 1630 1580	W8RSW W2NC W8KPL N6JV WA2ZHR K2VV DL1QT ON4QX K6JG K6XP	1509 1508 1496 1486 1485 1473 1472 1432 1373 1344	N4NO YU7BCD W4BQY W9DWQ VK4SS G2GM N2AC W3ARK N4MM WA1JMP	1340 1300 1295 1281 1245 1225 1197 1182 1105 1101	K5UR VE7CNE W9FD I6SF V01AW LZ1X K6ZDL YU7AW N6FX YU3NP	1093 1045 1024 925 876 861 848 801 791 787	NAYB JE1JKL JA1KRU KF2O K8LJG YU7SF KL7AF N3ED W11HN DJ1YH	756 735 719 689 656 644 616 605 600	NN4Q AG5C KA3A G4FAM VE2FOU EA1JO W8ILG N2AIF OE1KJW

of promises, so don't just sit back after working a new one. Keep trying to work other hams in that same country until you actually have it confirmed.

"8. Finding a post office that handles IRC's can be a problem. I get mine from the International DX Foundation, P.O. Box 117, Manahawkin, N.J. 08050 for 45¢ each. QSL Managers for DX stations often have IRC's for sale, cheap. Of course, you may get IRC's which have been validated by a foreign post office, but don't worry, as IRC's are good regardless of where they were validated.

"9. Make sure you have plenty of selfaddressed, stamped envelopes on file at your QSL Bureau. Otherwise, you risk the loss of some cards.

"10. Be patient! DXpeditions have thousands of cards to get out, and 'via the bureau' can mean anything from three months to three years. Mine seem to average about a year enroute."

Profiles of Some Outstanding DXers

Tom Russell, N4KG: Tom was born in Detroit and attended the public schools of Grosse Pointe, Michigan. He qualified for his Novice ticket while in the 6th grade and upgraded to general class as a 7th grader. He earned his BS in electrical engineering at the University of Michigan, and after tours with Collins Radio and Motorola he went back to U.M. for his masters. While at the University he was president of the U.M. Radio Club, W8UM.

Tom's DX achievements include 311 countries mixed mode, 308 on s.s.b., and 285 confirmed on c.w. He has worked 234 countries using less than 5 watts power (QRPp). His country total for 5-Band DXCC is 1447 and 5-Band WAZ is just around the corner. Tom is a member of the North Alabama DX Club in Huntsville, Alabama.

Gerben Menting, PAGGAM: OM Gerben is an outstanding operator and also edits DXPRESS, the DX Bulletin of the Netherlands Amateur Radio Society (VERON). Gerben is 29 years of age, married, has one son, and works for the Dutch Telephone Company. He has been licensed since 1973 and prefers c.w. operation. His country count is pushing 300, but editing chores as DXPRESS do not leave much time for the bands.

DXPRESS has been published since 1959 and has many U.S. and Canadian



The station at PAØGAM includes an FT101ZD, FV101Z, and FL2277B.



The antenna installation at PA@GAM. There is an 18 m. high self-supporting tower, and antennas included a TH3MK3, a 40 meter dipole, and an 80-10 meter windom. Gerben lives in the house left of the tower.

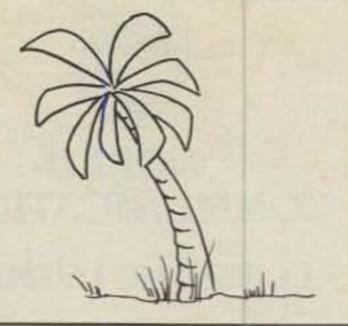
readers. K4IIF has been a reader since 1962. Gerben does the editing, while printing and mailing are done by the Central Bureau of VERON, which also handles subscriptions. If you are interested in the bulletin, drop a line to VERON at Postbus 1166, 6801 BD Arnhem, The Netherlands.

Paolo Gori, I5ZJK: Paolo Gori was licensed on Dec. 28, 1979 and qualified for Single Band WAZ in December 1982. He is a widower, age 48, with a 17-year-old son and a 14-year-old daughter. He is proANNUAL ANNUAL

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Hideo Takahashi, JF1SEK, is a prominent DXer in Japan. See "profiles of outstanding DXers in this column for details.



Mario, IOMGM, at the operating position of 1A0KM in S.M.O.M. Mario's son can be seen in the background. 1A0KM has been one of the most exciting stations to come on the bands for several years. Congratulations to Mario and to Al, IOAMU, and the others who helped with new country status for S.M.O.M.

3 GREAT WAYS

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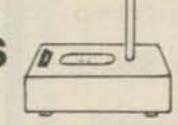
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ficient in four languages and works as an interpreter.

The station at I5ZJK includes 5-element monoband beams for 10 and 15 meters, a 4-element monobander for 20 meters, and inverted Vee's for 40 and 80. Like many I-land DXers, Paolo is partial to Drake equipment and operates a TR7, PS7, RV7, and L7. His country total is in the high 200's, and he is well along toward 5-Band WAZ. He found zone 23 to be most difficult to work from Italy. Paolo is a member of the Montecatini Section of the A.R.I.

Hideo Takahashi, JF1SEK: Hideo has been licensed since June 30, 1973 and has earned many DX awards including Single Band WAZ #12 on 15 meter s.s.b., the CQ DX Award, USA-CA 500, DXCC, WAS, DLD-200, R-100-0, ADXA, AAA, DUF, and others. He has also won two plaques in the ARRL DX contests.

Hideo operates 60% c.w. and 40% phone using a 5-element tribander, a 2-element monobander for 40 meters, and an 80 meter dipole. His rig includes a Kenwood TS-830S, a T4XB, and an R4B. His most difficult zones from JA-land were zone 2 and zone 40.

Hideo is 33 years old and a high school science teacher. He has an XYL, one son, and one daughter.

QSL Information

A4XGY to K2RU A71BH to G4HNP Duraz, Bahrein C2180 to P.O. Box 225, Nauru, T778 to WA3HUP Central Pacific C21FS to P.O. Box 83, Nauri, TE32J to TI2J Central Pacific EA60K to P.O. Box 295, Palma TR8JL NOT to K6VNX de Mallorca, Spain EA9NW to P.O. Box 195, ville, Gabon Cueta, Spain ED9IAL to EA9JV **EL2AD** to WA3HUP **EL2Z** to KØLST KOHWS/FC to I4ALU FB8WI to F6GXB FB8ZP to F6KNO FC9UC to F5RV FK8CE to K2ROR F08F0 to F2BS FOSJP to F1BBD FOOJE to F3JE FP8HOQ to NS4M FPBIDO to VE1CCM HIBLC to W2KF **HL9SN** to KA5EPI HSBHS to Box 2008, Bangkok, Thailand 12DMK/IA5 to I2MQP IT9HLO/IH9 to I2YBC J5HTL to SM3CXS J73AJ to W2KF

J88AQ to W2MIG JD188R to JA7AGO JX6BAA to LA7JO JY9TS to WA3HUP K4C0G/DU1 to WA4LQQ KC4AAA to K9TUB KC6GM to WD6BDZ KC6HA to K6EDV KC6RN to JH1RNZ KD7P/KH2 to KS7L KG4CD to KC4VD LA2WW/9L1 to NGAFW **CHETTY** to OH2AA **OJEMA** to OHENIA PT2ZAI to K4IQH PYSTA to PY1VOY

SU1ER and SU1MR to P.O. Box 33, Airport, Cairo, Egypt A92DW to P.O. Box 30100, SV9PR to Box 1325, Iraklion, Greece TE30RC to TIORC TRECR to F6AQO TR8JLD to P.O. Box 484, Libre-TR8SDP to F8BC TU2NW to AK3F VP2MDS to VE3AZJ VP2MM to AB1U VP2VEG to WØDVZ VP8ALD to G4CHD VQ9JD to N6AFD W3TB/TF to W3IVG WA6DJO/KH8 to WB6HGH XP1AB to WA2TTI YS1GMB to W3HNK YS1LSR to VE3MFP YZØU to YU2BHI Z24JS to W3HNK ZD9BV to W4FRU ZF2DZ to KC3DA ZF2GP to N8AKF ZK1AR to WB6HGH ZL2BKM/C to ZL2HE ZL3HI/A to ZL2QW ZL40Y/C to VK3DWJ 3D6AJ to WB3CQN 3D6AK to G3WPF 4X6GP to K2VUI 5N6WCY to K6EDV 5T5PD to NØAFD 5Z4CT to JACKE 5Z4CV to W2KF 5Z4RK to K4YT 6Y5FS to G3XTJ **6Y21A** to 6Y5RA 7P8CT to DL2CI 9J280 to W60RD 9M2BH to W6RIA 9M2HB to N4FFN 9V8VM to WB@TEC 9Y4RD/SU and 9Y4RD/4X to KA2DDJ 9Y4VU to W3EVW

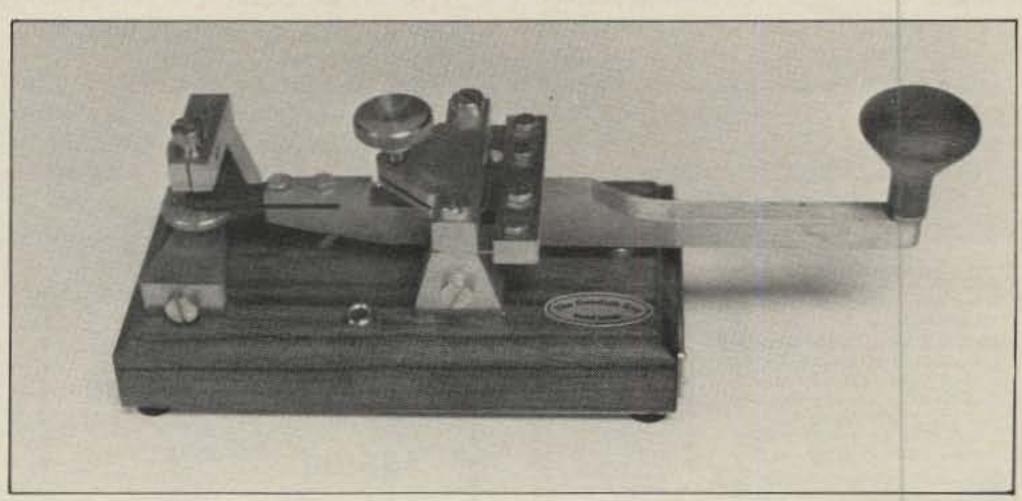
73, John, K4IIF

A LOOK AT THE WORLD AROUND US

Amateur Collectibles of Recent Times

s we discussed in the September column, an increasing number of amateurs are realizing the sheer enjoyment of collecting and restoring various types of amateur radio related gear from past eras. Those properly refurbished units can return many hours of nostalgic operating pleasure quite different from that experienced with today's super-refined and tightly packaged rigs. Of course, there may be some problems locating exact replacement parts for very early rigs, and obtaining clean performance for presentday operations can be rather challenging, but that's half the fun of the game! Some amateurs, however, may find their interests lean toward more modern equipment and/or specialized areas. This month's column thus is presented with those thoughts in mind—a sort of bridge to the classics of more recent times. In some respects, this might be analogous to classic autos. While Model A's and T's are continuously in demand, there is also significant interest in MG's of the 40's. Cadillacs of the 50's, Chevys of the 60's, and even presently manufactured autos such as Excaliburs and Ferraris.

Recent-day collectibles in the amateur radio world can be categorized as either quite diversified or highly specialized. This may include anything and everything from classic teleprinters and hand keys to "first run" models of s.s.b. transceivers or all production models of a particular manufacturer. The attractive point of such recent-day collections is comparatively good availability of rigs, parts, and service information. Additionally, many of these units can be used and enjoyed on a fairly regular basis. Return with us now to those thrilling days of yesteryear when gear was warm and beautiful and we were too broke to afford it. Remember how you yearned to own a National NC300 "dream receiver" and Central Electronics 200V "broadband" transmitter, or maybe one of the new Collins KWM-1 s.s.b. transceivers? The present time may be a mite late, but the prices surely are fair, and think of the fun you'll have restoring it to mint condition! Looking for an inexpensive 30 meter rig? The general-coverage receivers and widetuning-range transmitters of the 50's are a grand choice. Why your creativity and ingenuity could be the envy of everyone



A true modern-day collectible which can be used and enjoyed with style, this handmade Swedish key is a masterpiece of craftsmanship. Due to its U.S. cost of approximately \$200, there are no plans to market the key in this country. Maybe a Swedish amateur friend could suggest ideas for obtaining one.



What do these items have in common? Each represents a unique and specialized area of amateur collectibles. The field is truly unlimited, including vintage radios, handies, limited-production items, and SSTV gear.

on the band! Surely you've also considered rebuilding and occasionally reusing your very first ham rig, right?

Classic Gear of Recent Decades

Some of tomorrow's most highly sought collectibles presently reside in far corners of distributors' warehouses, in basements of senior amateurs, and on back tables of hamfest fleamarkets. Those

items need only be recognized for their beauty and potential when the purchase opportunity arises. The most logical way to become familiar with gear and trends from recent eras is by reading related-period amateur radio magazines. Check local libraries and hamfest fleamarkets for that information. You'll surely find the reading fascinating and the gear overwhelmingly enticing.

One of the popular setups of the

^{*}Eastwood Village No 1201 So., Rt. 11, Box 499, Birmingham, AL 35210

1950's which can still prove its worth on c.w. bands of the 1980's is the Johnson Ranger transmitter and the Hammarlund HQ110 or deluxe HQ180 receiver. Both units will benefit from a thorough cleanup, a round of new tubes, full realignment, and a renewed warm-up period. As a special touch to this setup, check CQ's and QST's of the 50's for an article detailing "Proxy": a v.f.o. spot switch which activates when the v.f.o. knob is touched. Maybe you also can find a Dow Key antenna relay and E1-Key paddle to complement the setup.

True c.w. buffs surely can appreciate the beauty of a Johnson Navigator and National NC300 setup. The transmitter

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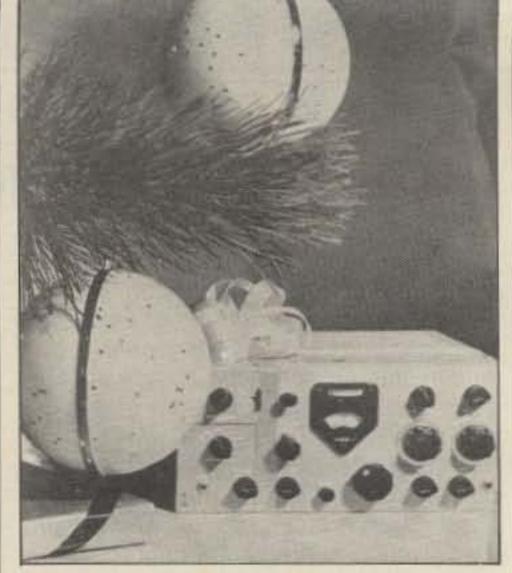
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features time-sequential keying which produces a beautiful sounding signal. If the provided 40 watts isn't sufficient, add a Courier amplifier with a pair of new 811's. The NC300 receiver boasts variable i.f. selectivity and gain, and its extensive bandspread is complemented by a flywheel balanced tuning knob. The final touch to this setup would be full break-in operation using a tube-type automatic T/R switch.

On the more advanced and s.s.b. side of recent-era collectibles, there are the Central Electronics 10V or 20A, Viking Thunderbolt, and Drake 1A "shoebox." Wow, what a rig! That super signal is complemented by one of the first ama-



The classic Collins KWM-1 transceiver was a dream rig of its time. This staunch performer still holds many hours of sheer operating enjoyment for restoration-oriented amateurs.

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CIRCLE 12 ON READER SERVICE CARD

teur receivers featuring passband tuning. Keep an eye peeled for a surplus BC458, which was used for v.f.o.'ing this setup.

If you don't have sufficient room (a second ham room) for one of the previously mentioned setups, maybe a classic transceiver would pique your interest. The Sideband Engineers SB33 was an innovation for its time. This solid-state receiver and tube final rig boasted a Collins 2.1 kHz mechanical filter, a.c. supply, and speaker in one very compact box. Several blue vinyl matching suitcases for carrying the SB33, mike, and logs are also still in circulation.

Another rather classic s.s.b/c.w. transceiver worth restoring is the National NCX-5W. The W designates walnut cabinet, a beautiful piece which would complement any decor, and it eliminates problems of degaussing the cabinet.

Finally, there is the classic Collins KWM-1, a 20, 15, and 10 meter s.s.b./c.w. transceiver of the latter 1950's. Somehow it would seem rather natural to switch on one of these units today and still hear Gus, W4BPD, and Ack, W4ECI, planning operations from Agalega and Aldabra. If you think the VOX on the KWM-380 is touchy, try the KWM-1. Seriously, however, a fully refurbished, retubed, and realigned KWM-1 could easily steal your heart and become a dear friend for many years. (I've personally been looking for a KWM-1 and mating a.c. supply for many moons. They seem to be getting scarce.)

How much money can one expect to pay for the previously mentioned collectibles? Since this is a very undefined area, financial calculations and/or trades are extremely variable. Generally speaking, however, we'll say it is what the buyer is willing to pay (usually low) and what the seller is willing to accept (usually high). Bartering helps.

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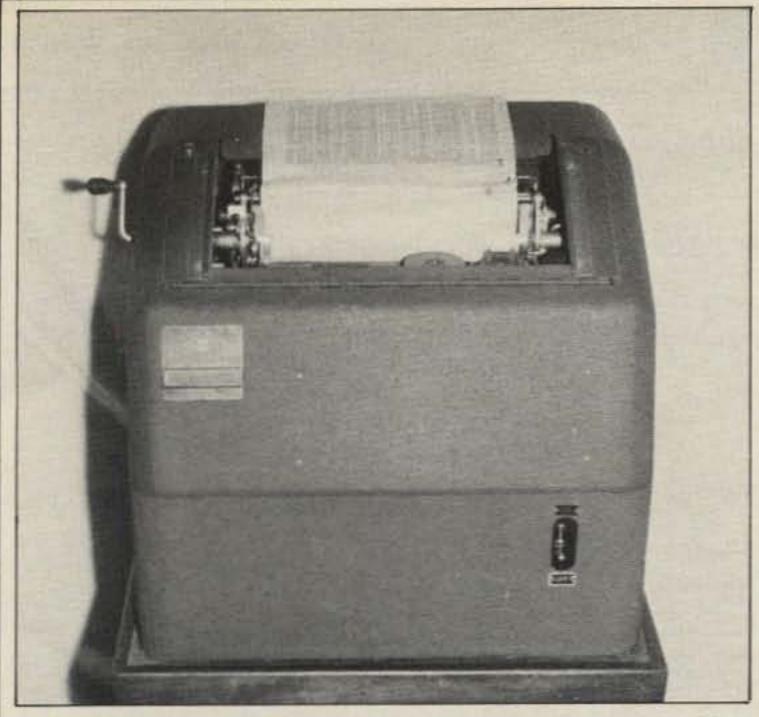
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The model 15RO teleprinter was a "receive-only" unit with a finely tuned and smooth purr that added warmth to many amateur setups.



The classic model 26 teleprinter was a quiet and compact unit designed primarily for light-duty operation. The unit still can be enjoyed with today's RTTY setups. (Teleprinter courtesy of Joe Graffo, KA4BDI)

Specialized Collections

If you enjoy one of the specialized modes of amateur communications, consider starting your own collection of related items. Those units also can be used on an occasional basis, and the in-shack enjoyment is tremendous. If you are into RTTY, the sweet sound of finely tuned mechanics might be acquired from restored model 14's, 15's, 19KSR's, or the compact model 26 teleprinter. The older model 14 was particularly unique, printing information on a single-line strip of paper which was fed from the unit's side. The model 15 was available both with or without a complementing keyboard, the former being known as 15RO, for "receive only." Likewise, there are many additional items and tales in this area, and we'll let you carry the ball from here.

Early SSTV gear, which was necessarily home constructed, can be acquired quite inexpensively via magazine ads and hamfest fleamarkets. In addition to their collectible and nostalgic value, the units can provide many hours of enjoyable offthe-air viewing.

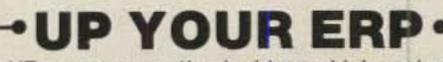
Another very attractive area of amateur collectibles involves QRP gear, especially those items you personally constructed and used for some notable contacts. Suppose, for example, you construct a small 1 watt transmitter and then use it to contact some very distant areas. The QRP International Club awards several certificates for such accomplishments, one of which recognizes communications exceeding 1000 miles per watt. The resultant award, QSLs, and utilized rig would make an impressive display for any shack.

HT Collectibles

If you enjoy 2 meter f.m. activity, setting up a usable collection of early handheld talkies can be a blast. Since the units could be housed in a small curio-type cabinet, they would require miniscule storage room and could be pulled for use on a moment's notice. Some of the particularly attractive talkies from past "crystallized" times include the large Varitronics two-channel unit (one of the first talkies manufactured especially for amateur radio use), the Clegg "bent" talkie (which used Motorola 15 volt battery packs), the compact and attractive Genave handie, and the Motorola cigarettepack-size HT100. The latter unit can be amateur modified for four channels, autopatch encoder, and 1/2 watt output-a "dream unit" anyone would be proud to own. Finally, there are original Drake TR22's and ICOM portables which may soon become extinct and yet collectorsought items. Yes, HT collecting can be as enjoyable as pistol or cup collecting.

We've covered quite a bit of ground in this two-part series on amateur collectibles (see the September 1983 issue for part one), including both past and present times plus several areas of special interest. Due to space limitations, some thoughts applicable to several areas were mentioned only once. We thus suggest you reread both parts and ponder any between-the-lines ideas. It should be apparent at this point that auto enthusiasts, gun collectors, or even plant buffs don't have the corner on collections. As we've said before, there is something in this exciting world of amateur radio for each and every one of us.

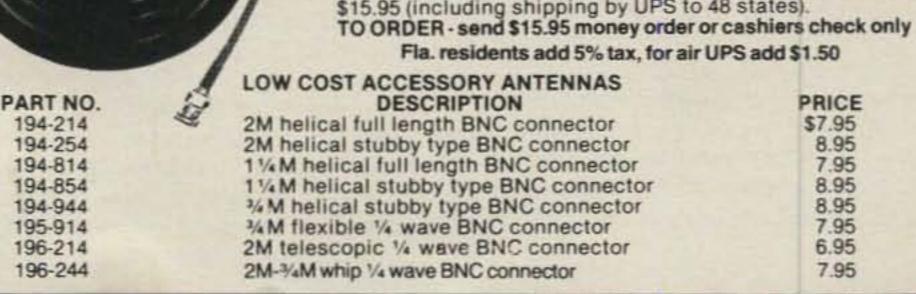
73, Dave, K4TWJ



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CIRCLE 45 ON READER SERVICE CARD

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Since this issue of CQ will reach most subscribers before the CQ World Wide DX C.W. Contest weekend of November 26–27, here is an updated day-to-day forecast for that weekend. It looks like the weekend will fall within a period of good, stable shortwave propagation conditions. Expect High Normal conditions during most of the Contest period, with periods of Above Normal also possible. It should be a really good Contest weekend!

1983—Another Good Year

Despite steadily declining solar activity, 1983 was a good year for high-frequency radio propagation conditions. The year began with cycle 21 at a smoothed sunspot level of 93. It is estimated that by the end of 1983 the cycle will have declined to a level of approximately 70. Solar activity was therefore moderately high during the past year, and this was reflected in the generally good conditions observed on all the h.f. amateur bands.

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 71.9 for August 1983. This results in a smoothed number of 90.2 centered on February 1983. A smoothed sunspot number of approximately 70 is forecast for this month.

Solar activity has now declined to a point where some noticeable changes will take place in DX openings during this winter season, as compared to past winter seasons during periods of more intense solar activity. For example, F-layer DX openings on 6 meters are now very unlikely, fewer DX openings will be possible on 10 meters, DX openings on 20 meters during the darkness hours will be reduced considerably, and conditions will improve for DX openings during the night-time hours on 40, 80, and 160 meters.

December Conditions

During December the 10 meter band should open an hour or so after sunrise, peaking on signals from an easterly direction before noon, from a southerly direction during the afternoon hours, and from a westerly direction during the late afternoon and early evening hours.

Excellent openings are expected on the 15 meter band to one area of the world or another from shortly after sunrise through the early evening hours. This

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LAST MINUTE FORECAST

Day-to-Day Conditions Expected for December 1983

	Exped	cted Sig	nal Qu	ality
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 6, 8, 17, 29	Α	Α	В	С
High Normal: 3, 5, 7, 18, 23-24, 28, 30-31	A	В	С	C-D
Low Normal: 1-2, 4, 9-10, 12-13, 16, 22-27	A-B	B-C	C-D	D-E
Below Normal: 11, 14-15, 19, 21, 25	в-с	C-D	D-E	E
Disturbed: 20, 26	C-E	D-E	E	E
Disturbed: 20, 26	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9.

- B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
- C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
- D-Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.
- E-No opening expected.

HOW TO USE THIS FORECAST

- Find propagation index associated with particular band opening from Propagation Charts appearing on the following pages.
- 2. With the propagation index, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a propagation index of 3 will be good-to-fair (B-C) on December 1 and 2, good (B) on the 3rd, good-to-fair (B-C) on the 4th, good again (B) on the 5th, etc.

should be the optimum band for DX openings during much of the daylight period.

Good-to-excellent DX propagation conditions are forecast for 20 meters during December. Opening at sunrise, the band is expected to remain open to one area of the world or another through the daylight hours and into the early evening. To some areas of the world, 20 meters may remain open during many of the hours of darkness as well. DX propagation conditions should be optimum on this band during and shortly after local sunrise, and again during the late afternoon and early evening hours.

DX propagation conditions on the lower frequency amateur bands should improve considerably during December and the winter months. Static levels should be at seasonally low values, and signal levels are expected to be stronger than at any other time of the year. DX openings on 40 meters should begin during the late afternoon hours, with the band opening first to Europe and to other areas in a northeasterly direction from the USA. The band is expected to remain open to one area of the world or another through the hours of darkness and until shortly after sunrise, when conditions are expected to peak to Oceania and to other areas in a generally southerly and westerly direction.

DX conditions on 80 meters should be fairly good during December. Relatively strong signal openings should be possible to many areas of the world during the hours of darkness, with conditions expected to peak as the sun rises at the easternmost terminal of a DX path.

Even the 160 meter band should have its share of DX during December. Some openings are likely to take place when the transmission path is entirely in darkness, or when part of the path is in darkness and the other part is either in twilight or at dawn.

To optimize DX openings on 40, 80, and 160 meters, remember that signals peak just as the sun begins to rise at the easternmost terminal of a path.

Short-skip conditions during December favor the 40 and 80 meter bands for daytime openings less than 250 miles in length. Try 80 and 160 meters for this same distance at night. For openings between 250 and 750 miles, 40 meters should be optimum during the day, and both 80 and 160 meters at night. Try 20 meters during the day for openings between 750 and 1300 miles, 40 or 80 meters from sunset to midnight, and 80 meters from midnight through the sunrise period. Try 40 meters again for an hour or so after sunrise. For openings between 1300 miles and the maximum one-hop distance of 2300 miles, either 15 or 20 meters should be optimum during the day, 20 and 40 meters from sundown to midnight, and 40 and 80 meters from midnight to sunrise. Ten meters should also provide good short-skip openings between 1300 and 2300 miles during much of the daylight period.

This month's column contains DX Propagation Charts valid through mid-February 1984. Short-skip Propagation Charts for December appeared in last month's column.

V.H.F. Ionospheric Openings

A major meteor shower, the *Geminids*, is expected during the second week of December, reaching peak intensity between the 11th and 12th, with a meteor count of approximately 60–70 an hour. A second but less intense shower, the *Ursids*, is scheduled to peak between December 20–21 with a meteor count of approximately 15 an hour. Both showers should produce brief periods of ionization which may make possible short-skip openings on the v.h.f. bands for distances up to approximately 1300 miles.

December is not optimum for trans-

equatorial scatter propagation. However, an occasional 6 meter opening may be possible via this mode towards South America. The best time to check for TE openings is during the evening hours between 8 and 11 p.m. local time. Openings, if they should occur at all, will favor locations in the southern tier states.

Some auroral-type v.h.f. ionospheric openings are likely to occur during December for distances up to approximately 1300 miles, particularly when conditions on the h.f. bands are expected to be Below Normal or Disturbed. Check the Last Minute Forecast at the beginning of this column for those days during the month that are expected to be in these categories.

A secondary seasonal peak in sporad-

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart approprate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left-hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in () after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days

(3) Opening should occur between 14 and 22 days(2) Opening should occur between 7 and 13 days

(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate standard time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the propagation index will increase by one level for each 10 dB loss, it will lower by one level

 Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

December 15, 1983 - February 15, 1984 Time Zone: EST (24-Hour Time) EASTERN USA TO:

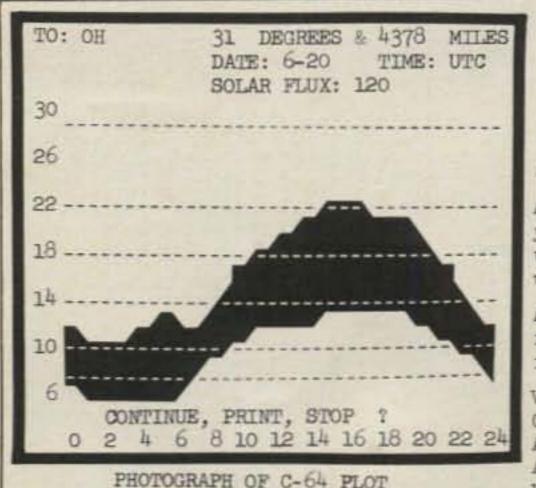
7,12	22.22	22 22	00.04.00	
Western & Central Europe & North Africa	07-08 (1) 08-09 (2) 09-11 (4) 11-12 (3) 12-13 (2) 13-14 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-12 (4) 12-13 (3) 13-14 (2) 14-15 (1)	23-01 (2) 01-05 (1) 05-07 (2) 07-09 (3) 09-11 (2) 11-12 (3) 12-15 (4) 15-16 (3) 16-19 (2) 19-23 (1)	14-16 (1) 16-17 (2) 17-19 (3) 19-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 17-19 (1) 19-20 (2) 20-02 (3) 02-03 (2) 03-04 (1)
Northern Europe & European USSR	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-13 (1)	23-02 (1) 02-04(2) 04-06 (1) 06-07 (2) 07-11 (3) 11-13 (2) 13-14 (1)	16-19 (1) 19-23 (2) 23-03 (1) 19-02 (1)*
Eastern Mediter- ranean & Middle East	07-08 (1) 08-10 (2) 10-12 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-12 (3) 12-13 (2) 13-14 (1)	06-08 (2) 08-10 (1) 10-13 (2) 13-16 (3) 16-21 (2) 21-23 (1) 23-02 (2) 02-06 (1)	18-20 (1) 20-22 (2) 22-00 (1) 20-23 (1)*
Western Africa	08-09 (1) 09-10 (2) 10-11 (3) 11-13 (4) 13-14 (3) 14-16 (2) 16-17 (1)	13-15 (4) 15-17 (3) 17-18 (2)	01-06 (1) 06-08 (2) 08-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-21 (3) 21-01 (2)	18-22 (1) 22-02 (2) 02-03 (1) 00-03 (1)*
Eastern & Central Africa	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)		13-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-23 (2)	18-00 (1)
Southern Africa	07-08 (1) 08-10 (2) 10-12 (4) 12-13 (3) 13-14 (2) 14-15 (1)	07-09 (1) 09-11 (2) 11-12 (3) 12-15 (4) 15-17 (2) 17-18 (1)	14-15 (2) 15-18 (4) 18-20 (3)	18-19 (1) 19-21 (2) 21-00 (1) 19-22 (1)*
Central & South Asia	08-10 (1) 17-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 18-20 (1) 20-23 (2) 23-01 (1)	06-08 (1) 20-22 (1)
Southeast Asia	09-10 (1) 10-11 (2) 11-13 (1) 18-20 (1)	09-10 (1) 10-12 (2) 12-14 (1) 17-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-19 (1) 19-22 (2) 22-03 (1)	05-07 (1)
Far East	17-18 (1) 18-19 (2) 19-20 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	16-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-02 (1) 02-04 (2) 04-07 (1) 07-09 (2) 09-11 (1)	05-08 (1) 05-07 (1)*

South Pacific & New Zealand	12-14 (1) 14-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	The state of the s	12-19 (1) 19-22 (2) 22-00 (3) 00-02 (2) 02-04 (3) 04-06 (1) 06-07 (2) 07-09 (4) 09-12 (2)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Austral- asia	09-10 (1) 10-11 (2) 11-12 (1) 15-17 (1) 17-19 (2) 19-20 (1)		07-10 (3) 10-12 (2) 12-15 (1) 15-17 (2) 17-20 (1) 20-22 (2) 22-02 (1) 02-04 (2) 04-07 (1)	03-05 (1) 05-07 (2) 07-09 (1) 05-08 (1)*
Caribbean, Central America & Northern Countries of South America	07-08 (1) 08-09 (3) 09-12 (4) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (3) 08-10 (4) 10-13 (3) 13-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	07-09 (4) 09-11 (3) 11-16 (2) 16-17 (3) 17-21 (4) 21-00 (3) 00-03 (2) 03-05 (1) 05-07 (2)	17-18 (1) 18-19 (2) 19-21 (3) 21-04 (4) 04-05 (3) 05-06 (2) 06-07 (1) 19-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-06 (1)
Peru, Bolivia, Paraguay Brazil, Chile, Argentina, Uruguay	07-08 (1) 08-11 (2) 11-14 (3) 14-16 (4) 16-17 (2) 17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-21 (4) 21-02 (3) 02-04 (2) 04-07 (1) 07-09 (2) 09-11 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-03 (1)*

ic-E propagation is expected during December (the major peak occurs during the summer months). This should result in a number of good short-skip-type openings on the 6 meter band between distances of about 800 and 1400 miles. Sporadic-E conditions usually peak during the early evening hours, but some openings may occur at other times as well. An occasional 6 meter F-layer DX opening may be possible during December, but solar activity has now declined to the point where such openings will be few and far between. Check for 6 meter DX openings on days that are expected to be High Normal or Above Normal. The best chance for such openings is towards the Caribbean and Latin America from about an hour or two before to about an hour after noon.

The Editor of this column would like to take this opportunity to extend his warmest wishes for the Holiday Season to readers everywhere.

73, George, W3ASK



Propagation

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McMurdo Sound, Antarctica	Nil	06-09 (1) 16-18 (1) 18-20 (2) 20-21 (1)	18-19 (1) 19-20 (2) 20-00 (3) 00-02 (2) 02-04 (3) 04-06 (1) 06-08 (2) 08-09 (1)	00-05 (1)
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*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

December 15, 1983 - February 15, 1984 Time Zones: CST & MST (24-Hour Time) CENTRAL USA TO:

VIII TO THE REAL PROPERTY.		The state of the state of		Tale of the latest and the latest an
Western & Southern Europe & North Africa	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-12 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (4) 12-13 (2) 13-14 (1)	02-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (3) 13-16 (2) 16-19 (1) 19-22 (2) 22-00 (1) 00-02 (2)	15-17 (1) 17-18 (2) 18-01 (3) 01-02 (2) 02-03 (1) 17-20 (1)* 20-01 (2)* 01-02 (1)*
Northern & Central Europe & European USSR	08-09 (1) 09-10 (2) 10-11 (1)	06-07 (1) 07-10 (2) 10-12 (1)	22-00 (1) 00-02 (2) 02-06 (1) 06-08 (2) 08-11 (3) 11-12 (2) 12-14 (1)	17-19 (1) 19-22 (2) 22-01 (1) 19-00 (1)*
Eastern Mediter- ranean & Middle East	08-09 (1) 09-10 (2) 10-11 (1)	07-08 (1) 08-11 (2) 11-12 (1)	04-06 (2) 06-10 (1) 10-12 (2) 12-14 (3) 14-18 (2) 18-22 (1) 22-02 (2) 02-04 (1)	18-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Western Africa	07-08 (1) 08-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-09 (1) 09-11 (2) 11-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-01 (1)	18-21 (1) 21-23 (2) 23-01 (1)

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	nd a stamped envelope to receive our coil kit list.

& Central Africa	08-09 (1) 09-12 (2) 12-13 (3) 13-14 (2) 14-16 (1)	10-13 (2) 13-15 (3) 15-17 (2)	11-14 (1) 14-16 (2) 16-19 (3) 19-21 (2) 21-00 (1)	19-00 (1)
Southern Africa	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	07-10 (1) 10-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-17 (2) 17-18 (1)	16-18 (4) 18-20 (3) 20-21 (2)	
Central & South Asia	08-10 (1) 18-20 (1)	07-09 (1) 18-19 (1) 19-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-19 (1) 19-22 (2) 22-00 (1)	06-08 (1) 19-21 (1)
Southeast Asia	09-10 (1) 10-12 (2) 12-13 (1) 16-17 (1) 17-19 (2) 19-20 (1)	09-10 (1) 10-12 (2) 12-14 (1) 16-18 (1) 18-20 (2) 20-21 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-18 (1) 18-20 (2) 20-21 (1)	04-07 (1)
Far East	16-17 (1) 17-19 (2) 19-20 (1)	15-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	15-17 (1) 17-18 (2) 18-20 (3) 20-23 (2) 23-01 (1) 01-03 (2) 03-07 (1) 07-09 (2) 09-11 (1)	02-08 (1) 04-07 (1)*
South Pacific & New Zealand	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)		06-07 (2) 07-09 (3) 09-12 (2) 12-18 (1) 18-20 (2) 20-00 (3) 00-02 (4) 02-04 (3) 04-05 (2) 05-06 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 03-07 (1)*
Austral- asia	08-09 (1) 09-11 (2) 11-12 (1) 15-17 (1) 17-19 (2) 19-20 (1)	10-14 (2) 14-15 (3)	10-12 (2)	02-04 (1) 04-07 (2) 07-09 (1) 03-06 (1)*
		20-21 (1)	17-20 (1) 20-22 (2) 22-03 (1) 03-05 (2)	
Caribbean, Central America & Northern Countries of South America	07-08 (1) 08-09 (3) 09-11 (4) 11-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	08-12 (3) 12-17 (4)	06-07(2) 07-11 (3) 11-15 (2) 15-17 (3) 17-20 (4) 20-22 (3) 22-00 (2) 00-02 (3) 02-04 (2) 04-06 (1)	18-19 (2)
Peru, Bolivia, Paraguay Brazil Chile Argentina Uruguay	07-08 (1) 08-11 (2) 11-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	04-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-17 (3) 17-20 (4) 20-02 (3) 02-04 (2)	19-21 (1) 21-02 (2) 02-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	Nil	07-09 (1) 16-18 (1) 18-20 (2) 20-21 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-04 (2) 04-06 (1) 06-07 (2) 07-09 (1)	22-05 (1)

December 15, 1983 - February 15, 1984 Time Zone: PST (24-Hour Time) WESTERN USA TO:

Western & Southern Europe & North Africa	07-08 (1) 08-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-12 (1)	22-00 (1) 00-03 (2) 03-06 (1) 06-09 (2) 09-11 (3) 11-14 (2) 14-16 (1)	18-21 (1) 21-00 (2) 00-01 (1) 19-23 (1)*
Central &	07-09 (1)	06-07 (1)	16-18 (1)	17-22 (1)
Northern		07-09 (2)	22-00 (1)	22-00 (2)
Europe &		09-10 (1)	00-02 (2)	00-01 (1)

European USSR			02-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (1)	19-23 (1)*
Eastern Mediterr- anean & Middle East	07-09 (1)	07-08 (1) 08-10 (2) 10-11 (1)	22-00 (1) 00-03 (2) 03-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1)	18-21 (1)
Western Africa	08-09 (1) 09-11 (2) 11-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	06-08 (1) 08-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	05-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-21 (1) 00-03 (2)	18-22 (1)
Eastern & Central Africa	09-10 (1) 10-12 (2) 12-14 (1)	08-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	08-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	18-20 (1)
Southern Africa	08-10 (1) 10-12 (2) 12-14 (1)	07-09 (1) 09-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	07-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1) 00-02 (1)	18-20 (1)
Central & South Asia	17-19 (1)	07-10 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	05-07 (1) 17-20 (1)
Southeast Asia	09-11 (1) 14-15 (1) 15-17 (3) 17-18 (2) 18-19 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-18 (3) 18-19 (2) 19-21 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	03-08 (1) 04-06 (1)*
Far East	14-15 (1) 15-16 (2) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-14 (1) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	02-04 (1) 07-08 (1) 08-11 (2) 11-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-21 (2) 21-22 (1)	00-01 (1) 01-03 (2) 03-06 (3) 06-08 (2) 08-10 (1) 02-08 (1)*
South Pacific & New Zealand	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	02-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-23 (4) 23-00 (3) 00-02 (2)	22-00 (1) 00-03 (2) 03-06 (3) 06-07 (2) 07-08 (1) 00-03 (1)* 03-06 (2)* 06-07 (1)*
Austral	10-13 (1) 13-15 (2) 15-17 (3) 17-19 (2)	08-09 (1) 09-12 (3) 12-15 (2) 15-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	18-20 (1) 20-22 (2) 22-02 (1) 02-05 (2) 05-06 (1) 06-08 (2) 08-10 (4) 10-12 (2) 12-14 (1)	01-03 (1) 03-06 (2) 06-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	07-08 (1) 08-09 (2) 09-10 (3) 10-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-08 (2) 08-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)		17-18 (1) 18-19 (2) 19-23 (3) 23-03 (4) 03-04 (2) 04-05 (1) 19-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-04 (1)
Peru Bolivia, Paraguay Brazil Chile Argentina Uruguay	07-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-13 (3) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-22 (3) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1) 06-07 (1) 07-08 (2) 08-09 (1)	20-22 (1) 22-01 (2) 01-04 (1) 22-02 (1)*
McMurdo Sound, Antarctica	Nil	06-09 (1) 14-16 (1) 16-19 (2) 19-21 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-04 (2) 04-06 (1) 06-08 (2) 08-10 (1)	23-05 (1)

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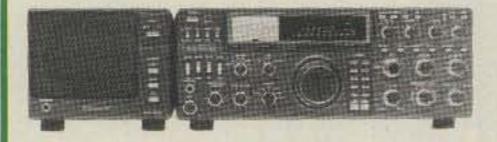
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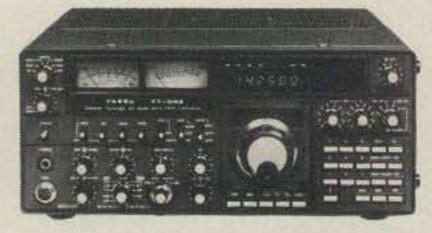
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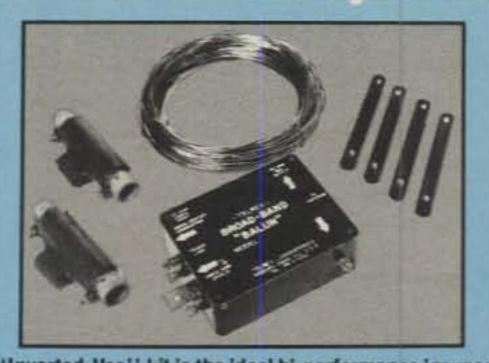
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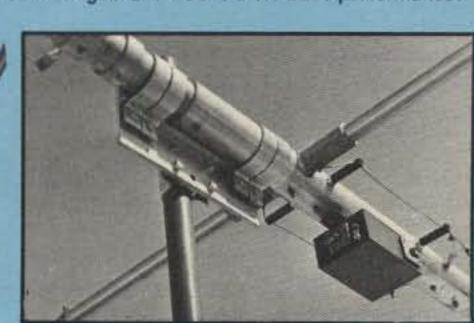
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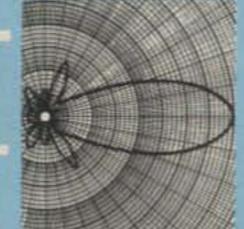
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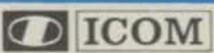
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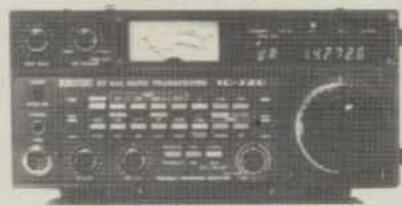
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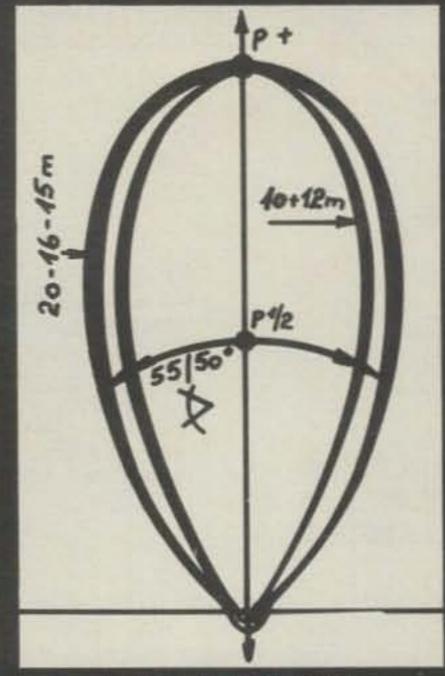
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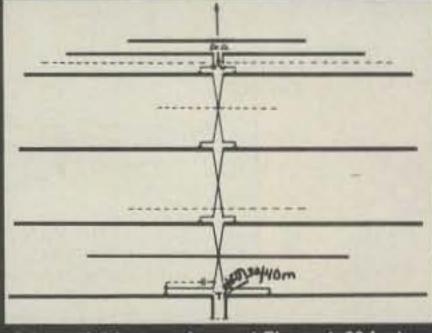
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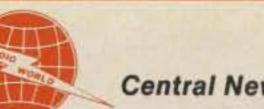
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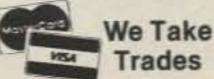
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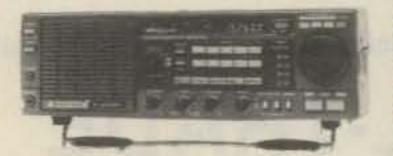
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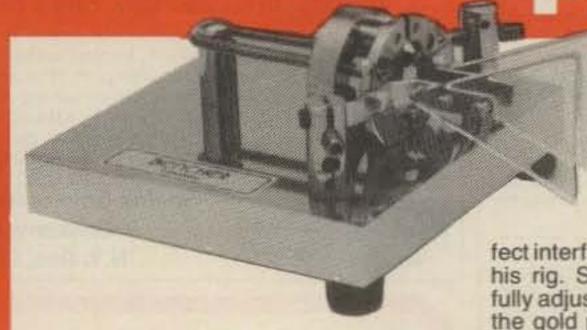
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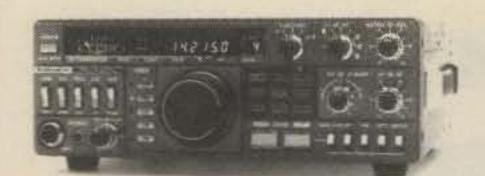
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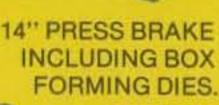
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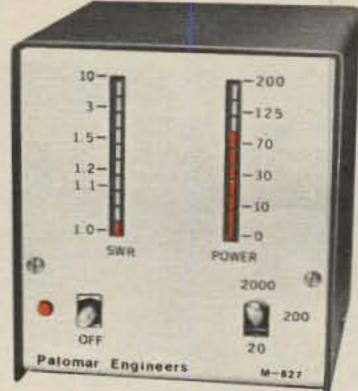
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Advertiser's Index

AEA/Adv. Elec. Applications	
	121
Ad-Tech West	103
All Electronics	.22
Amateur Accessories	.39
Amateur Radio Center, Inc	132
Amateur Radio Operators Yearbook	
Amp Supply Co.	89
Astron Corp.	.65
Autocode	. 99
BHC, Inc	121
Barry Electronics	98
Base 2 Systems	127
Bash Educational Services	136
Bencher, Inc	136
Britt's 2-Way Radio	99
Burghardt Amateur Center	135
Butternut Electronics	.61
CQ Book Shop	.88
C Comm.	130
CZLabs	105
Caddell Coll Corp	128
Calvert Co	9
CeCo Communications Inc.	90
Certifled Communications	26
Col+atch+co	67
Comm Center	136
Communications Electronics Specialties	8
Computer Trader	136
DX Edge Delaware Amateur Supply	128
EGE, Inc.	.90
ENCOMM, Inc.	2
ETO	. 55
Electronic Exchange Electronics Overseas	105
Electro-Voice	
Fair Radio Sales	39
Flesher Corp.	.41
Fox Tango Corp	124
GBC Closed Circuit TV	95
Hal Communications	111
Hal-Tronix	. 64
Ham Mastertapes	_16
Ham Radio Center	76
Ham Shack.	59
Harvey Radio	60
Heil Sound	105
Henry Radio	. 29
Hustler, Inc	13
JL Industries	115
Jal Radio Comm	86
Jun's Electronics	130
KLM	35
KenwoodCov.	11. 1
LaCue Communications	109
LaRue Electronics	114
Long's Electronics	2,73
MFJ Enterprises	129
Macrotronics	138
Madison Electronics95,	119
Magnum Dist.	.87
Mail Order Express	-83
Memphis Amateur Electronics.	137
Metheny Corp.	8
Microlog Corp.	.91
Microwave Filters	105
Mirage Comm. Eqpt.	
Missouri Radio Center	138
Monitoring Times	-60
Mosley Antennas	122
Nampa Satellite Systems	
Nemal Electronics	.41
Nuts & Volts	124
PC Electronics	.82
Pacific One Corp	130
Peterson Electronics.	.99
Plak, Rudy	124
Polar Research	64
RF Products	
RJM Electronics	.49
Radio Amateur Callbook, Inc.	112
Radio World	
	.49
Rak Electronics	
Rak Electronics	
Rak Electronics	.89
Rak Electronics Rivendell Electronics Rockwell/Collins Int'l. Rolin Dist. Ross Dist. Co.	103
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing	.89 103 .86 39
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co.	.89 103 .86 .39 .64
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems	.89 103 .86 .39 .64 134
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas	.89 103 .86 .39 .64 134 .22
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio	.89 103 .86 .39 .64 134 .22 132 .99
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas	.89 103 .86 .39 .64 134 .22 132 .99
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Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain	.89 103 .86 .39 .64 134 .22 132 .99 137 .85
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec	.89 103 .86 .39 .64 134 22 132 .99 137 .85 5
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers. 15, 142, 143,	.89 103 .86 .39 .64 134 .22 132 .99 137 .85 5 133 .47
Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Transleteronic, Inc.	.89 103 .86 .39 .64 134 .22 .99 137 .85 .5 .5 .5 .133 .47 144 .42
Rak Electronics Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers. Transleteronic, Inc. Tri-Ex Tower Corp.	89 103 86 39 64 134 22 132 99 137 . 5 133 . 47 144 . 42 101
Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Transleteronic, Inc. Tri-Ex Tower Corp. Tropical Hamboree	89 103 86 39 64 134 22 132 99 137 85 5 133 47 144 . 42 101 121
Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Ten-Tec Texas Towers Tri-Ex Tower Corp. Tropical Hamboree Tuned Antenna Co. UNR/Rohn	89 103 86 39 64 134 22 99 137 85 . 5 133 47 144 42 101 121 81 17
Rivendell Electronics Rockwell/Collins Int'L Rolin Dist Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Ten-Tec Texas Towers Tri-Ex Tower Corp Tropical Hamboree Tuned Antenna Co. UNR/Rohn U.S. Communications Corp	89 103 86 39 64 134 22 99 137 . 55 . 5 133 . 47 144 . 42 101 121 81 . 17
Rak Electronics Rivendell Electronics Rockwell/Collins Int'l. Rolin Dist Ross Dist. Co. S.F. Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Transleteronic, Inc. Tri-Ex Tower Corp Tropical Hamboree Tuned Antenna Co. UNR/Rohn U.S. Communications Corp Unity Electronics	899 1033 866 399 137 137 855
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Rak Electronics Rivendell Electronics Rockwell/Collins Int'l. Rolin Dist. Ross Dist, Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers. Transleteronic, Inc. Tri-Ex Tower Corp. Tropical Hamboree Tuned Antenna Co. UNR/Rohn U.S. Communications Corp. Unity Electronics Video Electronics Video Electronics Viewstar, Inc.	89 103 86 39 64 134 22 132 99 137 85 . 5 133 47 144 42 101 121 81 17 90 39 86 41 . 23
Rak Electronics Rivendell Electronics Rockwell/Collins Int'l. Rolin Dist. Ross Dist. Co. SF Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio. TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Transleteronic, Inc. Tri-Ex Tower Corp Tropical Hamboree Tuned Antenna Co. UNRIRohn U.S. Communications Corp. Unity Electronics Video Electronics Video Electronics Video Electronics Video Electronics Video Electronics Viewstar, Inc. W9INN Antennas	89 103 86 39 64 134 22 132 99 137 85 . 5 133 47 144 42 101 121 81 17 90 86 41 . 23 103
Rak Electronics Rivendell Electronics Rockwell/Collins Int'l. Rolin Dist. Ross Dist. Co. SF Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio. TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Transleteronic, Inc. Tri-Ex Tower Corp Tropical Hamboree Tuned Antenna Co. UNRIRohn U.S. Communications Corp. Unity Electronics Universal Electronics Video Electronics Viewstar, Inc. W9INN Antennas Wayne R & D	899 1033 866 399 1377 1444 422 101 121 817 990 866 411 233 1033 1033 1033 1033 1033 1033 103
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Rak Electronics Rivendell Electronics Rockwell/Collins Int'l. Rolin Dist Ross Dist. Co. S-F Amateur Radio Service Shepherd Marketing Sintec Co. Sommer Antenna Systems Spider Antennas Spi-Ro Distributors Sultronics Amateur Radio TET Antennas Telco Telex/HyGain Telrex Labs Ten-Tec Texas Towers Transleteronic, Inc. Tri-Ex Tower Corp. Tropical Hamboree Tuned Antenna Co. UNRiRohn U.S. Communications Corp. Unity Electronics Video Electronics	899 1033 866 399 1377 1444 422 101 121 817 990 866 411 233 1033 866 411 237 1037 866 399 v. IIII

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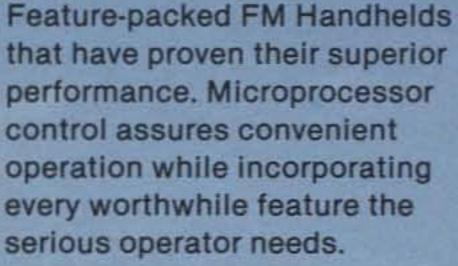
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- New Model TBR-160HD (High Power 160 meter Base Resonator) \$49.00. Model RMK-11 (roof mount kit

with multiband radial kit \$39.00. Model STR-2 (Stub Tuned Radial Kit) \$29.00.

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

UNARCO-ROHN Self Supporting Towers -On Sale!

Freight Prepaid

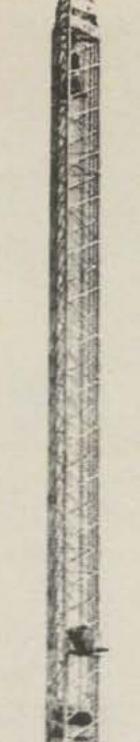
These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

And - Save even more - include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! How's that for good old fashloned savinos?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price		CONTRACTOR IN
HBX40	40 ft	10 sq ft	164	BX86	289	24	313
HB 48	48 ft	10 sq ft	383	BXB7	369	26	395
HBX56	56 ft	10 sq ft	385	BX88	449	30	479
HDBX48	40 ft	18 sq ft	281	BXB7	339	26	365
HDBX48	48 ft	18 sq ft	363	BXBB	429	30	459

\$219

\$ 39



These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- · Totally self-supportingno guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq. ft., 50 mph	\$549
WT-51	51 ft.	9 sq. ft., 50 mph	\$999
LM-354	54 ft.	16 sq. ft., 60 mph	\$1599
LM-470D (Motorize		16 sq. ft., 60 mph	\$2999
		Bearings-	

RG-213U

\$.29/ft \$279/1000 ft Up to 600 ttvia 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

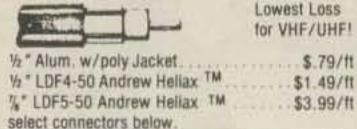
\$.19/ft \$179/1000 ft

• RG8X-95% Bare Copper Shield • Low Loss Non-contaminating Vinyl Jacket Foam Dielectric

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	6.8			
RG-58/U	52	1.4	1.9	6.0	12.5			
1/2 " Alum	50	.3	.5	1.2	2.2			
1/2 " Heliax	50	.2	.4	.9	1.6			
Belleville & St Belleville & C.	200	1	1000	1 200	7372			

HARDLINE/HELIAXTM

%" Heliax | 50



HARDLINE & HELIAX TM CONNECTORS

Cable Type UHF FML	UHF MALE	N FML	N MALE
1/2." Alum \$19	\$19	\$19	\$25
1/2 "Heliax TM \$22	\$22	\$22	\$22
%" Heliax TM \$49	\$49	\$49	\$49

AMPHENOL CONNECTORS

Silver PL259	\$1.25	Nickle	PL259	.\$.90
UG218 N Male.	\$2.95	UG23D	N Female.	\$2.95

ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld \$ 12/ft	14 Ga. Copperweid \$.10/ft
14 Ga. Stranded \$ 10/ft	18 Ga. Copperweld ¼ mi\$30
450 0hm H.D. Line \$ 16/ft	H.D End Insulators \$2/ea
Van Gorden 1:1 Balun	\$11
Van Gorden Center Insulate	V

ı	HUSTLER		6BTV	80-10	mtr	Vert.	\$129
1	4BTV 40-10 mtr Vert	\$89	5BTV	80-10	mtr	Vert	\$109
Ì	G6-144B 2-mtr Base	\$89	G7-14	4 2-m	tr B	ase.	\$119

Mobile Resonato	rs 10m	15m	20m	40m	75n
400W Standard	\$12	\$12	\$15	\$18	\$22
2KW Super	\$18	\$20	\$22	\$26	\$36
Bumper Mounts	- Springs	- Fold	ing Ma	ists in S	Stock

CUSHCRAFT

A3 R3

ILII-BAND HE ANIENI	KAS	
3-el Tribander \$219	A4 4-el Tribander	\$28
20/15/10mtr Vert\$279	A743/A744 40mtr Ki	1 57

1	HE MONO-BAN	DANTENN	IAS	
ı	10-3CD	\$ 95	10-4CD	\$109
ı	15-3CD	\$119	15-4CD	\$129
ı	20-3CD	\$199	20-4CD	\$279
	40-2CD	\$289	D40	\$149
	VHF/UHF BEAN			
-	A50-5		6178	\$199
	214B			

	ADU-D	- 2	19	DIVB	31:	n
	214B	. 5	79	3219	- 8 9	35
1	220B	\$	95	424B	. \$ 7	75
	OSCAR/TWIST					
	A144-10T	- \$	52	A144-20T	\$ 1	7.
	A147-20T					
	A14TMB	. 5	29	PS4	\$ 6	55
	VHF/UHF FM AI	NTE	NNA	S		
ı	A147-4	. \$	29	A147-11	\$ -	45
	214FB	\$	79	228FB	\$2	15
ı	THE RESIDENCE OF THE PARTY OF T					

A449-6 \$ 29 ARX2B

Broadband 3-el Triband Beam Explorer-14, In Stock-\$289

The second secon	
QK710 30/40 mtr. Add-On-Kit	\$75.0
V2S 2-mtr Base Vertical	
TH5MK2S Broad Band 5-el Triband Beam.	
TH7DXS 7-el Triband Beam	The state of the s
TH3JRS 3-el Triband Beam	
TH2MK3S 2-el Triband Beam	
HY-QUAD 2-el Triband Quad	
402BAS 2-el 40-mtr 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	
203BAS 3-el 20-mtr Beam	\$13
153BAS 3-el 15-mtr Beam	\$7
103BAS 3-el 10-mtr Beam	\$5
DB1015BAS 3-el 10/15 mtr Beam	
64BS 4-el 6-mtr Beam	
66BS 6-el 6-mtr Beam	
18HTS 80-10 mtr Hy-Tower Vertical	
LC-160 160-mtr Coil Kit for 18HTS	
214 14-el 2-mtr Beam	
28DQ 80/40 mtr Trap Dipole	1,70,70
ZOUG DOT TO THE TTEP LIPUIS	

HYGAIN/TELEX CRANKUPS

ON SALE! FREIGHT PAID! SPECIAL PRICES! SAVESS!

Model	Height Up	Down	Wind Load	List	Sale
HG-37SS	37.0 ft	20.5 ft	9.0 sq ft	\$777	\$669
HG-52SS	52.0 ft	20.5 ft	9.0 sq ft	\$1095	\$949
HG-54HD	54.0 ft	21.0 ft	16 sq ft	\$1818	\$1499
HG-70HD	70.0 ft	23.0 ft	16 sq ft	\$2850	\$2399
HG-33MT2	33.0 ft	11.5 ft	8.5 sq ft	\$898	\$779

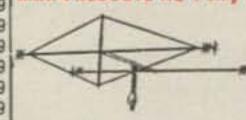
ALPHA DELTA COMMUNICATIONS

Transi-Trap TM Surge Prote	ctors-1
Model LT 200W UHF Type.	\$19
Model HT 2KW UHF Type.	\$29
Model LT/N 200W N Type.	\$39
Model HT/N 2KW N Type.	\$44
Model R-T 200W Deluxe	\$29
Model HV 2KW Deluxe	\$32



KLM	
KT34A 4-el Broad Band Triband Beam	\$309
KT34XA 6-el Broad Band Triband Beam	\$469
3.8-1 80-mtr Rotatable Dipole	\$429
7.2-1 40-mtr Rotatable Dipole	\$159
7.2-2 2-el 40-mtr Beam	\$289
7.2-3 3-el 40-mtr Beam	\$439
7.2-4A 4-el 40-mtr Beam	\$599
6el-20mtr Big Stick Monoband Beam.	\$599
6el-15mtr Big Stick Monoband Beam	\$389
6el-10mtr Big Stick Monoband Beam	\$229
10-30-7LP Log Periodic Broad Band Beam.	\$599
144-148-13LBA 13-el 2-mtr Beam	\$79
143-150-14C 14-el 2-mtr Satellite Antenna	\$79
420-470-18C 435 MHz Satellite Antenna.	\$59

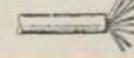
MINI-PRODUCTS HQ-1 only \$139!



Wing Span - 11 ft Boom - 54 in. long Wind Area - 1.5 sq ft 1200W P.E.P. Input 6-10-15-20 mtrs

ROTORS & CABLES

1	Alliance HD73 (10.7 sq ft rating)
ij	Alliance U100 (for small beams & elevation)\$49
į	Telex HAM 4 (15 sq ft rating)\$199
į	Telex Tailtwister (20 sq ft rating) \$249
Ŋ	Telex HDR300 Heavy Duty (25 sq ft rating) \$439
_	Kenpro KR-500 Heavy duty elevation rotor \$189.00
1	Standard 8 cond cable \$ 10/ft
я	Maintain a condition of the second



(virtyl jacket 2-#18 & 6-#22 ga) Heavy Duty 8 Cond cable \$.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

UNR-ROHN GUYED TOWERS

Prices-Call!

10 ft Sections 20G \$37.50 25G \$46.50 45G \$107.50

\$ 829

\$ 959

\$1159

\$1259

\$1359

Foldover	Model	Model Height Ant Load				
Towers	FK2548	48 11	15.4 sq ft			
115-11	FK2558	58 ft	13.3 sq ft			
N	FK2568	68 ft	11.7 sq ft			
IV	FK4544	44 ft	34.8 sq ft			
	FK4554	54 ft	29.1 sq ft			
	FK4564	64 ft	28.4 sq ft			
	25G Foldo	ver Doubl	e Guy Kit			
	45G Foldover Double Guy Ki					

Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid! Foldover prices 10% higher west of Rockies. All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE 3/16 *FHS Guywire (3990 lb rating)

3/ 10 End duywire (3550 to fatting).	- W. 1 EV. 11
1/4 "EHS Guywire (6000 lb rating)	\$.15/ft
5/32 * 7 × 7 Aircraft Cable (2700 lb rating)	\$.12/ft
3/16 "CCM Cable Clamp (3/16" or 5/32" Cable	\$.35
1/4 "CCM Cable Clamp (1/4" Cable)	\$.45
1/4 "TH Thimble (fits all sizes)	\$.30
3/8EE (3/8 " Eye & Eye Turnbuckle)	\$5.95
3/8 "EJ (3/8 " Eye & Jaw Turnbuckle)	
1/2 "EE (1/2" Eye & Eye Turnbuckle)	
1/2 "EJ (1/2" Eye & Jaw Turnbuckle)	\$9.95
3/16 * Preformed Guy Grip	
1/4 * Preformed Guy Grip	\$1.99
6 " Diam - 4 ft Long Earth Screw Anchor	
5000 Guy Insulator (5/32 * or 3/16 * Cable)	
502 Guy Insulator (1/4 * Cable)	
5/8 * Diam - 8 ft Copper Clad Ground Rod	CONTRACTOR AND ADDRESS OF THE PARTY OF THE P

PHILLYSTRAN GUY CABLE

HP162100 Gdy Gable (2100 to rating)	-\$.59/II
HPTG4000 Guy Cable (4000 Ih rating)	\$.43/ft
HPTG6700 Guy Cable (6700 lb rating)	\$.69/ft
9901LD Cable End (for 2100/4000 cable)	\$6.95
9902LD Cable End (for 6700 cable)	\$7.95
Socketfast Potting Compound (does 6-8 ends)	\$12.95
	- 0

GALVANIZED STEEL MASTS Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	1 15 FT	20 FT
_12 in Wall	\$25	\$39	\$59	\$79
.18 in Wall	\$39	\$69	\$99	\$109
.25 in Wall	\$69	\$129	\$189	\$249

SOUTH RIVER ROOF TRIPODS

Į	HDT-3 3 ft Tripod \$19	HDT-5 5 ft Tripod \$29
1	HDT-10 10 ft Tripod \$49	HDT-15 15 ft Tripod \$69
	Heavy Duty Tripods include r	mtg hdw-UPS Shippable



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1108 Summit Ave., Suite 4 / Plano, Texas 75074 Mon.-Fri.: 8:30 a.m. - 5:30 p.m. Sat. 9 a.m. - 1 p.m.

580Q 80-10 mtr Trap Dipole.

BN86 80-10 mtr KW Balun W/Coax Seal

TELEPHONE: (214) 422-7306



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CIRCLE 43 ON READER SERVICE CARD

COMMUNICATIONS EQUIPMENT SALE!

AMPLIFIER SALE!



Model	Band	Pre- amp	Input	Output	PWF	Sale Price	
A1015	6M	Yes	10W	150W	20A	\$249	
B23	2M	No	2W	30W	5A	\$ 79	
B215	2M	Yes	2W	150W	22A	\$259	
B108	2M	Yes	10W	80W	10A	\$159	
B1016	2M	Yes	10W	160W	20A	\$249	
B3016	2M	Yes	30W	160W	17A	\$199	
C22	220	No	2W	20W	5A	\$ 79	
C106	220	Yes	10W	60W	10A	\$179	
C1012	220	Yes	10W	120W	20A	\$259	
D24	440	No	2W	40W	A8	\$179	
D1010N	440	No	10W	100W	20A	\$289	

ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage: 105–125 VAC Output: 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	'Cont. Amps	ICS Amps	Price
RS4A	3	4	\$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229



Communications Sale! **CWR6850** \$749! CT2200 KB2100 \$959!

CWR6700 Receive Only Telereader	\$439
CWR6750 Receive Only Telereader	
DS3100ASR Deluxe RTTY Terminal	1699
MPT3100 Message Processor Terminal	
RS2100 1 "Scope w/Loop Supply	289
ST5000 RTTY Demodulator	
ST6000 Deluxe Demodulator/Keyer	649
DSK3100 Disc Storage Unit	829
ARQ1000 Amtor Error Correcting Terminal	
KG-12 12 " High Resolution Monitor	169

ICOM IC-25H

RC-1 Remote Control for Mirage Amplifiers MP-1 and MP-2 Peak-Reading Wattmeter.



List \$389 Call For Your Special Price

ICOM IC-290H



List \$549 Call For Your Special Price

ICOM IC-730



List \$829 Call For Your Special Price

KDK FM2030



List \$599 Call For Your Special Price

ICOM IC-751A



ICOM New Top Of The Line HF Transceiver List \$1399 Call For Your Special Price

ICOM IC-745



New Compact All Band. All Mode HF Transceiver List \$899 Call For Your Special Price

ICOM IC-02AT

New Digital Readout, Memories, Scanning HT List \$349 Call For Your Special Price

AEA CP-1 Computer Patch \$179



ALL ICOM PRODUCTS IN STOCK! CALL FOR YOUR SPECIAL PRICE!

ST144, P Handie Talkie ON SALE! Only \$279

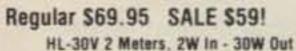
IN STOCK FOR IMMEDIATE DELIVERY

 142-149 995 MHz
 3 5W/1W/ 1W Output . Liquid Crystal Display · 24 Hour Clock



OTHER SANTEC ITEMS ST-440 µP 440 MHz H. T. SM-3 Speaker Mic 33 39 ST-LC Leather Case ST-500B3 Ni-Cad Battery

TOKYO **HY-POWER LABS**



OTHER TOKYO HY-POWER ITEMS HL-82V 2 Mtr. 2-12W In - 35-85W Out HL-160V 2 Mtr. 1-15W In - 160W Out HL-20U 440 MHz 1-3W In - 20W Out HL-90U 440 MHz 10W In-80W Out w/Preamp. 339 HC-200 HF Ant Tuner w/Wattmeter HC-2000 Deluxe 2KW HF Antenna Tuner

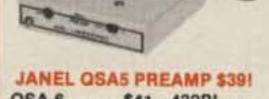


FREE . . . Ten-Tec Power Supply Model #260 (List Price \$199) with Purchase of Ten-Tec Corsair at \$1,169. 525D Argosy.....\$529 229 KW Antenna Tuner....\$259

4229 Antenna Tuner Kit....\$189

2591 New 2 Meter HT.....\$275

All Other Ten-Tec Accessories In Stock. Please Call For Your Special Prices.

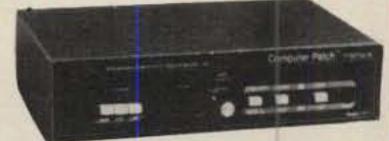


QSA-6 \$41 432PL..... \$59 PB-30 \$25 PB144 \$25 ...\$25 PB220 \$25

MFJ MODEL 104 On SALE For Only \$331 482 4 MSG Mem Keyer . . . 494 Keyboard 5258 RF Processor 624 Phone Patch 9408 Tuner w/Meter..... 941C Tuner w/Meter

989 Deluxe 2KW Tuner

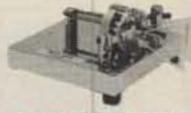
9498 Deluxe Tuner



CP-20 Computer Patch with Vic-20 Software \$219 CP-64 Computer Patch with Com-64 Software \$219

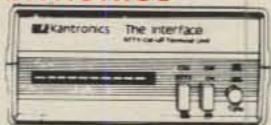
Other AEA Items In Stock. Call For Your Special Price.

DAIWA CN-620B \$111! 160/2 mtrs 20/200/2000 wts



BENCHER PADDLE BY-1 Blackbase \$39

BY-2 Chrome \$49



The Interface Reg. \$169.95 Sale \$129.00 The Interface II Reg. \$269.95 Sale \$239.00

Apple Amtor	VIC-20 Hamsoft 49
Soft/Hamtext \$139	Hamtext VIC-20 99
Vic-20 Amtor Soft 89	Hamtext Model-64 99
Model 64 Amtor Soft 89	Atari Hamsoft
Apple Hamsoft 29	TRS-80C Hamsoft 59

Mask:rCard

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YAESU SALE!



FT-ONE

GENERAL COVERAGE—ALL MODE **DELUXE SOLID STATE TRANSCEIVER**

Buy Now and Receive These Accessories Free: 300Hz CW Filter. \$FREE 600Hz CW Filter. \$FREE 800Hz CW Filter. \$FREE 6Khz AM Filter...\$FREE Memory Backup . \$FREE Installation....\$FREE

List Price \$3074. CALL FOR YOUR SPECIAL PRICE! Quantities Limited — Hurry!



CAT SYSTEM—Computer Aided Transceiver

- Wide Dynamic Range
 Low Noise Front End
- · General Coverage
 - 10Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK! . Full Break-in CW
 - · RF Speech Processor
- Variable Bandwidth
 - . IF Shift . APF/Notch
- AC Power Supply
 - Adjustable Noise Blanker
- 12 Internal Digital VFO's with Memories
- . Much, much more-call or write for info

Computer Interface now in development— Own Tomorrow's HF Transceiver-Today!! Manufacturer's Suggested List Price \$1499 Call For Your Special Price Today!!



FT-102

160-10MTR WITH WARC BANDS TRANSCEIVER

- . Digital Readout
- . Built-in AC Supply
- Variable Bandwidth
- * IF Shift
- CW/SSB/AM/FM Modes Noise Blanker
- RF Speech Processor · Much, much more-

List Price \$1149-Call for Special Low Texas Towers Discount Price and Save \$\$\$



New 80-10mtr Compact HF Transceiver

- . Digital Readout
- Adj Noise Blanker
- CW/SSB/FM Modes
- CW Wide/Narrow
- . Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available

List Price \$599 - Call for Special Low Texas Towers Discount Price and Save \$\$



FT-230R 2mtr FM \$359 FT-730R 440Mhz FM......\$399

- 10 Memories
- . Two VFO's
- * LCD Readout
- 25W Out
- Memory or Up/Down Scan Call today for Special Discount Price & Save \$\$



All Mode Tri-Band Transceiver

- * 50-54 Mhz • 144-148 Mhz
 - . 10 watts output on all bands
 - 430-450 Mhz 21, 24.5 & 28 Mhz
 - option available soon

Please Call For Price & Delivery Information



VHF/UHF Multimode Portables

FT-690R	50Mhz	 	 	\$379
FT-290R	144Mhz.	 * *	 	\$399
FT-790R	430Mhz.	 	 	\$399

Call today for Special Discount Price & Save \$\$



FRG-7700

All Mode Digital Communications Receiver .15 to 29.99Mhz-Receives SSB/AM/FM/CW, Built-in S Meter, Speaker, Noise Blanker, Timer, FM Squelch, AC Supply and More!

Manufacturer's List \$499-Call today for Your Special Discount Price!!

FT-208R 2mtr HT.....\$319 RF Out: 300mw/2.5W

FT-708R 440Mhz HT....\$319 RF Out: 200mw/1.0W

- * 10 Memories LCD Display
- Up/Down and Memory Scanning
- Complete w/Nicad Battery, Charger and Rubber Duck Ant

Accessories Available: LCC-8 Leather Case.....\$35 YM24A Spkr/Mic.....\$39 FNB-2 Nicad.....\$29 NC-8 Base Chgr.....\$99

Call for Special Yaesu Discount



IMPORTANT — Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special Yaesu Sale Prices and Save \$\$\$!!

Prices!!

ETD ALPHA



76PA \$1699



ALPHA 78



ALPHA 374A

SPECIAL SALE PRICES

Model	List	Sale
77DX	\$5450	
78	\$3495	
374A	\$2595	
76A	\$1985	
76PA	\$2395	
76CA	\$2695	

*Sale Prices Too Low To Print!! Call For Your Special Prices!!



TOKYO HY-POWER HC-2000 Tuner

\$339.95 List Price

SALE \$289.00

- Heavy Duty 2 KW Construction
- 160-10 Meter Operation (including WARC Bands)
- Calibrated Vernier Dial
- Built-in SWR and Watt Meter
- Built-in 12 Position Antenna/By-pass Switch
- · Built-in Balun for Balanced Feedline



TEXAS TOWERS

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 Plano, Texas 75074

Telephone (214) 422-7306

YAESU FT-726R TRIBANDER

NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

SATELLITES!!

FM!!

SCATTER!!

EME!!



The New Yaesu FT-726R Tribander is the world's first multiband, multimode Amateur transceiver capable of full duplex operation. Whether you're interested in OSCAR, moonbounce, or terrestrial repeaters, you owe yourself a look at this one-of-a-kind technological wonder!

Multiband Capability

Factory equipped for 2 meter operation, the FT-726R is a three-band unit capable of operation on 10 meters, 6 meters, and/or two segments of the 70 cm band (430-440 or 440-450 MHz), using optional modules. The appropriate repeater shift is automatically programmed for each module. Other bands pending.

Advanced Microprocessor Control

Powered by an 8-bit Central Processing Unit, the ten-channel memory of the FT-726R stores both frequency and mode, with pushbutton transfer capability to either of two VFO registers. The synthesized VFO tunes in 20 Hz steps on SSB/CW, with selectable steps on FM. Scanning of the band or memories is provided.

Full Duplex Option

The optional SU-726 module provides a second, parallel IF strip, thereby allowing full duplex crossband satellite work. Either the transmit or receive frequency may be varied during transmission, for quick zero-beat on another station or for tracking Doppler shift.

High Performance Features

Borrowing heavily from Yaesu's HF transceiver experience, the FT-726R comes equipped with a speech processor, variable receiver bandwidth, IF shift, all-mode squelch, receiver audio tone control, and an IF noise blanker. When the optional XF-455MC CW filter is installed, CW Wide/Narrow selection is provided. Convenient rear panel connections allow quick interface to your station audio, linear amplifier, and control lines.

Leading the way into the space age of Ham communications, Yaesu's FT-726R is the first VHF/UHF base station built around modern-day requirements. If you're tired of piecing together converters, transmitter strips, and relays, ask your Authorized Yaesu Dealer for a demonstration of the exciting new FT-726R, the rig that will expand your DX horizons!

Price And Specifications Subject To Change Without Notice Or Obligation

CIRCLE 48 ON READER SERVICE CARD





483

YAESU ELECTRONICS CORPORATION 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007 YAESU CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

ICON'S IC-02A

Digital Readout, Scanning, Memories and...



ICOM introduces the new top-ofthe-line IC-O2A and IC-O2AT to compliment its existing line of popular handheld transceivers and accessories. The new direct entry microprocessor controlled IC-O2A is a full-featured 2 meter handheld.

Some of its many teatures are

Scanning, 10 memories, duplex offset storage in memory, odd offsets, 32 keyboard selectable PL tones which store in memory, and internal lithium battery backup.

Keyboard entry through the 16 button pad allows easy access of frequencies, duplex, memories, memory scan, priority, dial lock, PL tones and DTMF in the IC-O2AT.

An easy-to-read custom LCD readout indicates frequency, memory channel, signal strength and transmitter output, PL tone, and scanning functions.

The new IC-O2A has a battery lock, frequency lock, and lamp on/off switch. An aluminum case back is

provided

VOLUME

for superior heat sinking when the IC-O2A is run at the standard 3 watt level or 5 watts (optional battery pack).

available for the IC-02A including new long-life 8.4 volt and 13.2 volt packs. Charging may be done from a top panel connector for 13.8 volts which will also power transceiver operation.



available...and its complete line of accessories work with the new IC-O2A.

The IC-O2A comes standard with BP3 NiCd battery pack, BC25U wall charger, flexible antenna, wrist strap and belt clip.

CIRCLE 3 ON READER SERVICE CARD

