Amateur Radio

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SPECIAL ANTENNA ISSUE

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THE RADIO AMATEUR'S JOURNAL

NEW

Digital DX-terity...

General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch...COMPACT!

TS-430S

The TS-430S combines the ultimate in compact styling with advanced circuit design and performance. An all solid-state SSB, CW, and AM transceiver, with FM optional, covering the 160-10 meter Amateur bands, it also incorporates a 150 kHz-30 MHz general coverage receiver having a superior dynamic range, dual digital VFO's, 8 memories, memory scan, programmable band scan, IF shift, notch filter, all-mode squelch, and built-in speech processor.

TS-430S FEATURES:

- **160-10 meter operation, with general coverage receiver**
  With 160-10 meter Amateur band coverage, including WARC 30, 17, and 12 meter bands, it also features a 150 kHz-30 MHz general coverage receiver. Innovative UP-conversion digital PLL circuit, for superior frequency stability and accuracy. UP/DOWN band switches for Amateur bands or 1-MHz steps across entire 150 kHz-30 MHz range. Two digital VFO's continuously tuneable from band to band. Band information output on rear panel.
- **USB, LSB, CW, AM, with optional FM**
  Operates on USB, LSB, CW, and AM, with optional FM, internally installed. AGC time constant automatically selected by mode.
- **Compact, lightweight design**
  Measures only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm), weighs only 14.3 lbs. (6.5 kg.).
- **Superior receiver dynamic range**
  Use of 2SK125 junction-type FET's in the Dyna-Mix high sensitivity, balanced, direct mixer circuit provides superior dynamic range.
- **10-Hz step dual digital VFO's**
  10-Hz step dual digital VFO's operate independently, include band and mode information. Different band and mode cross-operation possible. Dial torque adjustable. STEP switch for tuning in 10-Hz or 100-Hz steps. A=B switch quickly shifts "B" VFO to the same frequency and mode as "A" VFO, or vice-versa. VFO LOCK switch provided. RIT control tunes VFO or memory. UP/DOWN manual scan possible using optional microphone.
- **Eight memories store frequency, mode, and band data**
  Memories store frequency, mode, and band data. Eighth memory stores receive and transmit frequencies independently. M.CH switch for operation of memory as independent VFO, or fixed frequency.
- **Lithium battery memory back-up**
  Estimated five-year life.
- **Memory scan**
  Scans memories in which data is stored.
- **Programmable automatic band scan**
  Scans programmed band width. Scan speed adjustable. HOLD switch interrupts band or memory scan.
- **IF shift circuit for minimum QRM.**
  IF passband may be moved to place interferring signals outside the passband, for best interference rejection.
- **Tuneable notch filter built-in**
  Deep, sharp, tuneable, audio notch filter.
- **Narrow-wide filter selection**
  NAR-WIDE switch for IF filter selection on SSB, CW, or AM, when optional filters are installed. (2.4 kHz IF filter built-in.)
- **Speech processor built-in**
  Improves intelligibility, increases average "talk-power."
- **Fluorescent tube digital display**
  Indicates frequency to 100 Hz (10 Hz modifiable).
- **All solid-state technology**
  Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Built-in cooling fan, multi-circuit final protection. Operates on 12 VDC, or 120 VAC, or 220/240 VAC with optional PS-430 AC power supply.
- **All-mode squelch circuit, built-in**
- **Noise blanker, built-in**
- **RF attenuator (20 dB)**
- **Vox circuit, plus semi break-in with side-tone**

Optional accessories:

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-130 compact antenna tuner, 80-10 m incl. WARC.
- AT-230 base antenna tuner, 160-10 m incl. WARC.
- FM-430 FM unit.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand microphone.
- MC-60A deluxe desk microphone, UP/DOWN switch.

More information on the TS-430S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

KENWOOD

...pacesetter in amateur radio

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

R-600

"Now hear this"...digital display, easy tuning

The R-600 is an affordably priced, high performance general coverage communications receiver covering 150 kHz to 30 MHz in 30 bands. Use of PLL synthesized circuitry provides maximum ease of operation.

R-600 FEATURES:

- 150 kHz to 30 MHz continuous coverage, AM, SSB, or CW.
- 30 bands, each 1 MHz wide, for easier tuning.
- Five digit frequency display, with 1 kHz resolution.
- 6 kHz IF filter for AM (wide), and 2.7 kHz filter for SSB, CW and AM (narrow).
- Up-conversion PLL circuit, for improved sensitivity, selectivity, and stability.
- Communications type noise blanker eliminates "pulse-type" noise.
- RF Attenuator allows 20 dB attenuation of strong signals.
- Tone control. • Front mounted speaker.
- "S" meter, with 1 to 5 SINPO "S" scale, plus standard scale.
- Coaxial and wire antenna terminals.
- 100, 120, 220, and 240 VAC, 50/60 Hz. Selector switch on rear panel.
- Optional 13.8 VDC operation, using DCK-1 cable kit.
- Other features include carrying handle, headphone jack, and record jack.

Optional accessories for R-600 and R-1000:

- DCK-1 DC Cable kit. • SP-100 External Speaker.
- HS-6, HS-5, HS-4 Headphones.
- HC-10 Digital World Clock.

R-1000

High performance, easy tuning, digital display

The R-1000 high performance communications receiver covers 200 kHz to 30 MHz in 30 bands. An up-conversion PLL synthesized circuit provides improved sensitivity, selectivity, and stability.

R-1000 FEATURES:

- Covers 200 kHz to 30 MHz.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock/timer.
- RF step attenuator.
- Three IF filters for optimum AM, SSB, CW.
- Effective noise blanker. • Tone control.
- Built-in 4-inch speaker. • Dimmer switch.
- Wire and coax antenna terminals.
- Voltage selector for 100, 120, 220, and 240 VAC. Operates on 13.8 VDC with optional DCK-1 kit.

TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.
- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Effective noise blanker.
- Final amplifier protection circuit assures maximum reliability. Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

Optional accessories:

- PS-30 matching power supply (TS-130SE).
- KPS-21 power supply (TS-130SE).
- PS-20 power supply (TS-130V).
- SP-120 external speaker.
- VFO-120 remote VFO.
- FA-4 fan unit (TS-130SE).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 antenna tuner.
- MB-100 mobile mounting bracket.

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You've got to get a Santec to get it right!

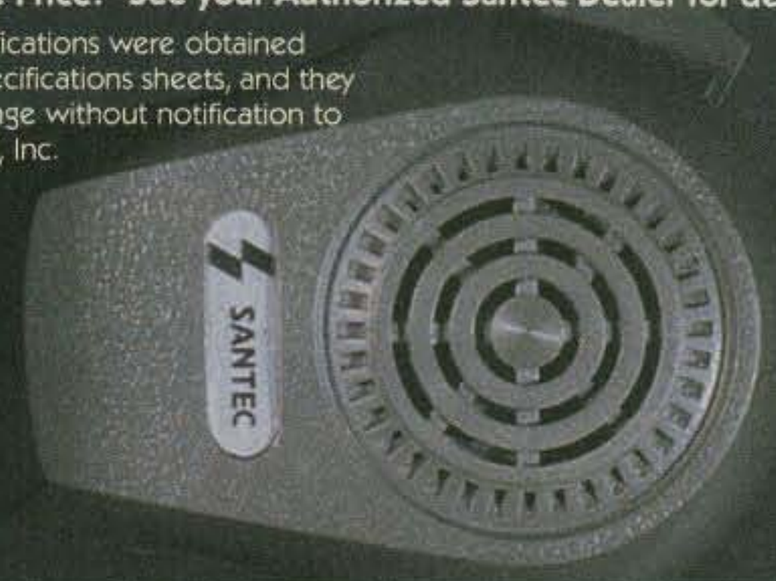
Compare Santec to anything you like, and you'll see — you've got to get a Santec to get: ■ memory channels which store standard repeater offsets for instant recall ■ less than 10 ma drain in receive to conserve power while you're monitoring ■ extremely wide power options of 0.1 W, 1.0 W or even 3.5 W for varying conditions ■ an accurate 24 hour clock for instant reference ■ and a full two year extended service plan which no one else will match.

When you get a Santec, you also get: ■ the widest frequency range of any handheld ■ odd offsets other than ±600 kHz ■ variable step sizes in bandscan ■ a 500 ma battery with charger ■ a full six digit back-lighted LCD display for full frequency readout plus the memory channel number ■ the easiest keyboard entry of any handheld ■ eight modes of scan, search, manual control and open scan ■ the ability to change batteries without losing memory data ■ easily programmable bandscan ■ a frequency lock switch on the keyboard ■ an automatic low battery indicator ■ and much more.

FEATURE	SANTEC ST-144	YAESU FT-208	KENWOOD TR-2500
Size (mm)	68 x 170 x 47	61 x 168 x 49	66 x 168 x 40
Weight with Batt.	600 gm	720 gm	540 gm
Readout	LCD (full 6 digits)	LCD (4 digits)	LCD (4 digits)
Memory Channels	10	10	10
Memory of Offsets	YES	NO	NO
Memory Backup	YES, Capacitance	Yes, Lithium Batt.	Yes, Lithium Batt.
Scan (mem. & band)	YES	Yes	Yes
Search Mode	YES	NO	NO
Step Size	5-100 kHz	5 or 10 kHz only	Any 5kHz multiple
Battery	Quick Change Pack 500 ma-hr, 9.6 V	Quick Change Pack 450 ma-hr, 10.8 V	Slide-on Pack 400 ma-hr, 8.4 V
Frequency Coverage	142-148.995 Tx (149.995 optional) 142-149.995 Rx	143.5-148.495 Tx/Rx	143.9-148.995 Tx/Rx
Power (max)	3.5 W High 1.0 W. Med. 0.1 W Low	2.5 W High 0.2 W Low	2.5 W High .3 W Low (approx.)
Priority	YES (in Mem/Scan)	Yes (Priority Ch.)	NO
Clock	YES	NO	NO
Computer Current Saver	YES (<10 ma)	NO (20 ma)	NO (27 ma)
Display	6 Digits + Mem. #	4 Digits + Mem. #	4 Digits + Mem. #

New! Affordable Price! See your Authorized Santec Dealer for details.

Competitors' specifications were obtained from published specifications sheets, and they are subject to change without notification to Santec or Encomm, Inc.



Shown with optional SM-3 speaker microphone.

Accessories for SANTEC Handheld Radios
clockwise from upper left
- Leather Case (ST-LC)
- Base Charger & Power Supply (ST-5BC)
- Remote Speaker (MS-505)
- Mobile Charger (ST-MC)
- Speaker Microphone (SM-3)

The ST-144 μP is approved under FCC Part 15

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CQ The Radio Amateur's Journal

ON THE COVER: April for amateur radio is Dayton and the start of the antenna season. Gary Woodhouse, K2UU, waves down at us from atop one of his towers. Photo by Larry Mulvehill, WB2ZPI.

APRIL 1983 **VOL. 39, NO. 4**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

The *CQ* team (Dick, Jack, and I) spent last weekend in Miami at the Tropical Hamboree. The weather was beautiful, the people extremely friendly, and the Hamboree committee very cooperative and helpful. What more could you ask for? Well, for one thing, we expected our shipment of magazines to arrive on time and they never showed up. We had to have an air-lift on Saturday to get some rush copies for the *CQ* booth. Outside of that, the weekend was pretty close to perfect—a rare chance to get some warm weather in the middle of winter. Evelyn Gauzens, W4WYR, who runs the event, outdid herself in that there seemed to be a few more exhibitors than last year and a bigger flea market to wander through. As usual, my suitcase was a bit heavier on the return trip. There were a few really good buys to be had for the careful shopper.

As this was the first big gathering after the FCC's NPRMs on a code-free license and volunteer examiners, these were the two big topics of conversation. Obviously, the more conservative opinion was against a code-free license, but a surprising number saw the logic and reasoning behind it. More importantly, many came up to the *CQ* booth and commented on my editorial concerning the $2,000,000 or so price tag on the licensing system. A few even went as far as to say that my figure was a little too low. There is a concern out there, and rightly so, that this could very well turn into a great debacle. I'd like to be more positive and supportive of the idea, but reality and experience say that it can't work—not without massive funding. Again, I am reminded of the old adage "Be careful of what you ask for; you just might get it."

Heard Island '83

They made it! Most of the amateur world will have heard or worked them by now, but it is still exciting and relatively fresh news at this writing. The official notice came a short while ago in a letter from Neil Penfold, VK6NE. The following is Neil's letter of announcement:

"With the arrival of this newsletter, we are pleased to let you know that VKØHI is a reality.

"After 14 months of planning, fund raising, and the usual run of problems associated with an expedition of such magnitude, it was with great jubilation that we farewelled the maxi yacht Anaconda II from Fremantle, West Australia, at 0234 hrs UTC Friday 31 December. An amount of $30,000 was required for amateur participation, and was to provide three amateurs with transport, food, clothing, bedding, and most other essentials of life. This money was made up from $10,000 received from the NCDX Foundation, $10,000 from IDXF, $7,000 from K2PA, $1000 from Canada. The DX Family Foundation of Japan sent $2500 with a further $2500 promised. When it arrives from JA, it will be used to reduce KP2A's commitment.

"The expedition radio equipment requirements were met by donations and the VK6 DX Chasers Club. Eighteen thousand dollars of equipment was loaned, donated, or bought. The VK6DXCC contributed $5000 of equipment; VK3 Division of the WIA supplied for expedition use one IC-720 and two P/S; VK2 an IC-730 and P/S; VK6 an IC-730 and P/S, three element beam with rotater, and controller. Out-of-pocket expenses for VK6XI and VK6NE were about $2000 each.

"Supplemental to the list of equipment was the gear brought from America as excess luggage by the two operators. This included two LA1000 linear amps, one IC-740, Procom headsets and keyers. The project co-ordinator and spokesman for the VK6DX Chasers Club is VK6XI. He has liaised with N2DT and WA2MOE of the IDXF all year. Many hours were spent on air and telephone, ironing out the details. VK6NE, publicity, equipment, and WIA liaison officer, succeeded in obtaining the equipment necessary to put two stations on air with 100% backup. Both VK6XI and VK6NE went to VK2 and discussed the involvement of the amateurs with the co-convenors of the mountaineering group. The work of answering the numerous enquiries and acknowledging donations received was carried out by VK6FS and VK6YL. VK6DY was kept busy manufacturing the various mechanical and electrical items, as well as strengthening the beams and tower. VK6UN spent nearly a week of his holidays loading and assisting on Anaconda II.

"Well, that very briefly is how we were able to send out the team with the expedition to Heard Island. Eventually we will publish a full list of donors and sponsors along with a list of equipment taken 'down south.'

"QSL routes: North America—N2DT; Japan—DX Family Foundation, Box 12 Shinjuku-kita, Ochiai, TOKYO 161, JAPAN; rest of the world—VK6NE. Should you hear VKØCW—as above."

73, Neil Penfold, VK6NE
for the VK6DXCC

YL = Young Lad?

Elsewhere in this issue is an article aimed at the XYL and how she can survive going to a hamfest with her OM. Yes, I know that it's cute, but it's also becoming chauvinistic in a lot of ways. When I first started to attend hamfests over twenty years ago, there were very few women in attendance—either licensed amateurs, family, or friends. In the last twenty years quite a number of women have joined the ranks of amateurs and regularly attend hamfests. In fact, the pendulum is now swinging in the other direction. I've noticed recently that with a number of couples who come by the *CQ* booth it is the woman who is the amateur and the man who is trying to look amused while walking his feet off. Perhaps it is time to update some of amateur radio's jargon accordingly. A YM (Young Man) could be a non-amateur who is dating a female amateur. An XOM could indicate the "Old Man" who is not (X) an amateur. YM and XOM activities could be introduced at hamfests to keep them busy while the amateurs go about their business. Log rolling, auto repairing, football watching, shark wrestling, and other macho events would be scheduled at the same time as the microwave cooking, sewing, and make-up demonstrations.

Slinky 30 Meter Antenna?

I received a nice letter from Jonathan Titus, KA4QVK, of the Blacksburg Group, the people who market the Slinky Dipole antenna. Jonathan informs me that they will supply a free tuning chart for 30 meters to all Slinky Dipole owners (regardless of where you bought it). Just send an s.a.s.e. to The Blacksburg Group, P.O. Box 242, Blacksburg, VA 24060.

Travels With CQ

Besides Dayton, don't forget the DX shindig in Visalia, California, this April. It is scheduled for the weekend before Dayton, and so far it looks like we will be there. Of course, Larry Brockman, N6AR, and others from our DX Committee usually are there, but this year we're trying to fit it into our plans, too.

I'm going to try the same thing this year as last with regard to Dayton. I'm going to pack another suitcase with a heavy jacket, sweater, umbrella, and raincoat—just in case. I did that last year, and for the first time in a long while we had terrific weather for the whole weekend. I know it's a little inconvenient to drag that extra stuff around, but it was worth it just to ensure good weather. It is a small thing to do for amateur radio.

73, Alan, K2EEK

The real beauty of the Collins KWM-380 is behind the panel, not on it.

At Collins, we know serious amateurs won't settle for less than professional performance. So we build every KWM-380 to commercial rather than amateur standards. For example, our PC boards are connected by ribbon cables with gold-plated pinfield connectors. The boards themselves are all glass epoxy, and virtually

unaffected by temperature and humidity which cause intermittents in the more commonly used phenolic boards.

Once built, every KWM-380 undergoes 24-hour burn-in, then is aligned and tested to meet or exceed every spec on the data sheet. Which makes us very confident about warranting your KWM-380 for one full year.

The result is a radio with superior performance and lasting quality, not front-panel glitter.

Frequency stability is just one example of its beauty: typically, drift is as low as 10-12 Hz per hour for normal ham shack environments. Other companies haven't matched our performance because they don't match our quality behind the panel.

Add some real beauty to your station. See the KWM-380 at your nearest authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, IA 52498. Phone (319) 395-5963. Telex: 464-435.

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CIRCLE 50 ON READER SERVICE CARD

Announcing

● **Foundation for Amateur Radio Scholarships** - This nonprofit organization with headquarters in Washington, D.C., plans to award ten scholarships for the academic year 1983–84. Licensed radio amateurs may compete for one or more of these awards if they plan to pursue a full-time course of study beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. Most of the scholarships require that the applicant hold at least an FCC General class license or the equivalent. Awards range from $300 to $900, with some preference given to specific geographical areas or study programs. Additional information and an application can be requested by a letter or QSL/postcard postmarked prior to May 31 and sent to Hugh A. Turnbull, W3ABC, 6903 Rhode Island Ave., College Park, MD 20740.

● **Challenge the World's Record for Copying Morse Code** - At the Dayton Hamvention (April 29–May 1) there will be the opportunity to challenge the world's record for copying Morse code. According to *The Guiness Book of World Records*, the record, which was set in 1939, still stands at 75.2 wpm. If anyone is interested in challenging this record, write to Frank J. Schwab, W8OK, CW Proficiency Chairman, Dayton Hamvention, Box 44, Dayton, OH 45401 for details.

● **VS6 Activity Day 1983** - The Hong Kong Amateur Radio Transmitting Society will sponsor VS6 Activity Day between 0001G Saturday, April 2, and 2359G, Sunday April 3. Many VS6 stations will be active on all bands and modes. Also to commemorate WCY 83, VS6WCY will be on the air during the year. Special QSLs will be issued for contact with VS6WCY. QSL to the Hong Kong QSL Bureau Manager, P.O. Box 541, Hong Kong.

● **Kingston, New York** - Overlook Mountain Amateur Radio Club will operate WA2MJM from 1500Z–2300Z April 9 and 10 to commemorate the 300th anniversary of Ulster County, New York. Frequencies: phone—20 kHz from bottom of General bands 40–10 meters, 147.255/855. Certificate for large s.a.s.e. to N2AAK, 51 Melissa Rd., Kingston, NY 12401.

● **Alamo Village DXpedition** - The Border ARS and Uvalde Radio Club will hold this annual event from 12 noon April 16 to 12 noon April 17. A certificate will be issued to all amateurs who contact them and send an 8"×10" s.a.s.e. to the Border Amateur Radio Society, P.O. Box CQ, Brackettville, TX 78832. They will be working 40–10 meters s.s.b.and c.w.

● **Novice, Texas** - The North Texas High Frequency Association will work Novices from Novice, Texas, using the callsign N5NT/5 from 1800Z April 16 to 1800Z April 17 in the 80, 40, and 15 meter Novice bands. Certificate for a QSL and large s.a.s.e. to N5NT, Box 2472, Denton, TX 76202.

● **Little Brown Church, Nashua, Iowa** - The Great Plains Amateur Radio Club will operate station KCØCP from 1400Z April 16 to 2300Z April 17 from the site of the Little Brown Church in the Vale. Frequencies: phone—3925, 7250, 14290, 21365, 28560. Certificate for QSL and $1.00 to D. Muchow, Box 203, Oelwein, IA 50662 (no envelopes please).

● **KØTIK from Nebraska** - This Special Event Station will be operated from the Nebraska State Arbor Lodge, Nebraska City. Operation will be in the general portion of the phone and c.w. bands, 80 through 10 meters, from 1800 CST Friday, April 22, to 2400 CST Sunday, April 24. An Arbor Day commemorative certificate will be issued to all contacts. Send $1.00 and business-size s.a.s.e. to N.C. Amateur Radio Club, Box 8, Nebraska City, NE 68410.

● **TSRAC Scavenger Hunt Contest** - The Triple States Radio Amateur Club will sponsor this event from 0000Z April 23 to 2359Z April 24. Operation will be on c.w. and phone 20 kHz above the bottom of any General or Novice band. Trophies and certificates will be awarded. For more information, contact David M. Kinney, KC8YR, RD #1, Mingo Jct., OH 43938.

● **The following hamfests, fleamarkets, etc., are slated for April:**

April 2, **Fourth Annual Western Slope Swapfest,** Grand Junction, CO. Contact Bill Brown, KØUK, 582 So. Maple St., Fruita, CO 81521 (s.a.s.e.), or call (303) 858-9661.

April 9, **Rochester Area Hamfest,** Rochester, MN. Contact RARC, c/o WBØYEE, 2253 Nordic Ct. N.W., Rochester, MN 55901.

April 9, **Great Bay Radio Assoc. Hamfest/Fleamarket,** Somersworth, NH. Contact Great Bay Radio Assoc., P.O. Box 911, Dover, NH 03820.

April 9, **Annual Flemington, NJ, Hamfest,** Flemington, NJ. Contact Cherryville Repeater Assoc., c/o W2FCW, Box 76, Farview Dr., Annandale, NJ 08801.

April 10, **Southern Alleghenies Hamfest,** Bedford County Fairgrounds, near Bedford, PA. Contact Tom Gutshall, W3BZN, at (814) 942-7334 or on the 147.75/15 Blue Knob Repeater.

April 10, **17th Annual Rock River ARC Hamfest,** Lee County 4-H Center, one mile east of junction of Rte. 52 and 30. Contact Ed Webb, WD9CJB, 618 Orchard St., Dixon, IL 61021, or call (815) 284-3811.

April 10, **Southeastern Michigan ARA 25th Annual Hamfest,** St. Clair Shores, MI. Contact SEMARA Swap, P.O. Box 646, St. Clair Shores, MI 48083, or call WD8KXN at (313) 777-0119.

April 10, **Madison Swapfest,** Madison, WI. Contact Madison Area Repeater Assoc., P.O. Box 3403, Madison, WI 53704.

April 15–17, **1983 Midwest ARRL Convention,** South Sioux City, NE. Contact Dick Pitner, WØFZO, 2931 Pierce St., Sioux City, IA 51104.

April 16, **Wellesley ARS Auction,** Wellesley Hill, MA. Contact Kevin P. Kelly, WA1YHV, 7 Lawnwood Place, Charlestown, MA 02129.

April 16, **Fifth Annual Oak Ridge Hamfest,** Oak Ridge, TN. Contact ORARC Hamfest, P.O. Box 291, Oak Ridge, TN 37830 (s.a.s.e.).

April 23, **Bemidji ARC Hamfest,** Bemidji, MN. Contact Jerry Pottratz, WBØMSH, Rt. 8, Box 585, Bemidji, MN 56601 (s.a.s.e.)

April 30 to May 1, **Greenville Hamfest,** American Legion Fairgrounds, Greenville, SC. Contact Phil Mullins, WD4KTG, P.O. Box 99, Simpsonville, SC 29681.

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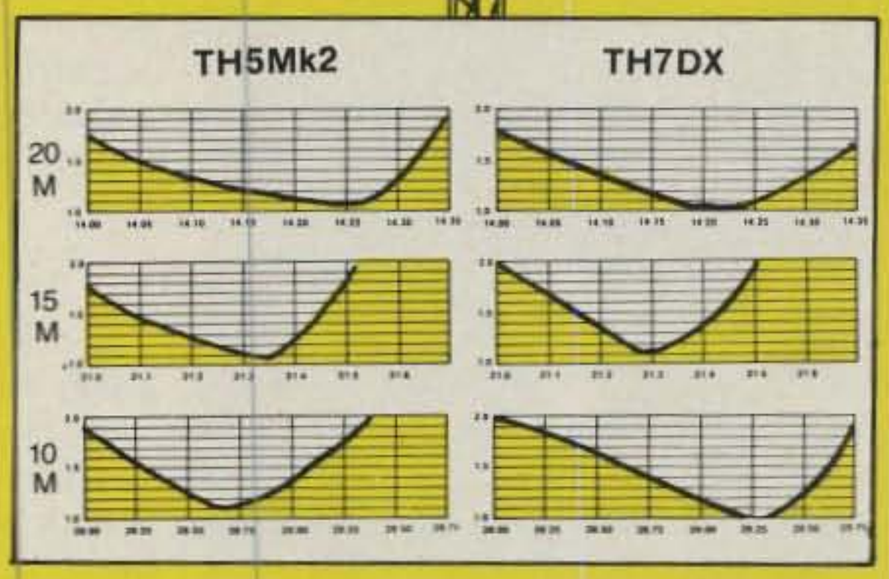

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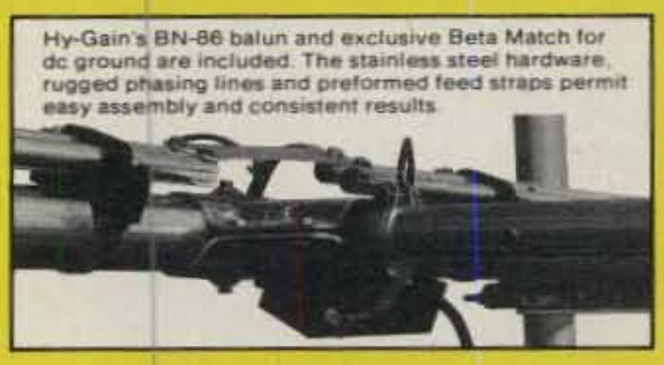
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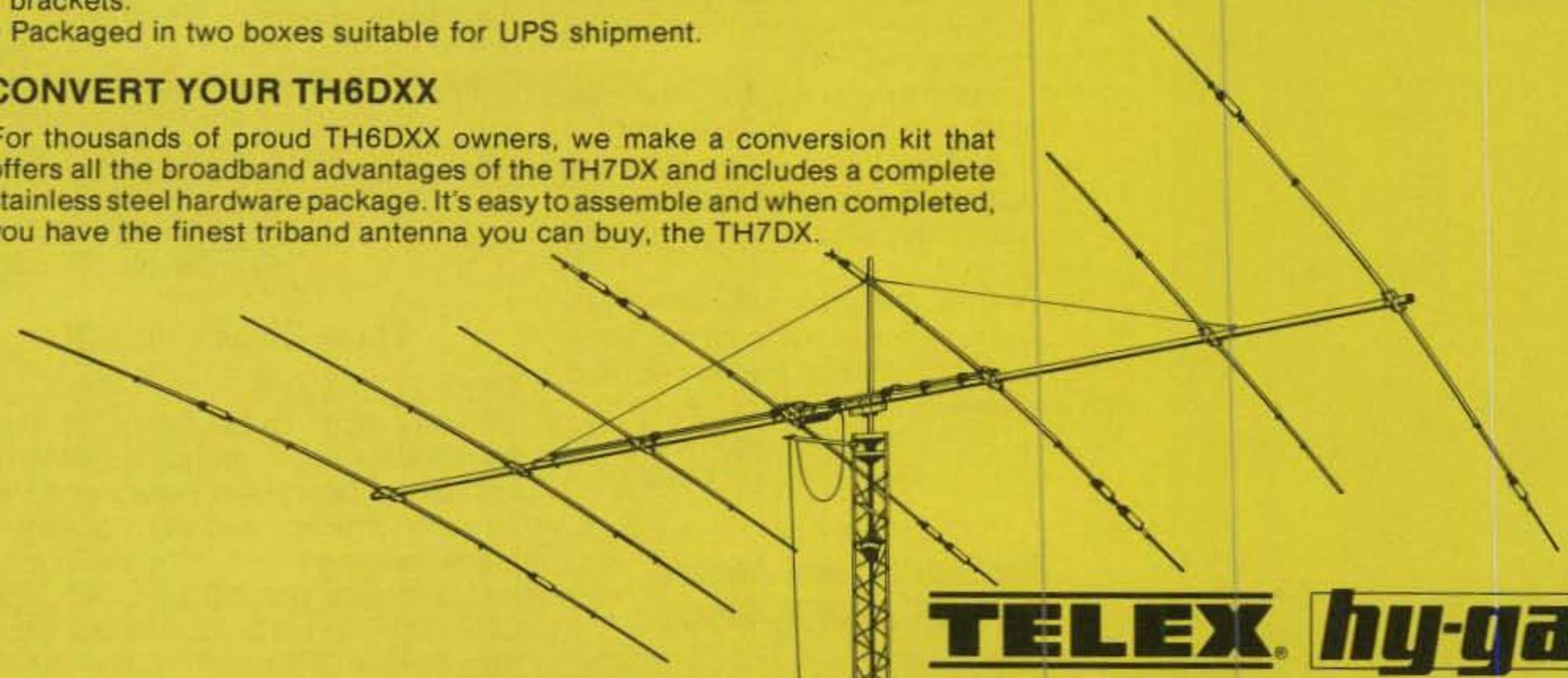

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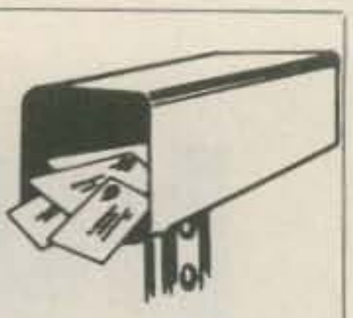

What Happened To Using Dummy Loads?

Editor, *CQ:*

Whatever happened to the practice of using dummy loads when tuning up?! Most of the old timers did so as a matter of course! I guess with the modern rigs it's easier to push the tune button—no matter if you're on a QSO frequency or not.

Being somewhat restricted now to moderate power and unseen antennas, a lot of desirable QSO's are fragile enough to be lost when some "lid" decides to tune up, obviously without listening. It may be old age, but I sure think some horrible thoughts! It would be a timely subject, I'm sure, if some persuasive person would do an article. Dummy loads are not that difficult to build, and certainly not too expensive.

Charles E. Winkley, W1EIF
Plymouth, MA

From an SB-201 User

Editor, *CQ:*

The February issue of *CQ* arrived today, and I have just finished reading John Schultz's most interesting review of the Heath SB-201 and SB-221 linears. As an assembler/owner/user of the SB-201 purchased and assembled in February 1979, I thought you should know that I enjoyed the review and intend to utilize the modification ideas.

My SB-201 has given excellent service and was trouble-free until December 12, 1982, when one 572-B came up with a grid-filament short and R-15 (1.5 ohm quarter watt) opened. (Which occurred first, I do not know.) Anyway, the quoted $30 price for a new 572-B is a bit low. I wound up paying around $50. The new 572-B seems to be compatible with the remaining original, and I hope they get along together for a good long time. Fifty dollar tubes are difficult to fit into the budget.

Believe me, this letter was *not* written to discuss tube price, but to let you know this old ham (75) enjoyed the article. I was first licensed in 1933 as W5DGC.

Donald Hutchins, KB6DQ
Pomona, CA

Amateur Station Aboard the USS John A. Moore

Editor, *CQ:*

The *USS John A. Moore,* one of the Navy's newest guided missile frigates, recently installed an amateur radio station on board to allow crew members phone patch privileges via the MARS frequencies and the 10 through 80 meter bands. The ship is presently operating from Long Beach, California. Pictured are Electronics Technician Second Class Kenneth Klarfield, WA2OXS (top); Lieutenant Keith Roberts, K5LSM, Ship Control Officer (middle); and the ship's commanding officer, Commander Alan Swinger, K9MBQ, positioning a Hustler 5BTV vertical on the ship's superstructure. Gear on board includes a Kenwood TS-530S with the MC-50 mic. The ship is conducting code and theory classes for crew members and expects to have several new amateurs on the air soon. Initial operating time shows that the Pacific Ocean is indeed an excellent ground plane for a vertical antenna, so listen for these hams and others who are serving our country far from their home QTH.

Alan W. Swinger, K9MBQ
Commander, U.S. Navy

Three Cheers for CQ!

Editor, *CQ:*

A very loud "three cheers" to the finest amateur radio magazine on the market. Great product reviews, great construction articles, and even greater columns devoted to the specialized modes and interests of operators. Am 100% QRP here, so really look forward to Adrian Weiss's QRP column (only wish it appeared more often). Once again, "Bravo."

Dick Downey, KA2JIZ
Amsterdam, NY

More kit quality

A triumph of price and performance – Heath's new HW-5400 Synthesized HF SSB Transceiver kit makes high technology affordable. With more versatile, far-reaching capabilities, it puts the original skill and adventure back into Amateur Radio...

HW-5400 Transceiver

control when used with the Split Memory function. The matching HWA-5400-1 Power Supply/ Speaker & Digital Clock (not shown) provides a double-fused source of 13.8 VDC from 120 or 240 VAC.

Heath breaks the price barrier on sophisticated transceivers, offering the highest value for your hamshack dollar. The slim, new HW-5400 is a marvel of kit-form engineering that performs like a dream on 80-10 meters.

MORE ADVANCED IDEAS

Solid state and broadbanded, the HW-5400 incorporates more performance-improving features at a lower price than any comparable transceiver. It's fully synthesized for crystal stability and accuracy. Operating in USB, LSB and CW with automatic sideband selection, it has full break-in (QSK) for proficient keyers, two memories per band, power supply activation at the Transceiver, defeatable amplifier relay, reverse and over voltage protection as well as high VSWR forward power cut-back circuitry for the finals.

A custom microprocessor yields flexible, fingertip control over all phases of T/R operation.

MORE CONVENIENCE

This perfection-packed kit has many benefits. A unique dual-speed tuning system can extract new QSOs or fly through a band in 1 kHz increments with 50 Hz resolution! *Split-Memory Access* lets you review and change the transmit frequency while in receive, without missing a single word or fragment of code. With it, you can beat the QRM every time. Essential vox and sidetone controls are located behind the front panel nameplate. Seven mode and function symbols confirm transceiver status at a glance.

The HW-5400's Frequency Entry Keypad option allows directly-synthesized QSY to any point in the band, and permits fast DX

MORE ENJOYMENT

Novice or active pro, the HW-5400 is perfect for operators who want a Transceiver that's second to none, plus the pride, knowledge and satisfaction that come from building it yourself with our world famous step-by-step manuals. You may find it to be the first microprocessor-controlled rig with enough potential to match the level of professionalism in every radio amateur!

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Also see our state-of-the-art SS-9000 Deluxe HF Synthesized Transceiver (pictured below), which can be controlled by a computer or ASCII terminal.

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IC-740

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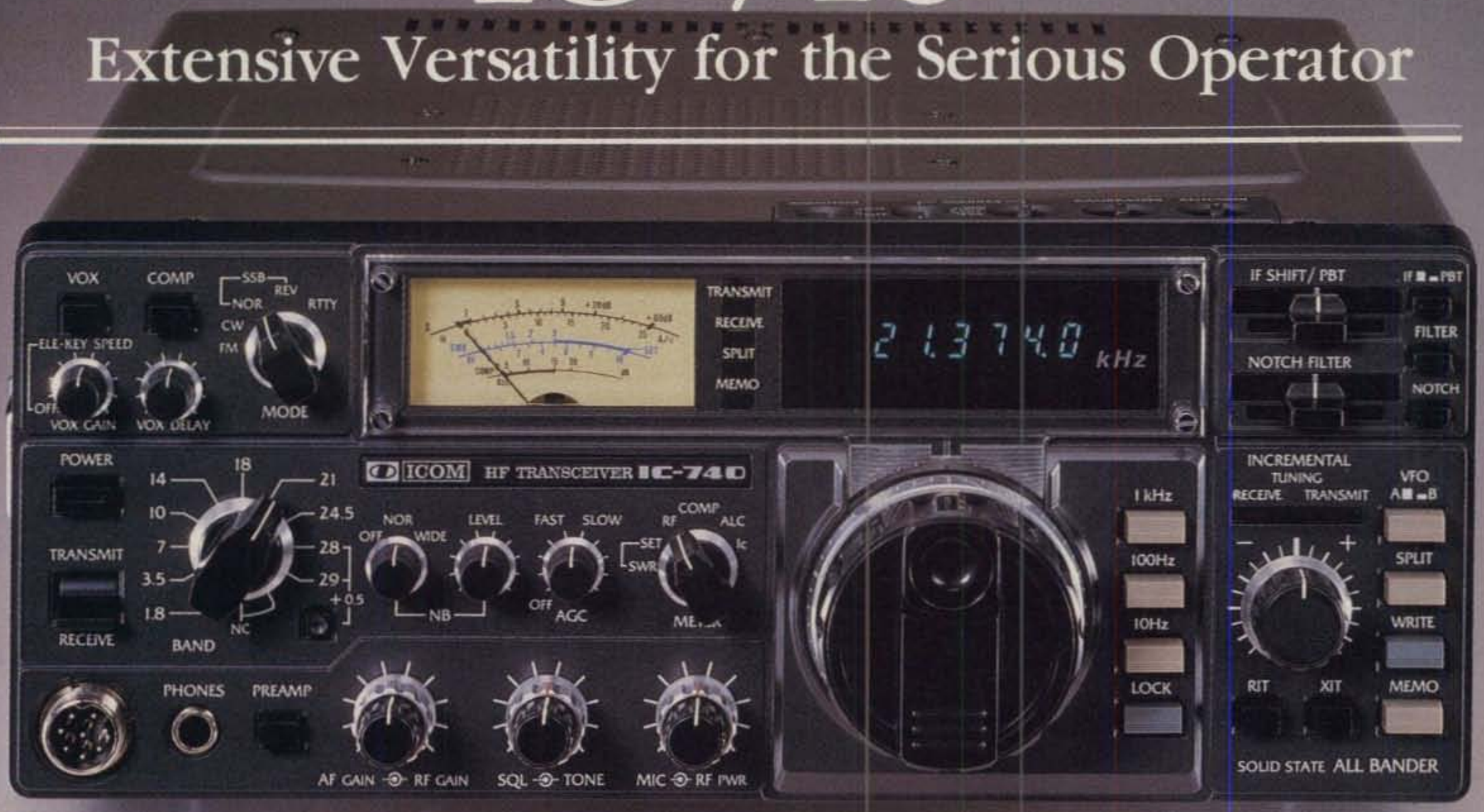

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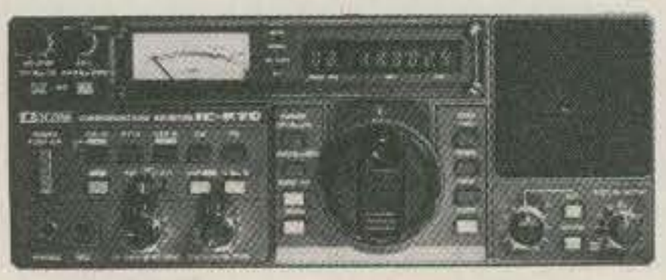

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How do they work? How can I use them? How much do they cost? The answers to these questions are not as difficult or expensive as you may think. One thing is certain: there is an awful lot of stuff in one of those little packages.

A Primer On Liquid Crystal Displays (LCD's)

BY VAUGHN D. MARTIN*

Historically, the liquid crystal state, or phenomenon, was first observed in the late 1800s. It was not until 1934, though, that this phenomenon or orderly molecular alignment and arrangements, which is characteristic of liquid crystals, was put to a practical use. Dye molecules were oriented to make polarizers—the first practical electro-optical use.

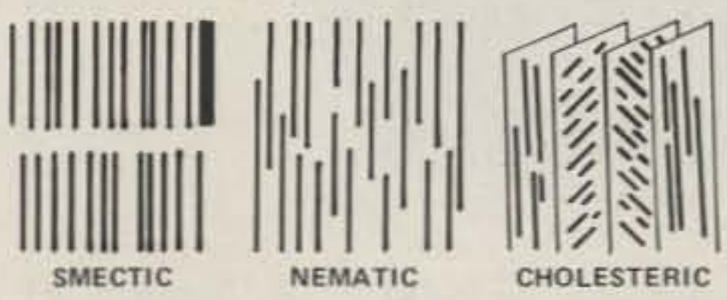

Fig. 1– The three liquid crystal phases.

The Three States of Liquid Crystals

Liquid crystals occur in three states which are also the phases through which they pass after being melted. Fig. 1 illustrates this. The **smectic** phase is characterized by a parallel layered arrangement of molecules. Physically this state resembles a high viscosity turbid fluid, like crankcase oil. The second phase is the **nematic** phase in which the molecules are still oriented in a paralleled axis arrangement, but the fluid is much less viscous. The third phase is the **cholesteric** state, which only occurs in optically active substances. Structurally, it very much resembles the nematic phase, but with a helical or spiral twisting.

LCD Construction

A liquid crystal display (LCD) consists of four basic parts (refer to fig. 2): (1) a glass plate on the front and back; (2) the liquid crystal solution itself; (3) segments actually etched on the glass; and (4) contacts and lead-in connections. The glass plates are typically separated by a mere 0.5 thousandth of an inch, with the inner glass surface having transparent electrodes deposited on it by a proprietary, or "company secret," process. On the other surface is found an electrode which is a continuous ground opposing all segments on the opposite face. Depending upon the type of nematic liquid chosen, a dynamic scattering or field-effect display results when the liquid is subjected to an electric field.

Dynamic Scattering vs Field-Effect LCD's

Both dynamic-scattering and field-effect LCD's use a nematic liquid substance. The field-effect LCD uses this liquid crystal substance sandwiched between two polarizers that are placed at right angles to one another. These layers

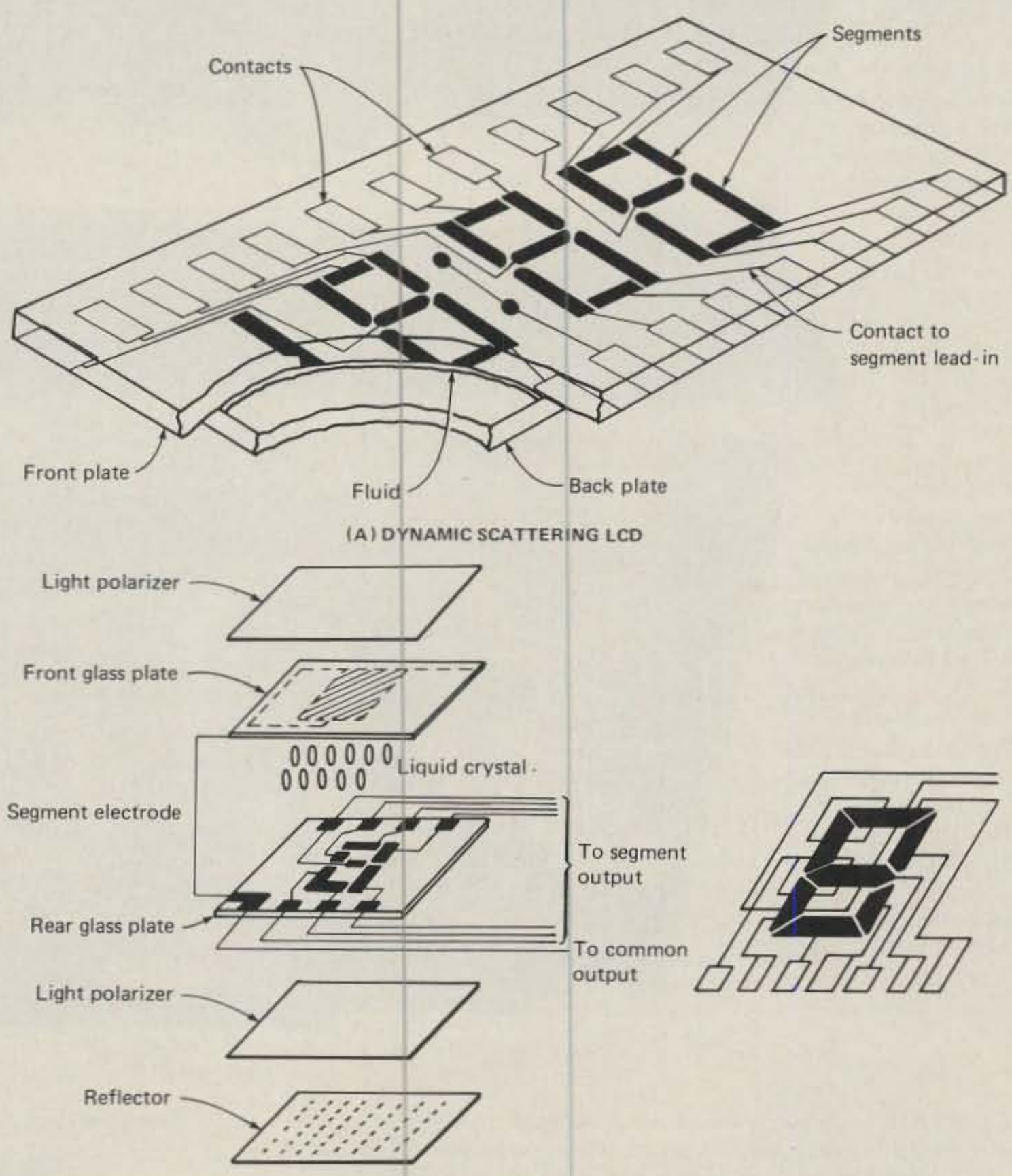

Fig. 2– Construction of a liquid crystal display.

*114 Lost Meadows, Cibolo, TX 78108

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MESSAGE PROCESSOR TERMINAL

MPT3100

Message processing is now available for radio communications systems. The MPT3100 is a complete up-date of the popular HAL DS3100 RTTY terminal, adding the ability to store RTTY messages, edit them, and retransmit them singly or in preset groups. ALL of the previous features of the DS3100 and MSO3100 are retained and new mailbox commands are included. The editor may be used with any file that is stored. The MPT3100 includes ASR (Auto Send-Receive), MSO (Message Storage Option - "mailbox"), and TRO (Traffic Relay Option) modes. The MPT3100 is a new software package that works in ANY DS3100 with MSO3100 circuit board. Some of the features of the MPT3100 are:

NEW FEATURES OF MPT3100:

- Automatic storage of all received text in files separated by the standard "NNNN" terminator (TRO-REC mode)
- Full editing capability of all files stored by mailbox (MSO) or by TRO storage
- Editor allows insertion or deletion of text in any part of a stored message - 15 keyboard edit commands
- Editor may be used even while receiving, transmitting, or storing messages - even when MSO mailbox is in use
- Files may be renamed, created in the editor, cut into smaller files, and deleted with keyboard commands
- Message files may be transmitted singly or in batches
- Transmitted messages may be serial-numbered automatically
- The full format requirements for NAV MAR COR MARS NTP-8(A) are supported
- New TRO commands include: RXON, RXOFF, DIR, SEND, STOP, RESUME, RESTART, EDIT, CUT, CREATE, QUIT, RENAME, DELETE
- On-screen status indicators show: TRO mode; bytes of memory remaining; file names being recorded, transmitted, and edited
- MSO mailbox .SDIR directory command revised to shorten time required for transmission
- New .DIR [filematch] and .SDIR [filematch] mailbox commands give listing of only file names that include [filematch]
- Programmable "header ID" for each mailbox transmission

MSO Mailbox Features:

- Programmable MSO call-up command
- Mailbox may be controlled by external station to store message files, read files, delete files, and list the file directory
- DS3100 operator may perform all MSO operations on the keyboard without transmitting
- Mailbox transmissions include user-prompting and automatic CW and RTTY indentification
- HELP messages are provided to assist the new user in operation of the mailbox
- All mailbox messages stored may also be edited, renamed, and transmitted using TRO commands
- MSO commands are: .DELETE, .DIR, .DIR [filematch], .ENDFILE, .FILEHELP, .HELP, .KY1ON/OFF, .KY2ON/OFF, .PRINTON/OFF, .QBF, .READ, .RYS, .SDIR, .SDIR [filematch], .WRITE

DS3100ASR Terminal Features:

- Send and receive ASCII, Baudot, Morse codes
- ASCII or Baudot at 45, 50, 57, 74, 100, 110, 134, 150, 300, 600, 1200, 2400, 4800, and 9600 baud; full or half duplex
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- Full length 72 character line / 24 line screen display.
- 50 line pre-type on-screen transmit buffer
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- MSO 3100 adds 32K bytes of additional storage
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WHEN OUR CUSTOMERS TALK, WE LISTEN – and we have been listening. Rather than making a proven product obsolete – a product that is well known and respected for its reliability and capabilities – HAL has completely rewritten the software of the DS3100 to offer the features that our communications customers have been asking for. A full year in the preparation, these are features that could only be designed by people who know and operate RTTY. Best of all, ANY DS3100 can be modified at the factory to include the MPT3100! In marked comparison to other radio equipment that is made obsolete by new models every 6 to 12 months, the DS3100 lives on – a full 4 years after its announcement.

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Manufacturer	Part Number	Functional Description
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AMI	S1408	3½ Digit, Crystal-Controlled Clock Divider/LCD Driver
AMI	S1420	3½ Digit, Crystal-Controlled, 5 Function Clock Divider/LCD Driver
Intel	5801/5202	3½ Digit, Crystal-Controlled, 3 Function Clock Divider/LCD Driver
Solid State Scientific	SCL5437/5442	3½ Digit, Crystal-Controlled, 4 Function Clock Divider/LCD Driver
Exetron (Fairchild)	FWA6003	3½ Digit, Crystal-Controlled, 5 Function Clock Divider/LCD Driver
Nortec	NEC5016/NEC5015	3½ Digit, Crystal-Controlled, Watch/Clock
National	MM5840	3½ Digit, Crystal-Controlled Clock Divider/LCD Driver
National	MM5887	3½ Digit, Crystal-Controlled, 5 Function Clock Divider/LCD Driver
National	MM5888	3½ Digit, Crystal-Controlled, 5 Function Clock Divider/LCD Driver
National	MM5847/MM5857	3½ Digit, Crystal-Controlled Clock Divider/LCD Driver
National	MM5848/MM5858	3½ Digit, Crystal-Controlled Clock Divider/LCD Driver
National	MM5849	3½ Digit, Crystal-Controlled, 3 Function Clock Divider/LCD Driver
RCA	CD22003/CD22003R	3½ Digit, 5 Function Clock Divider/LCD Driver
RCA	CD22008V1H	6 Digit, 2 Flag Clock Divider/LCD Driver
RCA	CD22018H	5½ Digit, 7 Day Flags & 4¼ Min. Flags, Clock Divider/LCD Driver
Intersil	1424	3½ Digit, 5 Function LCD Clock
Intersil	7210	4 Digit Alpha-Numeric 6 Function LCD Clock
Intersil	7221	4 Digit, 6 Function LCD Clock with Alarm
National	MM5850	3½ Digit, Crystal-Controlled, 3 Function Clock Divider/LCD Driver
AMI	S1427A	3½ Digit, Crystal-Controlled, 5 Function Clock Divider/LCD Driver
Solid State Scientific	SCL5437/SCL5441	3½ Digit, Crystal-Controlled Clock Divider/LCD Driver
Micro-Power Systems	MPS7110	3½ Digit, Crystal-Controlled Alarm Clock Divider/LCD Driver
National	MM5377	3½ Digit, Crystal-Controlled Clock Divider/LCD Driver
AMI	S1856	4 Digit, Crystal-Controlled Clock/ Elapsed Time Divider/LCD Driver
LSI Computer Systems	C1200	3½ Digit, P-Channel MOS, Crystal-Controlled DS Clock Divider/LCD Driver
Micro-Power Systems	MPS7125	5½ Digit, Clock, LCD Driver (Accepts 64 Hz Time Base)
Micro-Power Systems	LP7146	3½ Digit, Clock, LCD Driver (Accepts 64 Hz Time Base)
National	MM5847/MM5855	3½ Digit, Crystal-Controlled Clock Divider/LCD Driver
National	MM5316	3½ Digit, Line-Controlled Alarm Clock Divider/LCD Driver
National	MM5319	3½ Digit, Line-Controlled Alarm Clock Divider/LCD Driver
AMI	S1998	3½ Digit, P-Channel MOS, Line-Controlled Alarm Clock Divider/ LCD Driver
Intel	5801/5202	3½ Digit, Crystal-Controlled, 3 Function Clock Divider/LCD Driver
Fairchild	FWX6107/ FWX6107R	3½ Digit & 4 Digit Clock/ LCD Driver
Fairchild	6111/6113	6 Digit LCD Clock
Fairchild	6115	5½ Digit, 7 Function LCD Clock

Table II– Frequency Dividers and Decoder/Drivers for LCD watches.

of molecules are stacked in a helical fashion resembling a spiral staircase. The light passing through this spiral goes through the rear polarizer and is reflected by a mirror. When voltage is applied, the molecules rotate 90 degrees so that they are perpendicular to the front polarizer. Light that passes through is not rotated but is rather absorbed by the rear polarizer, producing the effect of a dark character or numeral contrasting with its light surroundings. The contrast can be reversed, yielding a dark background with light numerals.

When not undergoing any effect of a field, the dynamic-scattering LCD appears transparent because the long, cigar-shaped molecules are all lined up in a perpendicular fashion as illustrated in fig. 1. The application of an electric field, though, causes ion migration, which in turn causes the film to scatter incident light. As will be discussed shortly, the driving of LCD displays requires a d.c. offset, probably no more than 25 to 50 mV. If this d.c. offset is much larger than this, the life of the display will be greatly shortened because of the tendency of the ions to migrate right into the glass. The visual effect is that of frosted glass, and LCD's can be made to be completely transmissive for back-light applications, reflective for ambient light, or a combination semi-reflective LCD can be produced for a dual mode of operation. The reflective-type LCD suffers from being not visible in poor or limited lighting conditions. The transmissive LCD, with its back-lighting effect, and the semi-reflective LCD, though, have solved this problem.

LCD Limited Operating Temperature Ranges and Heater Strips

The limited temperature range of the displays—typically 0 °C to 55 °C (32 °F to 131 °F)—is a problem. Remember, the liquid crystal material is composed of a highly viscous material, and this in turn contributes to another problem: slow decay time or display turn off with 100 milliseconds being typical. Think of it as starting a car with very thick engine oil on a cold winter's day. However, there is a solution to this problem. In keeping with our automobile engine analogy, I have heard of wrapping warm engines in thermal blankets or having electric engine-block warmers. Well, the LCD has a thin film that is sticky-backed on one side to attach to its back side. This film is impregnated with wires with resistance, and when a current is passed through them, heat is given off, enabling the LCD to operate in much colder environments. As a rule of thumb, for every 5 square inches of LCD area, a 1 watt heater can be used. Any greater heating might cause the heated side of the LCD to heat so much more rapidly than the viewing side of the display that this non-uniform heating effect might cause the display to bow or buckle with possible subsequent glass breakage or leakage of the LCD's very liquid substance.

LCD Advantages

The advantages of LCD's are mainly the following three. First, power consumption is incredibly small—typically 0.021 μW with all segments activated on a typical watch-size display. Even on the much larger 4-digit Beckman LCD, which we shall discuss shortly, the power consumption is a scant 2.5 μW. Transmissive-type LCD's, though, naturally require additional power for the light source. Secondly, displays using LCD technology are very flexible, with the artwork being the only variable in an otherwise standardized process. Tooling charges for special displays are therefore a minimum, which opens avenues for products of a specialized limited-volume appeal. Lastly, the contrast ratio, or how well the characters show up against their background, is excellent with LCD's. Transmissive-type LCD's have contrast ratios primarily as a function of the voltage applied to the display. The reflective-type LCD's have contrast ratios directly related to ambient or outside lighting conditions.

Cost

The cost of LCD's is much cheaper than that of LED's or other displays. The only problem is driving the displays, which can become quite another economic consideration. Table I lists commonly available LCD decoder/drivers.

Driving LCD's

LCD's require a symmetrical squarewave with less than 50 mV d.c. offset as was discussed previously. The use of an exclusive-OR gate as shown in fig. 3 accomplishes this very nicely. Fig. 4 illustrates the driving/decoding technique for non-multiplexed BCD information. Note the use of 4055 and 4056 driver IC's. The 4055 and 4056 are CMOS devices which provide level shifting on the chip. The 4055 has "display frequency" output, while the 4056 has a strobed latch function. What that means is just this: The 4055's LCD 7-segment outputs are controlled by the DF (display frequency) input, which causes the selected segment outputs to be low, high, or a squarewave output. When the DF input is low, the output segments will be high when selected by the BCD inputs. When DF is high, the output segments will be low when selected by the BCD inputs. The 4056 or MC14543 as well as the 4-segment driver, the 4054, have data transferred from input to output by having a high on the strobe input. The 4056 provides parallel BCD input with internal latches to yield a demultiplexing capability. A 32 Hz to 100 Hz input can be derived from a 4047 CMOS monostable/astable multivibrator chip or by a Wein bridge oscillator as I did in the March 1982 *CQ* article on the 3½-digit DVM. Fig. 5 shows decoding multiplexed data to an LCD. Table II lists manufacturers and part numbers for fre-

CMOS Component Packages Containing LCD Segment Drivers

Manufacturer	Part Number	Functional Description
RCA	CD4030	Quad "Exclusive-OR" Segment Driver
Motorola	MC14507	Quad "Exclusive-OR" Segment Driver
National	CD4030	Quad "Exclusive-OR" Segment Driver
Solid State Scientific	SCL4030	Quad "Exclusive-OR" Segment Driver
Fairchild	F34030	Quad "Exclusive-OR" Segment Driver
Harris	HD4030	Quad "Exclusive-OR" Segment Driver
Motorola	MC14585	Quad "Exclusive-OR" Segment Driver
RCA	CD4070	Quad "Exclusive-OR" Segment Driver
National	MM74CB86	Quad "Exclusive-OR" Segment Driver
National	CD4070	Quad "Exclusive-OR" Segment Driver
Fairchild	F34070	Quad "Exclusive-OR" Segment Driver
RCA	CD4054	Quad Latch/Level/Shift/LCD Driver
AMI	S1907A	3½ Digit Counter/LCD Driver
RCA	CD4055	BCD-to-7-Segment Decoder/Level/Shift/ LCD Driver
RCA	CD4056	BCD-to-7-Segment Decoder/Latch/Level Shift/LCD Driver
Motorola	MC14543	BCD-to-7-Segment Decoder/Latch/LCD Driver
National	CD4543	BCD-to-7-Segment Decoder/Latch/LCD Driver
Intersil	7106	3½ Digit, Digital Panel Meter Driver
Siliconix	DF411	3½ Digit, Decoder Driver
Intersil	7211	4 Digit, Decoder Driver
Intersil	7224	4½ Digit Counter/Decoder Driver
LSI Computer Systems	LS7100	BCD-to-7-Segment Latch/Decoder Driver
LSI Computer Systems	LS7110	Binary Addressable Latched 8-Channel MUX/DEMUX/Driver
Hughes	HLCD0437	4 Digit BCD-to-7-Segment Decoder/LCD Driver
Hughes	HLCD0438	4½ Digit Serial Input Decoder/Latch/ LCD Driver

Table I– Commonly available Decoder/Driver LCD IC's.

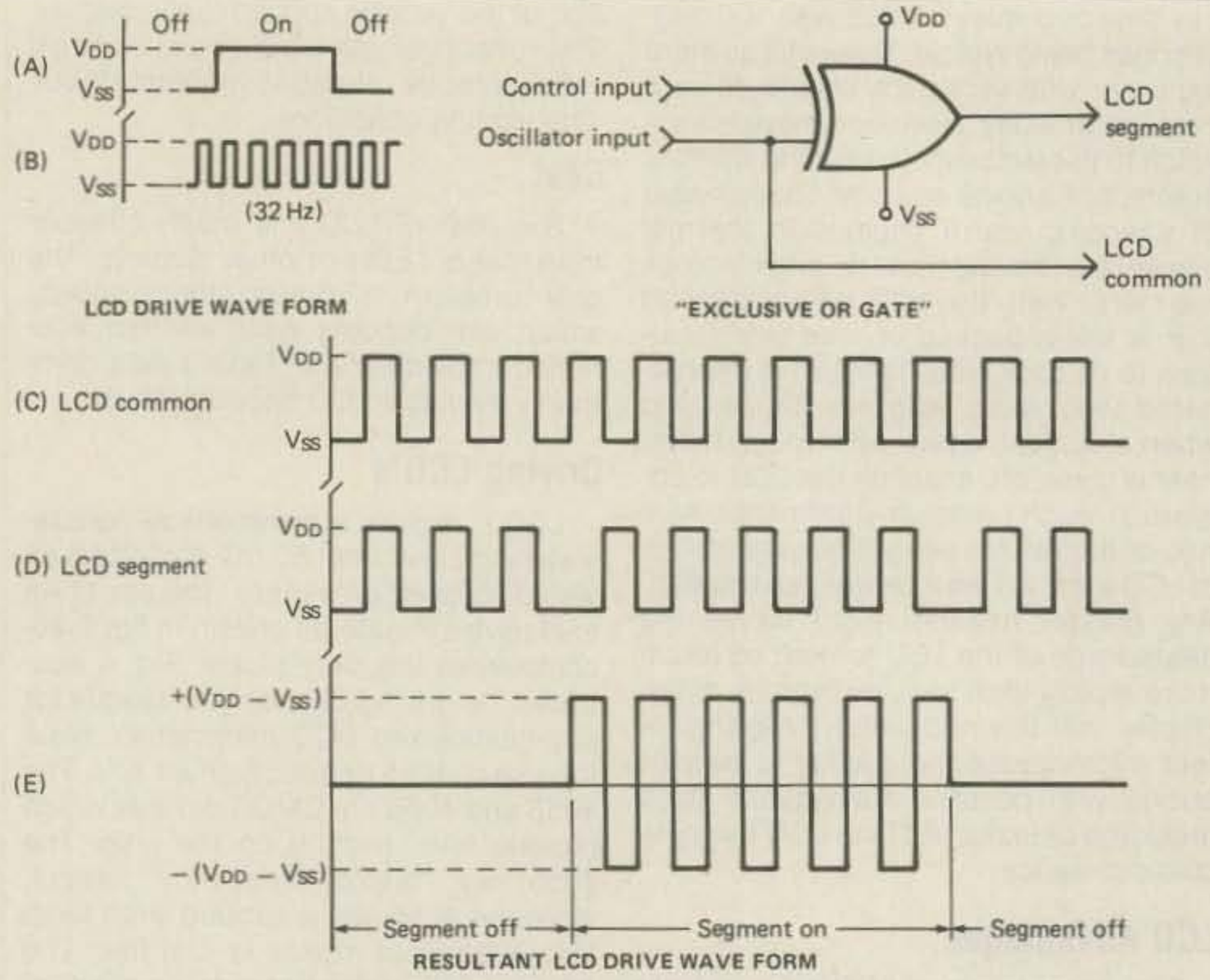


Fig. 3– Driving LCD's with an X-OR gate.

quency dividers and decoder/drivers for LCD watches.

A Comparison of Display Technologies

There are four types of displays that I feel are rapidly losing ground to LCD's. These are the LED, incandescent, fluorescent, and gas-discharge type displays.

LED displays are being displaced because of their poor visibility in high ambient lighting conditions and their excessive power drain, which is true of any display technology compared against LCD's.

The incandescent display is the oldest type display technology and works on the principle of heating a filament in a vacuum until it glows and gives off light. Unfortunately, the power consumed is on the order of 1 watt per display, plus breakage is a problem, resulting from the fact that the display is in a vacuum.

Fluorescent displays present a more promising outlook because they are made of seven anodes, each coated with a phosphor and a filament. The anodes are configured in the familiar style of an "8," with the filament being placed between the viewer and the anodes. Fluorescent displays are MOS compatible and therefore can operate in the 15 to 25 volt range. Power dissipation is a low – 200 μW typical. There are three disadvantages inherent in this technology: damage to the display from shock, a limited life of 20,000 hours, and a required continuous "stand-by" power drain to the filament.

The last display technology considered is the gas-discharge or "Nixie"™ (a registered trademark of the Burroughs Corporation) tube devices. This display technology operates on the principle of gas breakdown, which generally occurs at 170 to 200 volts. The displays draw a small amount of power, usually 0.5 mA per digit, and have a typical operational life of a whopping 150,000 hours. Their major disadvantage is that they cannot be driven directly from logic circuitry. Some interface like a d.c.-to-d.c. converter is required between normal logic level control signals and the display proper.

LCD Innovations

Recent innovations include the display of colors: namely red, blue, and green. There are a number of companies producing LCD's. However, there is a particular LCD company called AND which produces an LCD whose part number is FE0405. This LCD is configured as two horizontal rows adjacent to one another with 32 segments per row, for a total of 64 segments. This choice of three different colors and even rows of two different colors yields many possible new bar graph function indicating applications not previously capable of being implemented. These LCD's are still relatively expensive in single quantities, but their price should come down as in all new technologies.

Another breakthrough in LCD's is the intelligent alphanumeric display. There are numerous companies, such as Crystaloid, Epson of America, and Kylex to name but a few, that produce displays with the electronics built in, usually placed at the display's rear. As an example, Crystaloid's intelligent LCD has a 64-character ASCII generator, a 32 × 8 RAM for character position and display refresh, and a RAM power-down mode which permits the user to retain the contents of the refresh RAM. This display can easily be interfaced to an 8-bit microprocessor through an 8-bit bidirectional port. The controller electronics provides rotate left or right, shifting of characters and increment cursor, and self-test modes.

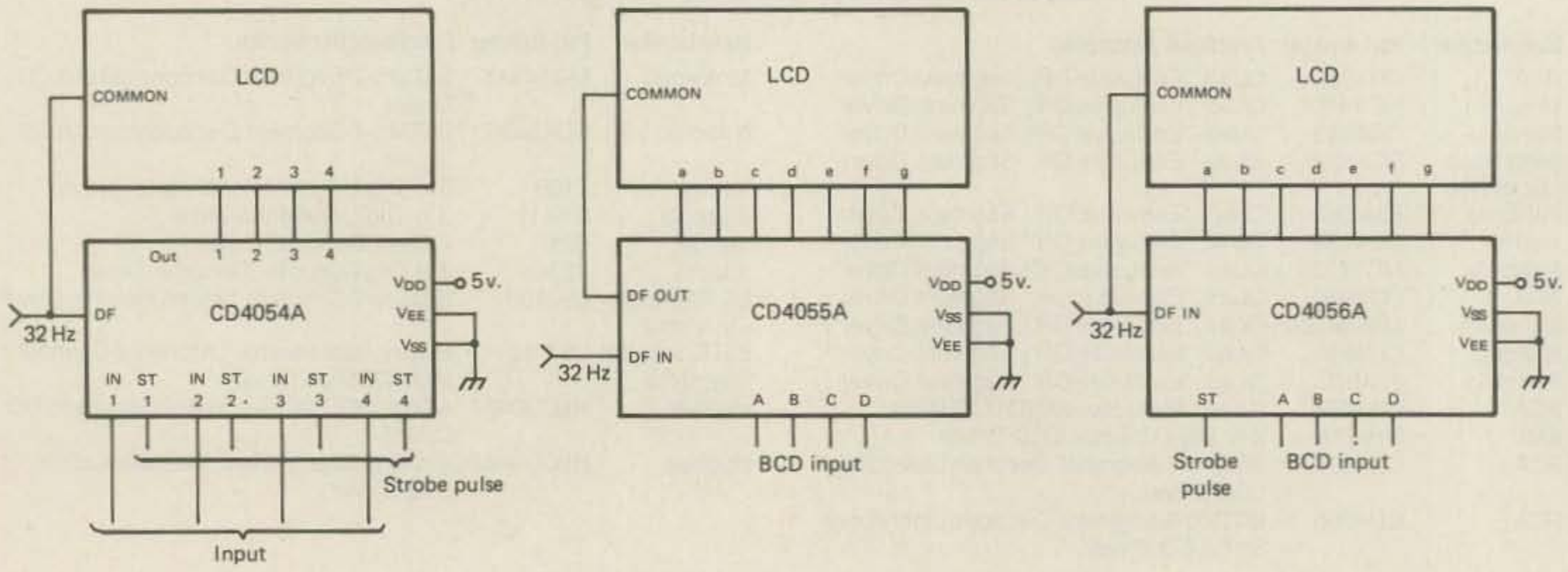
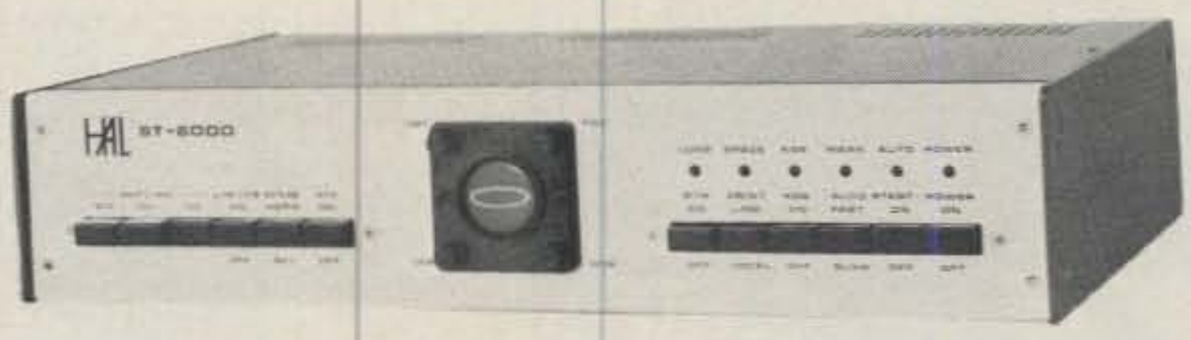


Fig. 4– Driving/Decoding LCD's with non-multiplexed BCD information.

DS3100ASR



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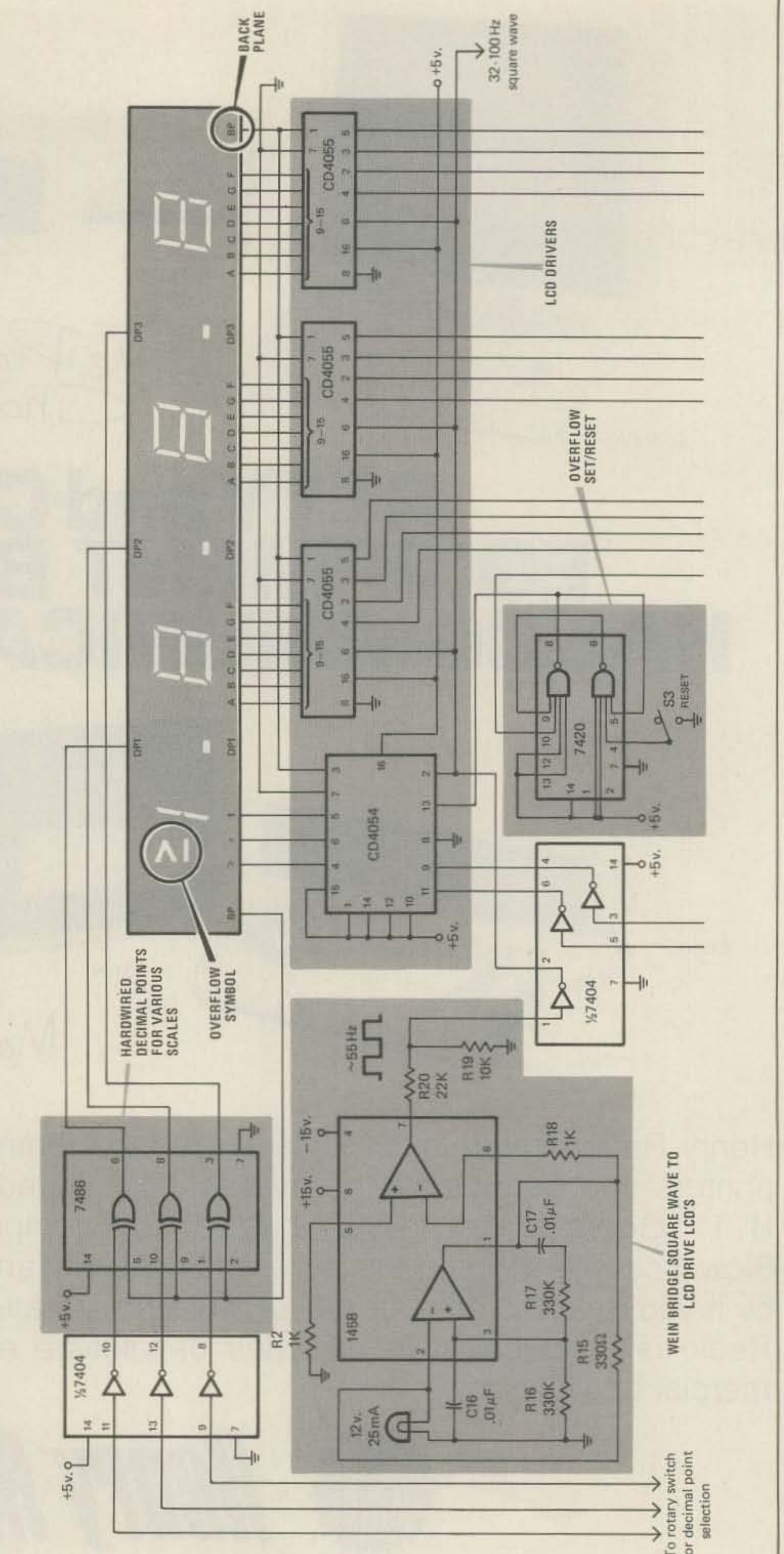

Fig. 5– Driving/Decoding LCD's with multiplexed BCD information.

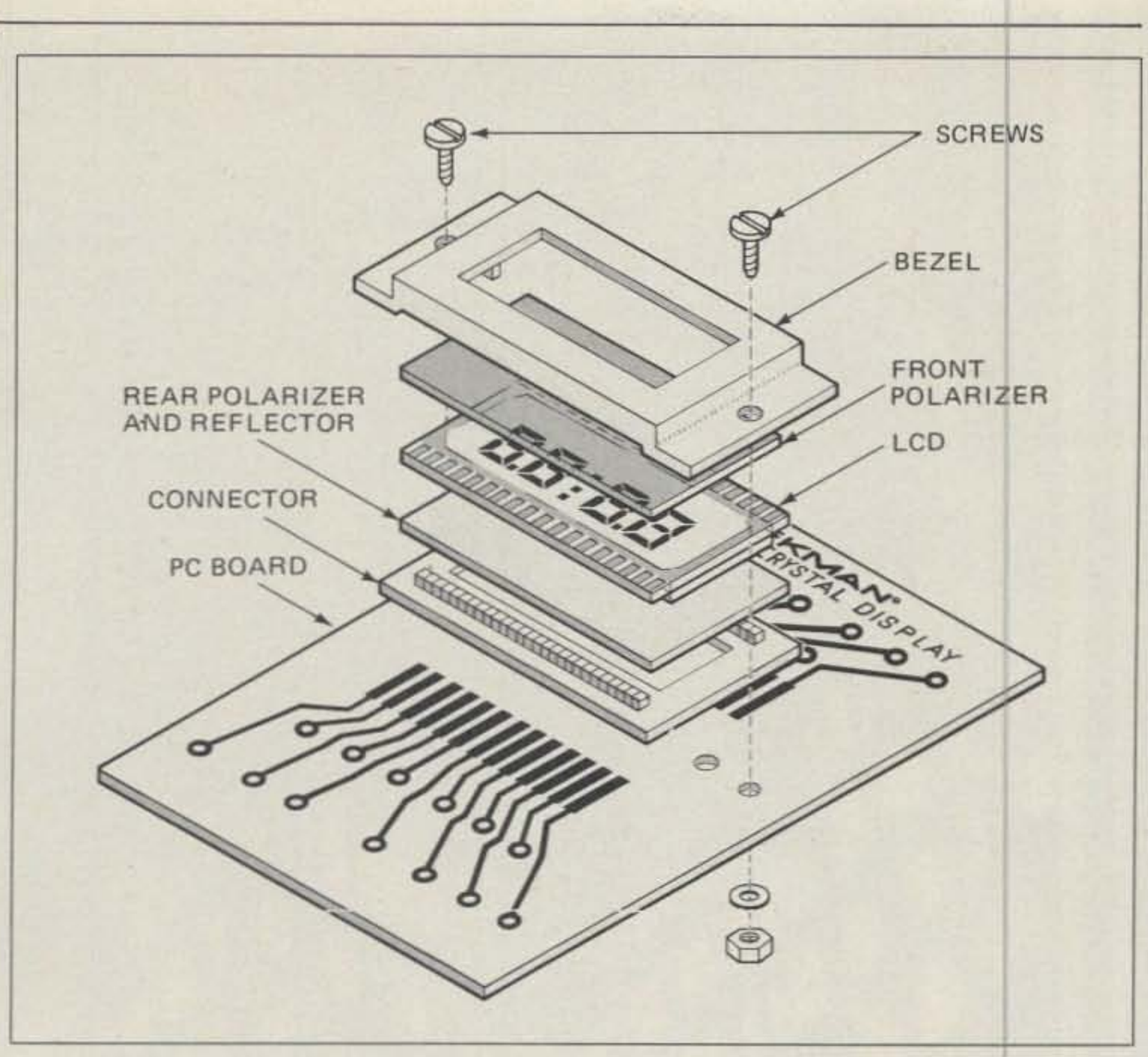

Fig. 6– Beckman's 750-2 LCD Designer's kit.

Gaining Hands-On Experience

In order for LCD manufacturers to sell their product, the technical sector of the public must not only be made aware of their products, but they must also understand how to use them. What better way to learn something of a technical nature than by actually gaining experience through experimentation to determine the devices' peculiarities or operating characteristics. This desire to gain practical experience is probably even greater now that you have acquired a good working knowledge of these devices.

Beckman Instruments, a leading LCD manufacturer, has done just this. They have come out with their 750-2 LCD Designer's kit. This handy kit contains not only an LCD (refer to fig. 6), but also a PC board, connector, mounting hardware, and accompanying elastomers and overlay bezel whereby the display proper may be replaced and/or removed. The connections to the display are not made directly to the display, but rather are made to the considerably more rugged PC board which will accommodate more heat in soldering and other physical abuse. Also if, for example, you desire to try out various LCD drive methods, some of which are typically shown within this very article, then you can do this quite easily. This 750-2 Designer's kit from Beckman is well documented and is available for $11.95 postpaid from Beckman Instruments, Inc., Electro-Products Group, 2500 Harbor Boulevard, Fullerton, California 98413.

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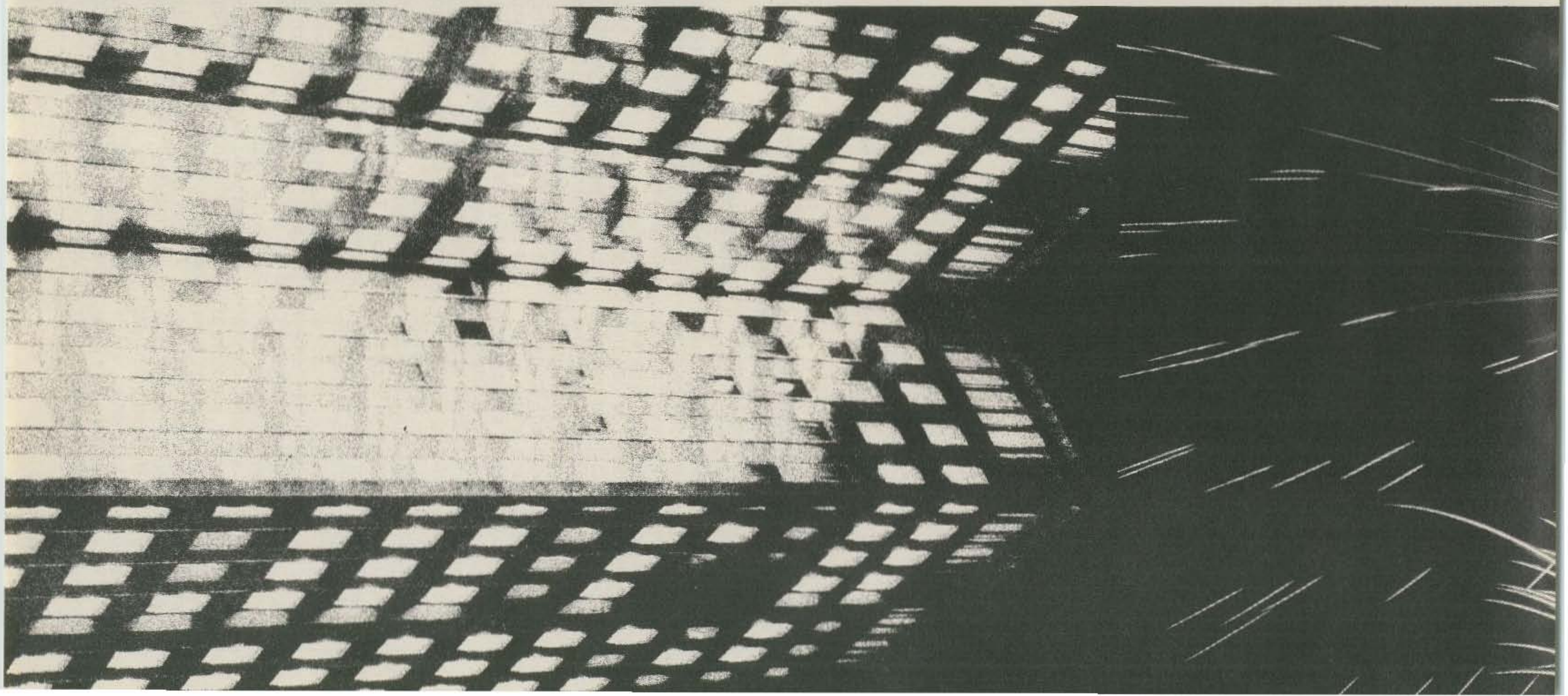
Professor Heisseluft exposes plan of DXers and contestors to create artificial ionosphere at critical geographical locations. World's scientists caught off guard by staggering physiological and biological implications.

All-Night Ionospheric Illumination Through The Use Of Large Reflecting Satellites

BY PROFESSOR EMIL HEISSELUFT*
LAUTON INSTITUTE •GROSSMAUL-AN DER DANAU •AUSTRIA

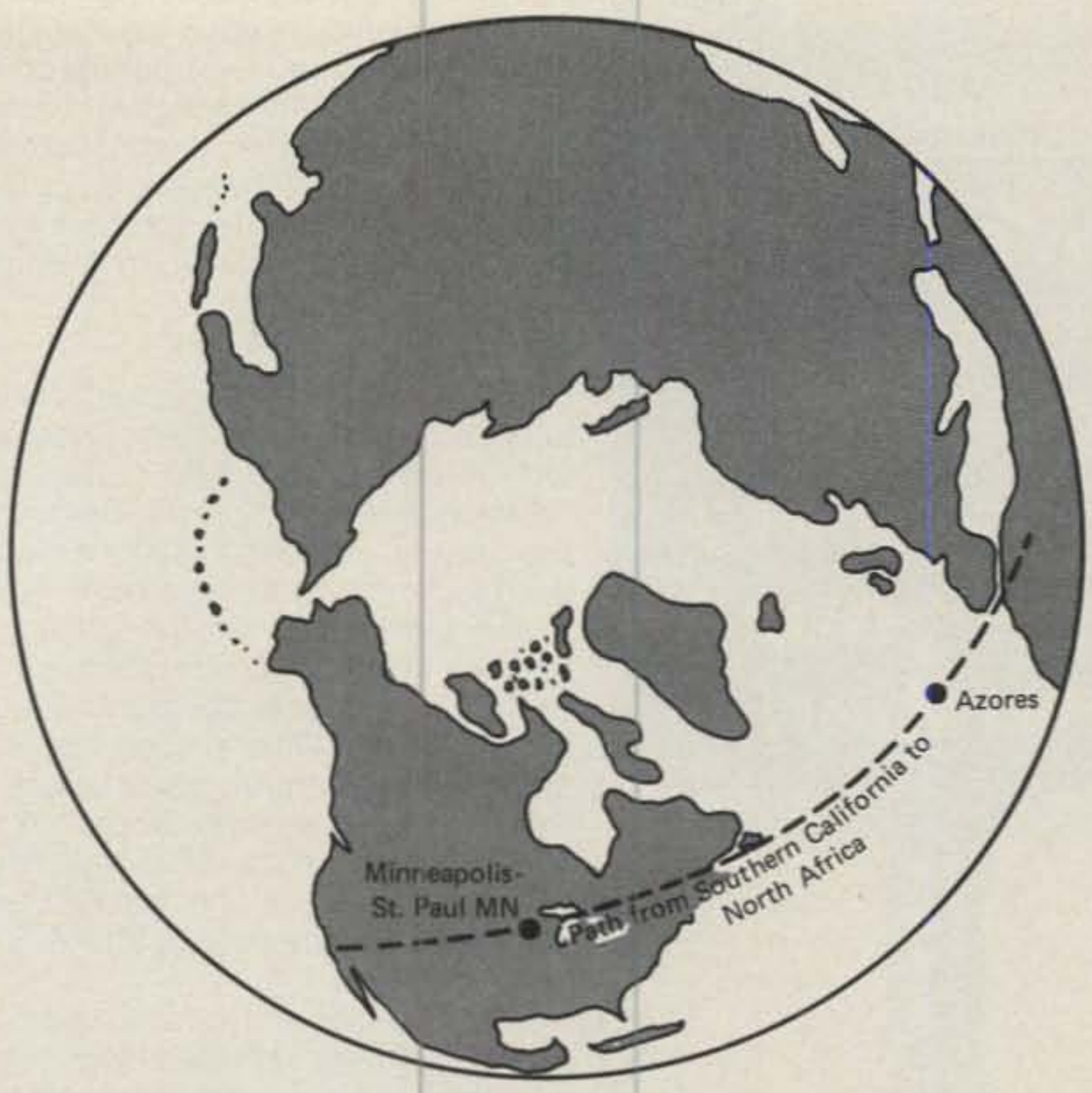


Dear readers, I have uncovered something so staggering in its implications that it portends a major change in the lives of every living thing on the face of the Earth!

In the course of my current investigations on mental aberrations among the U.S. populace, I uncovered a plan developed by a group of fanatical DX and contest clubs to create artificial ionospheric clouds at critical geographical locations around the Earth. These clouds, located at the height of the daytime F2 layer at control points on preferred ionospheric paths, would ensure that continuous h.f. communications could be conducted with operators in selected DX locations regardless of the time of day, time of year, and state of the sunspot cycle.

To accomplish this feat, the consortium of DX and contest clubs involved, together with a private space corporation based in Texas, will launch several large reflecting satellites into orbits around the Earth. These satellites, in turn, will be used to reflect the Sun's light to the targeted area of the atmosphere, and the solar radiation produced by each satellite will create an artificial ionosphere at the point selected.

So fanatical are the proponents of this plan that they have ignored the fact that the solar-reflecting satellites—or space lights—will illuminate several major population regions, *all night, every night!* This is sure to cause significant psychological problems among the peoples affected and to upset the biological clocks of all living organisms in the areas illuminated!



The solar reflecting satellites (●) to be launched by a consortium of West Coast DX and contest clubs will provide all-night illumination to Minneapolis-St. Paul, MN, and to the Azores.

Background

DXers and contesters alike have long lamented the fact that their ability to communicate is inexorably tied to the condition of the ionosphere. Depending on the time of day, time of year, and state of the sunspot cycle, these operators have seen their DXCC standings and contest scores wax and wane, leaving them frustrated, angry, and sometimes even a laughingstock. So desperate have some clubs become to ensure a contact with a new country or a winning contest score that they have set up elaborate repeater links for alerting and cueing, arranged for expedition and contest schedules, and even created tax-exempt organizations to sponsor and fund DX and contest expeditions to the rarer countries of the world.

Still, efforts to boost DXCC totals and contest scores have been continually thwarted by nature. Even during the last CQ World Wide DX Phone Contest, for example, high geomagnetic activity significantly reduced the number of 10 meter openings, and it did so at a time when this band should have been at its prime. And with the current sunspot cycle now headed for a minimum which will occur in early 1988, h.f. conditions are expected to deteriorate continuously over the next five years. At the next solar minimum, in fact, only one half of the currently available h.f. spectrum will be usable for worldwide ionospheric communications (ref. 1).

To say the least, both DXers and contesters are bewildered by the vagaries of the ionosphere and angered by the decline of the sunspot cycle. They anguish over the fact that their large investments in multi-kilowatt transmitters, communication receivers, and directive antennas cannot prevent a country or a contest multiplier from slipping into the noise. "Is there no answer?!" they scream, pounding their operating tables.

Anger and frustration led to cool, dispassionate analyses. And these analyses led to the development of an ambitious plan . . . a plan for ensuring that the ionosphere would be available when needed—*24 hours a day*—for DX chasing and contest activity.

The Plan

The plan I uncovered, developed on the West Coast, would use large reflecting satellites for all-night illumination of the atmosphere at the control points along preferred ionospheric paths. The intensity of the illumination would be only a fraction of natural daylight, but it would be enough to ionize patches of the atmosphere. This, in turn, would elevate the frequencies which could be reflected from these patches and would ensure that nighttime propagation would indeed occur on paths passing through these ionized regions.

Think of it! Paths which formally closed down at night because of reduced ionization levels in the atmosphere would now remain open during the hours of darkness, affording the sponsoring DXers and contesters "pipelines" into areas of interest throughout the hours of darkness!

Previous Work

The idea of using orbiting solar reflectors for illumination, of course, is not new. My old professor, Dr. Jerzy Ostermond-Tor, worked on such a project in 1929 with H. Oberth, the famous German space pioneer (ref. 2). Tor and Oberth's efforts were driven by humanitarian concerns. Specifically, they held the belief that space lights could increase the number of hours of daylight at the higher latitudes, thereby increasing crop yields and reducing world hunger. The technology needed to build and launch such satellites, of course, simply was not available.

Also of interest is the work in the 1960s at several companies of scientists who sought to develop reflectors which could be used in support of nighttime military operations in Southeast Asia. In all cases, the plans put forth were neither economically nor technically feasible.

But times have changed! I have now learned that Canady and Allen of NASA's

---

**The professor is currently under contract to an agency of the U.S. Government to investigate mental aberrations among the populace. Mail may conveniently be sent to the professor c/o CQ Magazine, 76 N. Broadway, Hicksville, NY 11801.*

Langley Research Center believe that reflectors built using new structural components and ultra-thin reflective materials may at last permit the construction of economical space lights (ref. 3). It is the NASA study that forms the basis for the amateur artificial solar illumination plan.

Some Plan Details

The detailed plans for the space lights to be launched by the West Coast amateur consortium are held in the utmost secrecy. However, I have learned that the first two satellites launched will be used to illuminate the two control points in the atmosphere on the great circle path from the West Coast to North Africa. (Note that this path is roughly 6600 km long, and so, 2-hop propagation is required.) The control points along the path—that is, the points where the electron density must be sufficiently high so as to bend the signals back to Earth—are located over Minneapolis-St. Paul, MN, and the Azores.

This portends a tremendous problem for people living in these areas . . .*areas which will now experience all-night illumination.* Not only will there be the potential for problems of a physiological nature, but the danger will always be present that maladjustment of the complex mirror systems aboard the satellites could lead to solar focusing and subsequent vaporization of buildings and vegetation beneath the space lights. You may be astounded to learn, dear readers, that such a thing actually happened during an early, terrestrial test of the space light concept back in 1938. Thousands of buildings were destroyed in a major populated area, with the loss of life still unknown. The whole ghastly affair was covered up, however, by hiding the true purpose of the test behind the broadcast of a radio show entitled "War of the Worlds."

Conclusion

Despite the known dangers and the cost involved, a California-based consortium of DX and contest clubs is plunging ahead with plans to launch the first space-light constellation. These satellites will be used to illuminate critical areas of the ionosphere during the night, thereby assuring that h.f. propagation of preferred paths remains open throughout the hours of darkness. However, the amateurs involved are deliberately ignoring the fact that their satellites will endanger the lives of people living in two major population areas! Alas, the amateurs are bent only on increasing their DX totals and their contest scores. The world as we know it may never be the same again.

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- Voltage Keying	-150VDC @ 50ma Max.
*Mercury Relay	200VDC or 2 amp (20VA Max.) N.O. & N.C.
T/R Change Over	ATR — Relay ± 30V @ 2 amp N.O. & N.C. ACT-1 — Transistor + 12VDC @ 300 ma. GND on XMT
AFSK Tones, Range	Keyboard Programmable 500 Hz to 3000 Hz
AFSK Tones, Level	Mic Compatible 30-50mv Audio
Slow Scan	Mic Compatible Audio. Sync 1200 Hz, Black-1500 Hz, White-2300 Hz

MISCELLANEOUS CONNECTIONS

RS 232	± 12VDC, 330 Ohm Source Impedance, Negative Mark
Printer Driver	ATR — • Hi-speed RS-232 upto 2400 Baud • Slo-speed Baudot & ASCII Floating Relay for Current Loop Switching
	ACT-1 — • Slo-speed Baudot & ASCII Transistor Switch + 40VDC @ 100 ma. • Optional Hi-speed ASCII RS232 @ 2400 Baud.
Tape Recorder	Mike = 100 mv Audio
"Brag Tape"	Speaker = 200 mv Audio
Scope	Horizontal and Vertical Outputs to Scope for RTTY Tuning Aid
Morse Speed Tracking	Automatic or Speed Lock

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VIDEO FORMAT

Normal	24 lines, 40 characters per line
Zoom	12 lines, 20 characters per line
Black on White or White on Black	Keyboard selectable
Display Split Screen	Any location Line 0 (Off) to Line 20, Keyboard selectable
SSTV	3 lines, 6 characters per line + graphics

TEST MESSAGES: Quick Brown Fox and RYRY's in Baudot, U*U* in ASCII, VV in Morse.

SYNC: Transmits "Blank-Fill" in RTTY and BT in Morse when Text Buffer is empty and unit is in transmit. Keyboard command on/off.

UN-SHIFT on Space: Automatically shifts back to "LETTERS" upon receipt or transmission of space. Keyboard command on/off.

REAL-TIME CLOCK: Keyboard set, always on screen display, hours, minutes, seconds. Can also be inserted in transmit text buffer by keyboard command.

WORD WRAP AROUND: Prevents splitting words at the end of a line. Works in receive as well as transmit.

CODE PRACTICE: Random 5 char generator sends at any speed you set via the keyboard. Hand-Key input allows use in code practice oscillator that will also read your sending!

STATUS DISPLAY can be called up to show the condition and control commands for 20 programmable parameters, such as AFSK tone freqs, UNOS, printer, etc. Useful as a "HELP" command in case you misplace the manual. There's also a constant "TOP-LINE" display of Time, Mode, Speed, & Code in use.

DETECTION MODES

Direct	Phase correlation detector with AGC controlled bandpass filter (100 Hz nominal width — 800 Hz center frequency)
Demodulator	Computer program enhanced dual tone demod. Primary tones fixed @ 2125/2295 Hz, Secondary tones variable @ 500 — 3000 Hz.
**Terminal	RS232 compatible half duplex or full duplex up to 9600 Baud

DATA RATES

Morse	5-199 WPM Keyboard selectable in 1 WPM steps. Auto speed tracking or speed on receive
Baudot	All standard 45, 50, 57, 74, 100 Baud (60, 66, 75, 100 and 132 WPM)
ASCII	110 & 300 Baud normal & synclock using internal Modem. ATR adds speeds up to 9600 Baud.
Slow Scan	8 seconds per frame

OUTPUT OPERATING MODES

Symbol	Character ouputs when typed
Word	Words sent after "Space Bar"
Line	Line sent after "Return"
Buffer	Send entire contents of text buffer

TUNING INDICATORS

Audio Ref. Tone	800 Hz Keyed Regenerated
Visual	LED on Mark (Keydown)
Scope	Tuning ellipse for RTTY

PROGRAMMABLE MEMORIES

Here is:	10-40 character messages (400 total) or *10-80 character messages (800 total) battery backed
ID:	15 characters maximum in standard ID and 17 in RTTY ID
WRU:	Up to 15 characters
Selective Call:	ATR — 4 memories, up to 15 characters each. ACT-1 — 2 memories for printer on and printer off

COMPUTER CAPABILITY

Memory	Standard unit has 4000 bytes of RAM for user program. Basic package adds 16K.
Language	Basic or Motorola M6800
Commands	Input; Output; Load; Go with Break Point; or Normal Basic
Tape Interface	Store Programs on Audio Cassette

POWER

115 VAC, 60 Hz 60 VA Max, Act-1, 30 VA Max (230 VAC, 50 Hz optional)
12 volt version available
External input for charging expanded battery backed memory. 6-15VDC @ 10 ma. max.

MECHANICAL

ATR-6800:	
Size	14¾"W x 12¼"D x 4"H
Weight	15 lb.
ACT-1:	
Size	17.8 W x 3H x 9.5D
Weight	7 lb.
ATR-6800 & ACT-1:	
Color	Beige Top, Black Base
Material	AL5052 Aluminum Alloy

*Standard on ATR, Optional on ACT-1
**Standard on ATR, Not available on ACT-1

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CQ Reviews:

The Butternut 2MCV 2 Meter Collinear Antenna

BY JOHN J. SCHULTZ*, W4FA

The Butternut Collinear is actually not new. (The collinear is a newer version of the 2MCV Trombone antenna.) It has been around for a few years, but has not been widely advertised. It deserves more notice than it really has received to date. The dimensions of the antenna are shown in fig. 1. It is, of course, an omnidirectional vertical antenna which achieves some gain in the vertical plane by proper phasing of the sections of the antenna. The antenna structure consists of telescoping aluminum tubing and aluminum rods for the "trombone" section and the ground plane radials. The antenna is gamma matched, which although preset at the factory, can be adjusted by the owner using an s.w.r. meter. It can be fed by any 50 ohm coaxial line and mounted on almost any type of vertical support, although its base section is dimensioned to slide directly over a 1 inch O.D. mast.

The concept behind the antenna was to create a gain-type vertically polarized antenna, but without breaking up the main vertical element with an insulator for the insertion of phasing elements for each ½λ on the main vertical element. Obviously, if the main vertical element could be one continuous structure, there would be all sorts of mechanical design advantages to such an approach. The conventional approach to phasing ½λ sections is shown in fig. 2(A). The ¼λ horizontal phase inverting stubs have to be inserted in the main vertical element as shown so the currents in the ½λ sections remain in phase and enhance radiation. But, insulators are required in the main vertical element.

The Butternut idea (which is patented, by the way) can be visualized as starting out with the configuration shown in fig. 2 (B). The two parallel top sections of the antenna are each ¾λ long and, being in parallel, have the same current distribution. When one section (the smaller diameter "trombone") is folded as in fig. 2(C), the outer ½λ section carries current 180° out of phase with that in the adjacent ½λ section of the main vertical element. The theory is that the out of phase currents in the "trombone" ½λ section and adjacent main vertical element ½λ section will cancel, leaving the upper and lower elements to radiate in phase as shown in fig. 2(D). But, since this would equate to a collinear array of the dipole elements separated by a ½λ between the ends, the gain should be about the same as three co-phased dipoles laid end to end in the same space (about 3 dB).

One could argue a bit about some fine points in the above description (e.g., if cancellation in the middle section is really complete), but the main point is that the design seems to work effectively, at least as far as the Butternut 2 meter antenna is concerned. It also presents an interest-

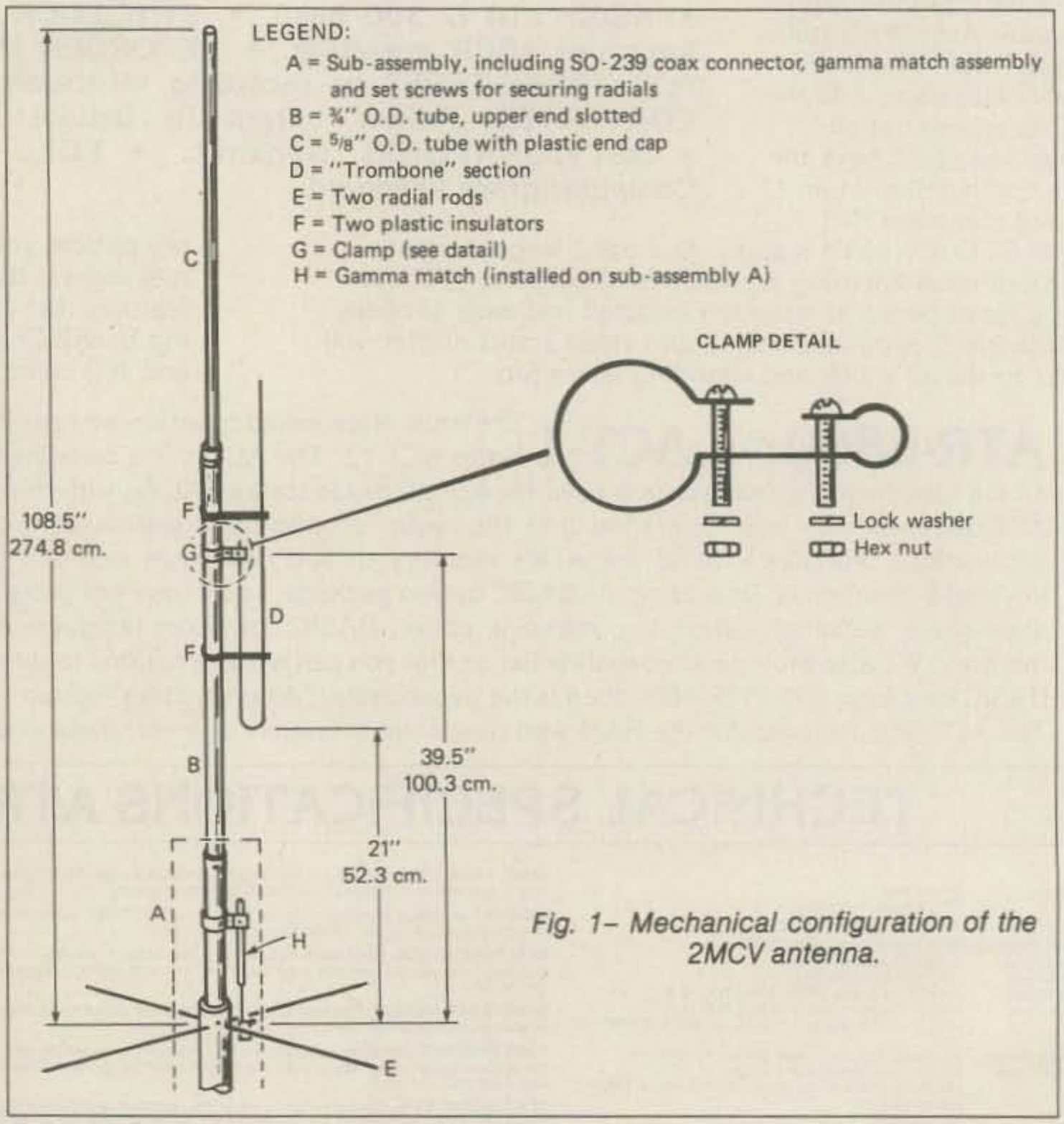

Fig. 1– Mechanical configuration of the 2MCV antenna.

*c/o CQ Magazine

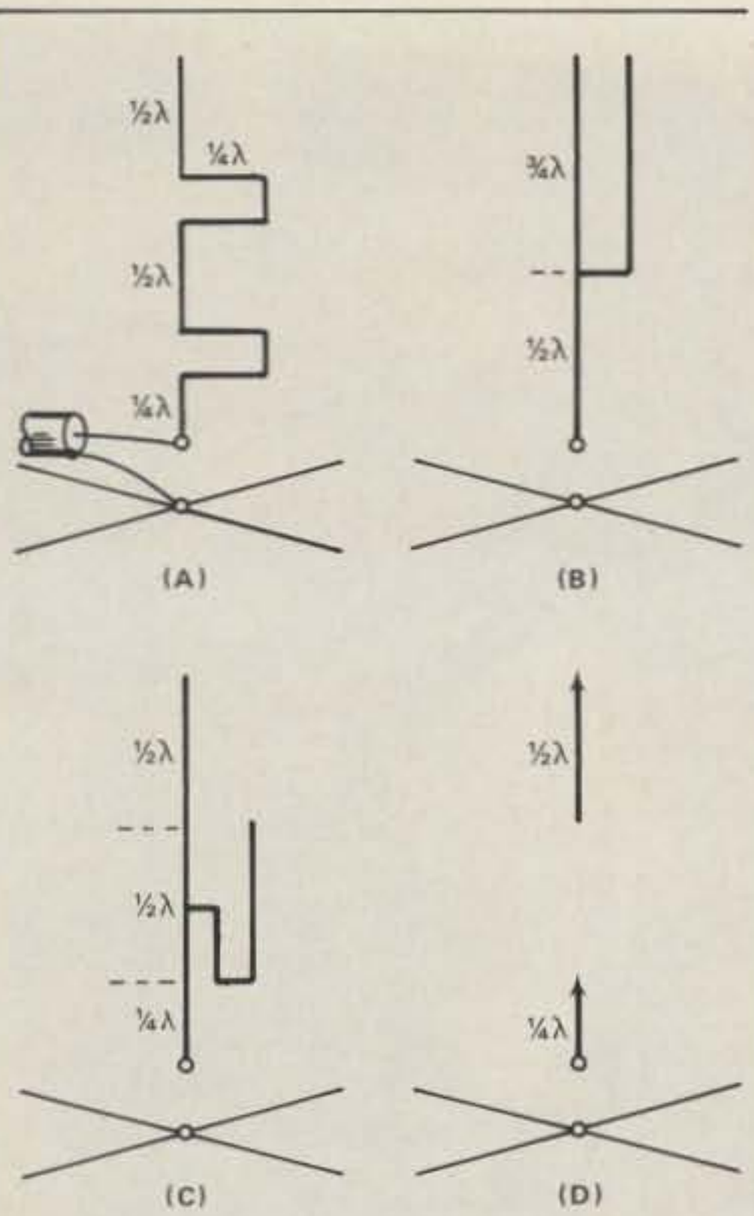

Fig. 2– Evolution of the Trombone antenna design. See text for details.

ing design idea that could possibly be applied to antennas for other bands.

The Trombone used assembled very easily as per the instructions supplied with the antenna. All of the components appeared to be of good quality materials that should stand up to prolonged outdoor usage. The newer collinear version features an adjustable gamma match and all stainless steel hardware.

The means was not available to compare the collinear with a variety of other commercially available antennas. But, the 2MCV was compared to a ground plane and various home-brew gain antennas. In every case, it did a significantly better job of providing access to distant repeaters. So, no conclusion will be offered as to possible gain of the antenna, but the design definitely will provide an upgrade in performance for any amateur who is using a more simple, non-gain omnidirectional vertical antenna.

The antenna gives the impression of being able to withstand rough weather conditions, especially since the main vertical element is not broken by an insulator. The pin side of the SO-239 connector at the base of the antenna is now "potted" to protect against snow or ice buildup. Since it is a low impedance point, it probably doesn't make any real difference. But, before putting the antenna permanently on top of a mast, I would be inclined to put some coaxial connector sealer all around the SO-239 connector.

All in all, on a performance-to-price basis, I would say that the Trombone is definitely a good buy for anyone who wants to upgrade a basic vertical, omnidirectional antenna system.

Here's an idea that'll warm Gus Browning's heart. It's an ecological use for those empty plastic soda bottles.

THE TWO LITER COIL COVER

BY MARC ROFFMAN*, WB2CUZ

This life-suport system is not from M.A.S.H., but is a means of keeping the r.f. coursing through the coil.

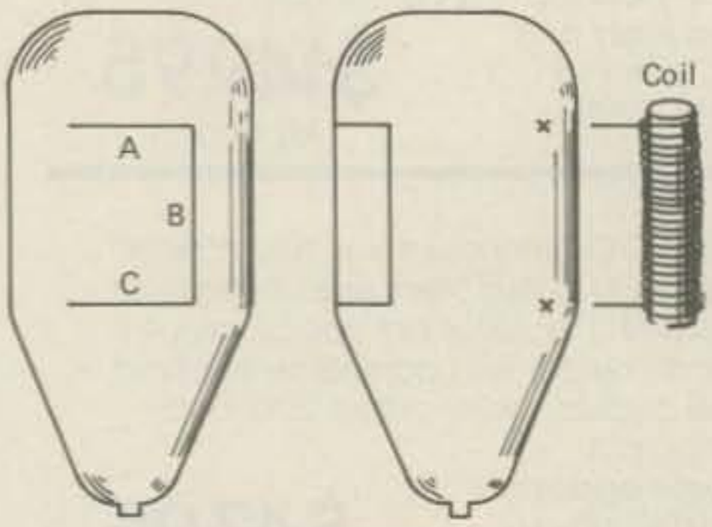

Fig. 1– The door dimensions (A, B, C) are determined by the height of the coil. The two spots marked "X" are for the holes (again determined by the coil height) for the coil leads to pass through.

If you've ever had to change the tap on an antenna coil after a nice winter ice storm, then you know the two tools necessary: a screwdriver and a blowtorch. This project will eliminate the blowtorch.

We will do this by adding a cover in the form of a soda bottle. If ice isn't your problem, it will keep the rain from changing the inductance of the coil. In this case the antenna is a Hy-Gain 18V, 10 through 80 meter vertical which requires that you change the tap any time you want to change the band you will be operating.

To begin, you need an empty 2 liter plastic soda bottle; that's the large economy size. Discard the cap and then remove the black bottom section by slowly prying it off with your fingers.

The next step is to hold the bottle upside down, and using a magic marker, make three lines. This will be a door, so make it the same height and width as your coil. Keep the lines on the flat middle section of the bottle. Now make the first incision with a single-edge razor, and then continue with a scissor. Next straighten the leads of the coil, and holding the coil and the bottle vertically, mark the back of the bottle where the leads will come out; the back of the bottle is opposite the door.

Now for the tricky part. Find a thin nail and hold the head in a pair of pliers while you heat the tip over the stove. After 10 to 15 seconds on the stove, make one hole on the mark, heat it again, and make the second hole. Put the coil inside the bottle and put the leads through the holes. Now put a little silicone bathtub caulk around the base of the leads where they come out of the bottle.

If you need a screwdriver to change taps, heat the end of a long, thin screwdriver and make a hole on the bottom of the bottle just over the half of the coil facing the door so that the same screwdriver can be put through the hole to unscrew the clip.

If you would like a doorknob, make a small hole in the door using the heated nail again. Then put a ½ inch sheetmetal or woodscrew a couple of turns in.

That's about it. Just hook up the coil to the antenna with the bottle upside down and run the tap through the doorway; the wire keeps the door from closing too much (see photo).

So good luck and don't give up on these bottles. I foresee many other uses for them in the future. As a matter of fact, my next article is entitled "101 Things To Do With Those Black Plastic Things." ▣

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SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+ $4), like 941C less balun. **MFJ-945, $79.95** (+ $4), like 941C less antenna switch. **MFJ-944, $79.95** (+ $4), like 945, less SWR/Wattmeter, **MFJ-943, $69.95** (+ $4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER

MFJ-900 **$49.95 (+ $4)**

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient air-wound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $59.95 (+ $4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+ $4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B **$139.95 (+ $4)**

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W. 50-ohm dummy load. SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962 **$229.95 (+ $10)**

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+ $10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV

MFJ-984 **$329.95 (+ $10)**

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $239.95 (+ $10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+ $10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+ $10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V

MFJ-989 **$329.95 (+ $10)**

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf-6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

Built-in lighted 2% meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

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With one WARC band on line, it's time to prepare for the other two. If you're into a little lathe work, W1HXU has an interesting antenna project for you.

The HR-52 Antenna

A 5-Band 2-Element Beam

For 14, 18, 21, 24.5, 28 MHz

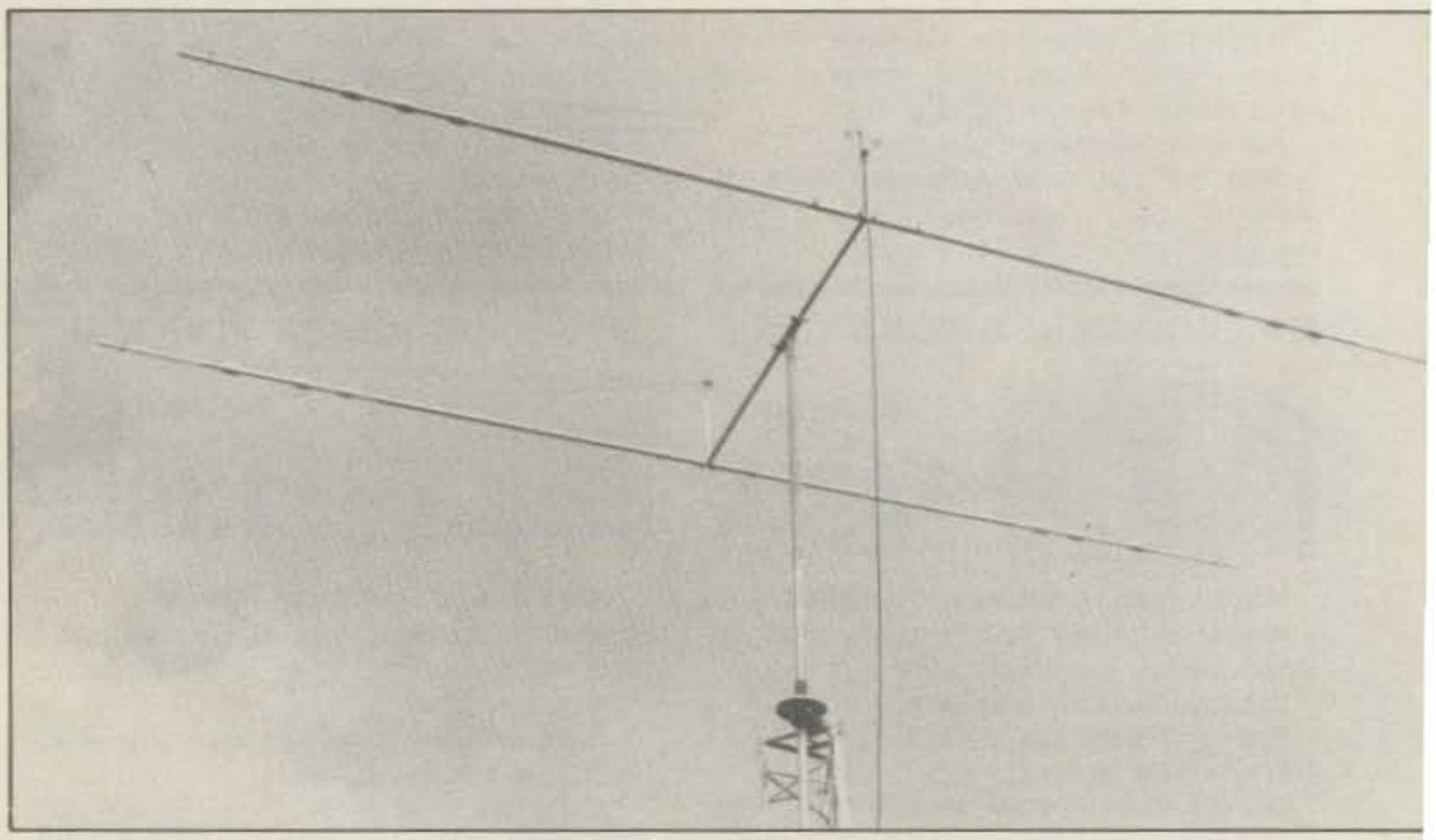
BY JOHN P. TYSKEWICZ*, W1HXU

The new generation of transceivers offers three additional nicely spaced bands. To make proper use of these expectant WARC frequencies will require some new antennas.

For various reasons, most amateur antenna farms have been limited to a triband beam for 10/15/20 meters and a trap or multiple dipole for the lower frequency. Of particular interest are the new 18 and 24.5 MHz bands (when we eventually get them). The logical solution will be to fit them into the tribander frequency spectrum, all in one neat package.

At the time of this project the only commercial beam available with this extra band coverage was the log periodic, which only a few could afford because of its cost and awesome dimensions. However, by staying with the tuned trap element and adding one more set of traps we got two new bands.

Looking at fig. 1, we see two separate wire and trap combinations. The top wire element with one pair of traps is for the 24.5 and 14 MHz bands. The central wire element is a tribander for the 28, 21, and 18 MHz bands. Connecting them to a common feedline ends the triband beam era.



The HR-52 antenna.

Construction

I have been partial to the wood spreader and wire-type element because of its low cost, mod-flexibility, and simple "Brooklyn Bridge" construction. The spreader span, supported by the combination antenna and guy wires, holds up nicely during the winter season.

A selected 12 foot (3.61 meter) length of 2×4 (3.72 cm×8.9 cm) of medium weight, or 10 pounds (4.5 kg), provides the four spreaders. Each spreader has been step-tapered to eliminate unnecessary wood and to provide the proper cross section for the wire anchor points and traps. The 40 in. (102 cm) long B section has beveled edges to permit a loose, slip-on fit for the tuned traps. Spreaders and pylons are protected with latex paint or varnish.

Tuned Traps

The tuned traps shown in fig. 2 differ from the customary "handbook" type. Our LC circuit is tuned by a slit metal sleeve connected to *one* end of the coil. The effective capacity is determined by the sleeve surface area, thickness of the coil form or dielectric, and distributed capacity of the coil winding.

A closed or cylindrical sleeve looks like a shorted turn, with increased r.f. losses and a higher resonant frequency. The trap is compact, easily installed, and not subject to any mechanical stress.

The original plan was to have the coils exposed to the weather, *a la* Reyco Traps. This eliminated using natural polystyrene or polyethylene coil-form material, because this material will deteriorate under sunlight. The ridiculous asking price for a short length of Plexiglas-Lucite tubing steered us to a plumbing supply shop, not for PVC tubing, but for black **ABS** (**a**crylate **b**utadiene **s**tyrene), the dielectric properties of which are better than polyvinyl chloride.

Hold the coil length of ABS tubing in the

*77 W. Euclid St., Hartford, CT 06112

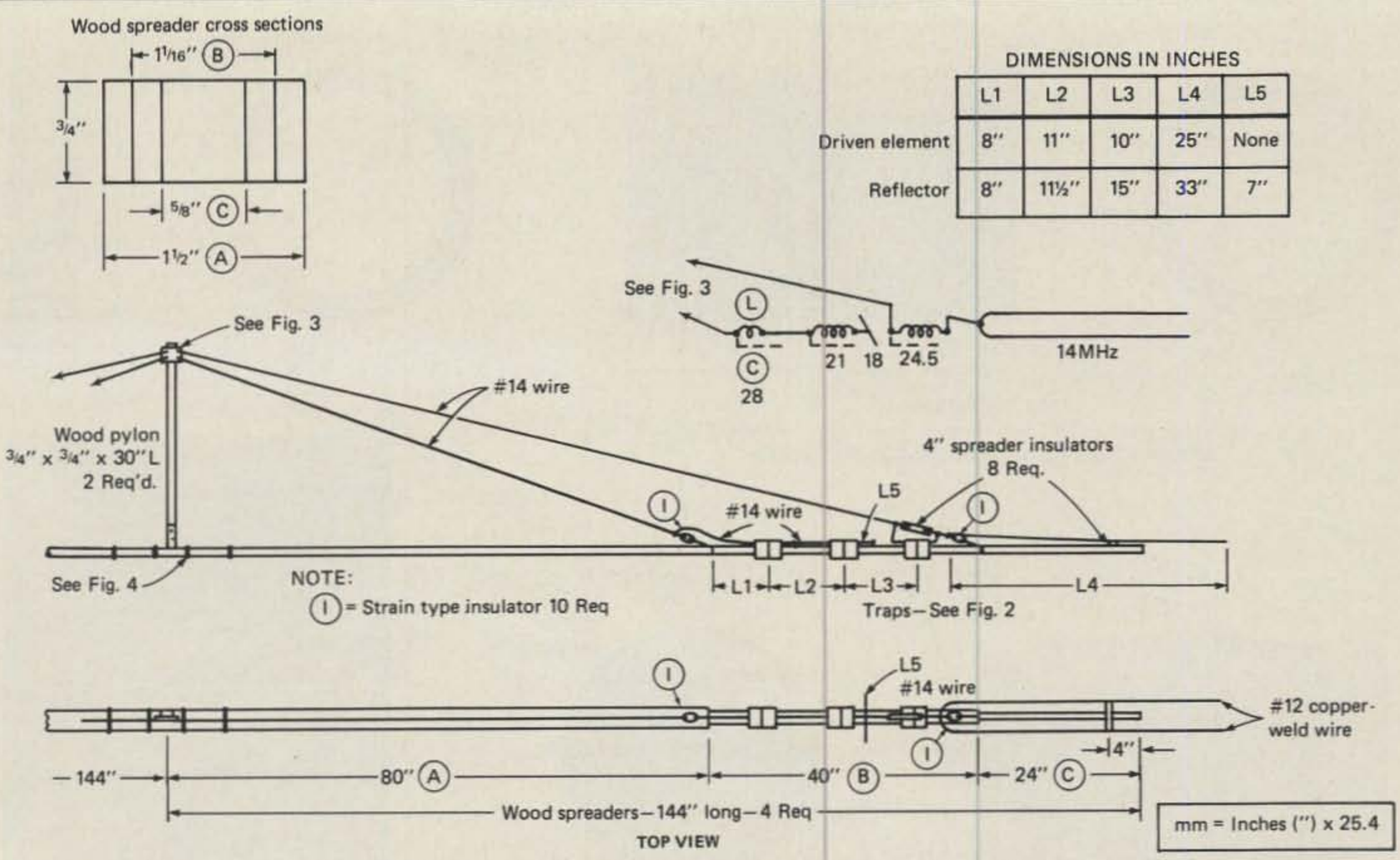


Fig. 1– Element construction detail and antenna wire-trap schematic.

lathe by the chuck and a large diameter conical tailstock center. ABS tubing is not a precise extrusion, and therefore the wire groove will vary in width and depth. The first cut is the thread-stop groove, ½ inch (12.7 mm) from the edge of the ABS tube. Advance the round-nose cutter until 25 percent of the tube is scored. Note the cross-feed dial reading and use it for the reference or zero mark.

Make the groove 30 mils deep and do the 6-pitch-thread wire groove with two passes. Set the first cut for 20 mils and finish with a 10 mil cut. At the intersection of the spiral and stop groove, drill a tight hole for the #14 bare or enameled copper wire; also drill the other wire hole and the ⅛ in. (3.18 mm) diameter hole, 40 degrees from the first wire hole, as shown in fig. 2.

Wind the wire tightly around the form using the "stretched wire" method. Crimp the inner leads close to the form and have them extend 2 in. (51 mm) beyond the form's edge. Dress leads with 1 in. (25.4 mm) long sleeve insulation.

Compression Rings

The compression rings (fig. 2) are machined from ABS tube stock and are sliced off with a thin parting tool. Make two extra rings ¼ in. (6.35 mm) wide. Saw a segment approximately 45 degrees wide out of each ring.

Capacitor Sleeve

The capacitor sleeve is made from a 12 fl. oz. (354 ml) seamless drawn aluminum beer or soda can. This item is perfect for this application. The lacquer around the corner hole must be scraped off to ensure good contact with a soldering lug. The lug should be cadmium plated or made from galvanized sheet metal.

Insert the capacitor sleeve into the coil form and align the ⅛ in. (3.18 mm) holes. From the inside, push through a 6-32 × ⅜ in. (M3.5 × 9.5 mm) long pan head screw with a soldering lug and use a large-size outside nut. Carefully solder the lug to the adjacent coil lead wire. Insert the ¼ in. (6.35 mm) wide ABS comp. ring edgewise and flip it over 90 degrees; also do this with the other narrow comp. ring. Position each ring approximately ⅝ in. (15.88 mm) from the edge of the coil form. Later on the narrow rings will be discarded and replaced by the permanent wider rings, the functions of which are to press the sleeve firmly against the inner wall and serve as insulated spacers.

Before proceeding with further construction notes, the following will be of interest. After I completed the set of 12 tuned traps, I finally decided to check a trap when exposed to soppy-wet conditions. It was submerged in a jar of tap water, and the grid dip meter reading showed a drastic frequency shift. For an all-weather beam, it will be necessary to protect the trap with a non-metallic outer casing. This will permit using polystyrene coilform material in the event the ABS fails when operating at high power. The maximum d.c. input here is 500 watts, and the ABS does not show any stress.

Trap Frequency

The trap frequency is determined by the desired section of a band. For c.w. and low-end phone, I chose 14.10, 18.12, 21.20, 24.94, 28.40 MHz. There appears to be some confusion among trap tuner-uppers as to the correct technique. Some tune up for the center of a band, and a *QST* tri-band beam article used an 800 kHz lower frequency for greater bandwidth. I picked 500 as a nice number for the driven element, which tunes our coils to 20.70, 24.44, 27.90 MHz.

A graph in the *ARRL Handbook* shows that reflector length varies with element spacing. Our 20 meter band reflector with ⅛ wave spacing will be 7% longer than the driven element, and the 10 meter band reflector, with ¼-wave spacing, will be increased to 4%. The reflector frequency targets are 13.20, 17.20, 20.20, 23.80, 27.00 MHz. Due to some interaction within a five bander, there will be some apparent shift from theoretical values. The reflector element traps will be tuned for 19.70, 23.30, 26.50 MHz and completed before adjusting the driven element traps. If one gets hasty with the tin snips and overshoots the desired frequency, the capacitor sleeve can be salvaged and used for the driven element.

Fig. 2 indicates the trimming edge, which may come close to the coil leads. The clearance here should be at least ¼ in. (6.35 mm); therefore start with the corners. When removing the sleeve, do not unsolder the lug to lead connection.

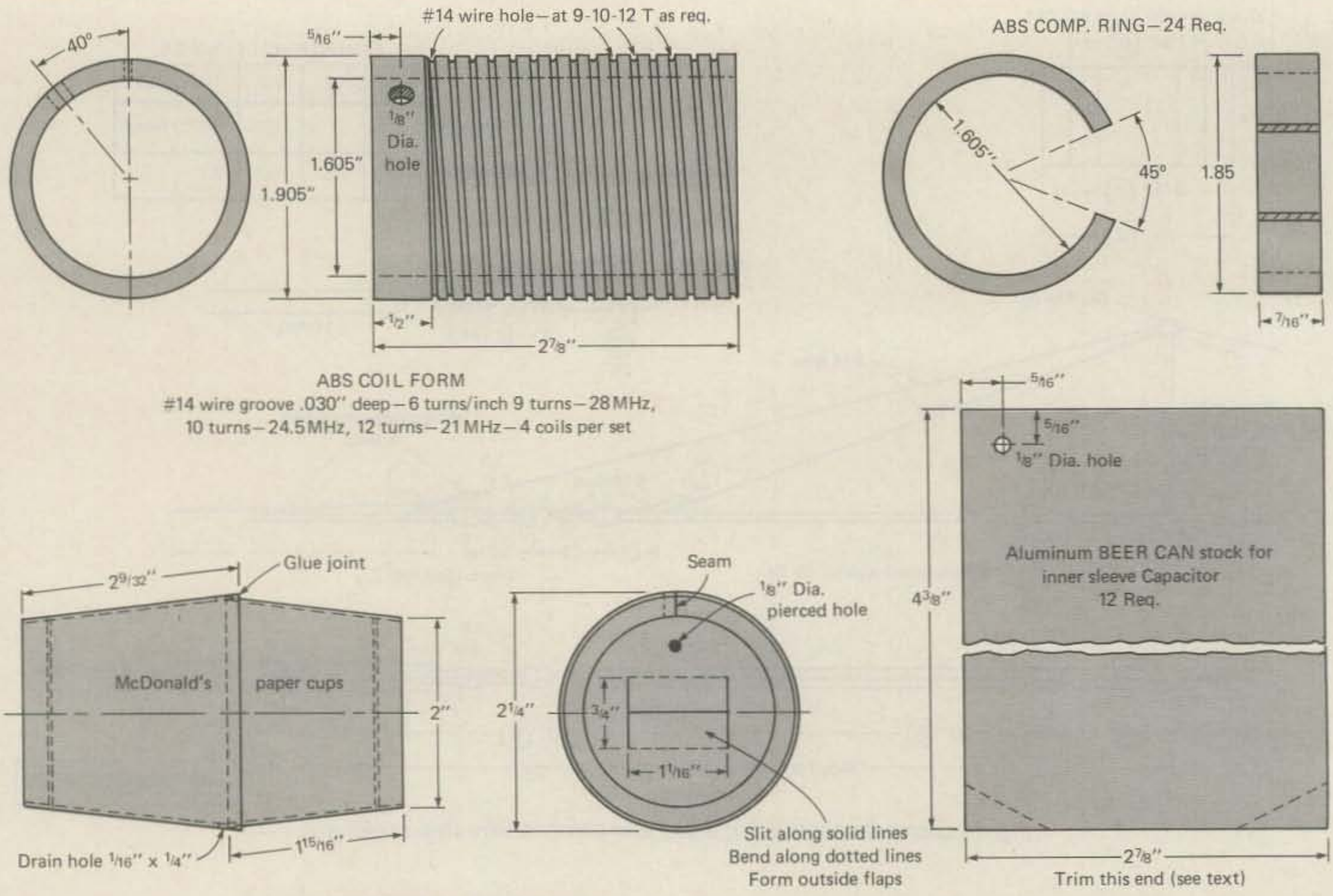


Fig. 2– Primary parts for the tuned traps; see text for assembly directions.

As the frequency gets closer to the magic number, check the grid dip meter calibration and, finally, use the 7/16 in. (11 mm) wide ABS comp. rings.

Trap Casing

The trap casing can be made from a plastic bottle or thin-wall tubing. The glove compartment in my car was stuffed with used McDonald's coffee cups, which were modified as shown in fig. 2. Before assembly spray the cup interior and outside of end header and flaps with clear Krylon. Assemble the trap and casing on a piece of wood 6 in. (152 mm) long and similar to cross section B fig. 1. Make six such holders to expedite production. Mark the trap frequency on the outer and longer half of the casing, and slip it over the capacitor connector end of the trap. Fit the cups together and seal the joint with model cement. Finish with an overall Krylon spray.

Tuning Coils

The tuning coils and attachment detail at the top of the pylon for the driven and reflector elements are shown in fig. 3. The strain-type ceramic insulators used here and throughout the beam are 1.5 in. (38 mm) long. The antenna and coil wire is plastic-covered #14 copper "house wire." The connector block is a phenolic or hard rubber to resist heat during the soldering operation.

Spider

The spider and boom construction is shown in fig. 4. The builder may improvise his or her own version, depending on material available and workshop equipment. I found the angle iron, pipe, strap iron, and EMT (electrical metallic tubing) at a scrap-metal yard. Good welding practice requires that joining pieces have a beveled edge to ensure deep weld penetration. New steel EMT and the #14 type TW wire are stocked at electrical supply stores. The 3/4 in. (19 mm) pipe stub requires some lathe or grinder work to fit into the EMT tubing.

Assembly

The assembly begins by bolting the pylon and spreaders to the spider. Suspend it with a line from a tower leg at a convenient height. The inboard set of strain insulators and antenna wire is attached at the first corner step 80 in. (204 cm) from the pylon (see fig. 1). At the connector block, make a firm but simple wrap for any final adjustments.

Slip on the traps in the proper order over section B. Locate dimension L1, with the coil centered within casing, as indicated by an equal length of protruded lead wire having formed the hook ends. Solder a connector wire from the antenna wire to the trap. Spot and center the coil for L2 and solder in the connector wire. At L3 temporarily tape the casing to the spreader. The outer wire includes a 4 in. (10 cm) long spreader-type insulator inserted directly above the 24.5 MHz band trap. At the connector block, make all adjustments for proper wire tension and spreader alignment. Bend the wire leads from the last trap towards its insulator and solder in connector wires. If a porcelain "Zepp" type insulator is unavailable, use a 3/8 in. (9.5 mm) diameter Plexiglas-Lucite rod or wood dowel boiled in parafin—days of H.P. Maxim.

Double or hairpin form the #12 copperweld wire 14 MHz extension to increase the end capacity loading and thereby shorten the span. Attach its insulator with a plastic wire clamp and one screw, or make a clamp from 5/8 in. (15 mm) wide sheet metal. Bind the hairpin to the antenna wire with bare copper wire and solder.

Getting back to the pylon and fig. 3, install the jumper wire and 7-turn coil across the reflector connector block and complete the wiring and twin 5-turn coils for the driven element. I added a homemade air-core 1:1 balun to equalize r.f.

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Hamtext™, our new program, is available for the VIC-20 and Commodore 64, with all the features of Hamsoft™ plus the ability to save received information to disc or tape, variable buffer sizes, VIC printer compatibility, and much more. Our combination of hardware and software gives you the system you want, with computer versatility, at a reasonable price.

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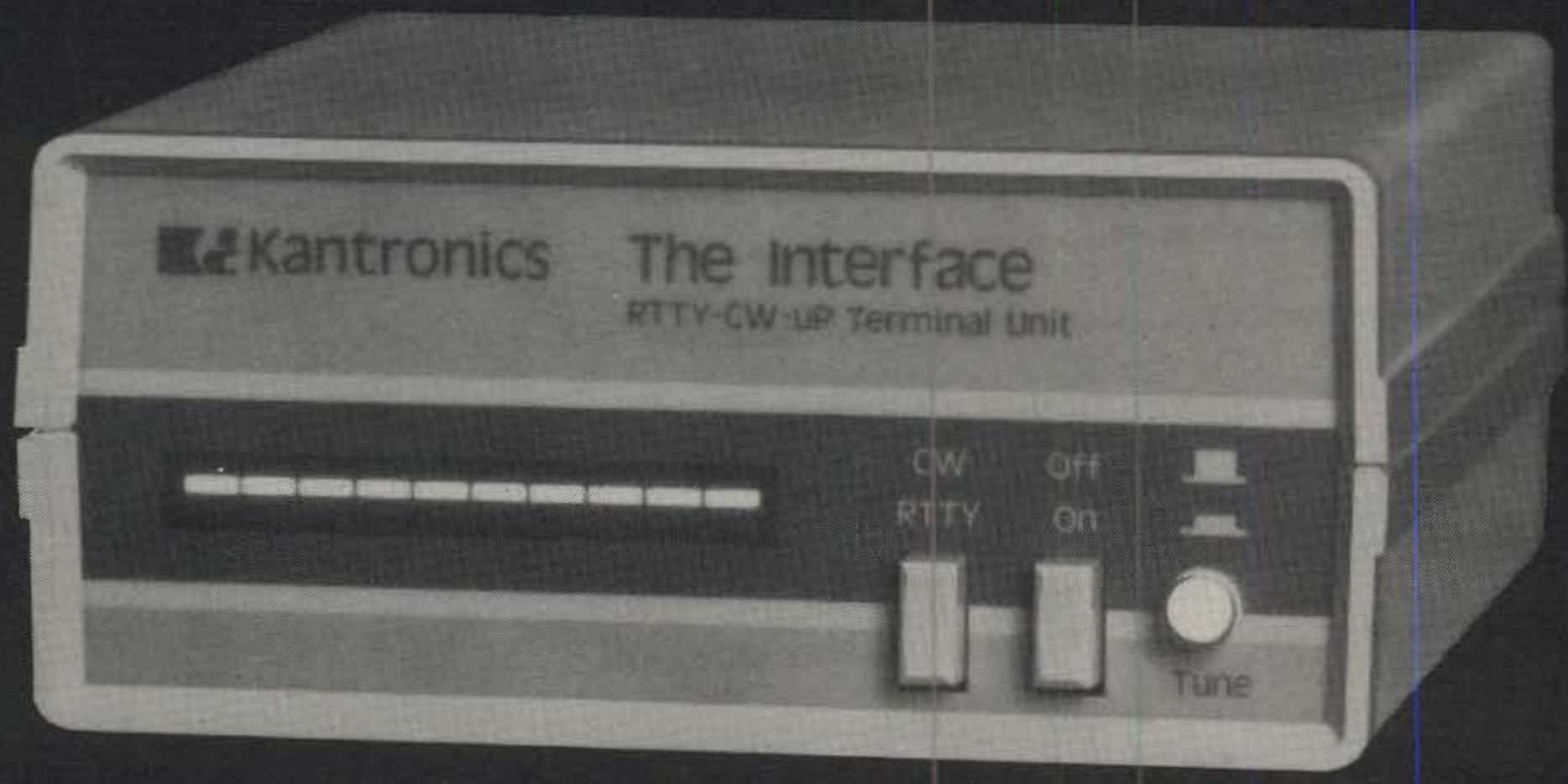

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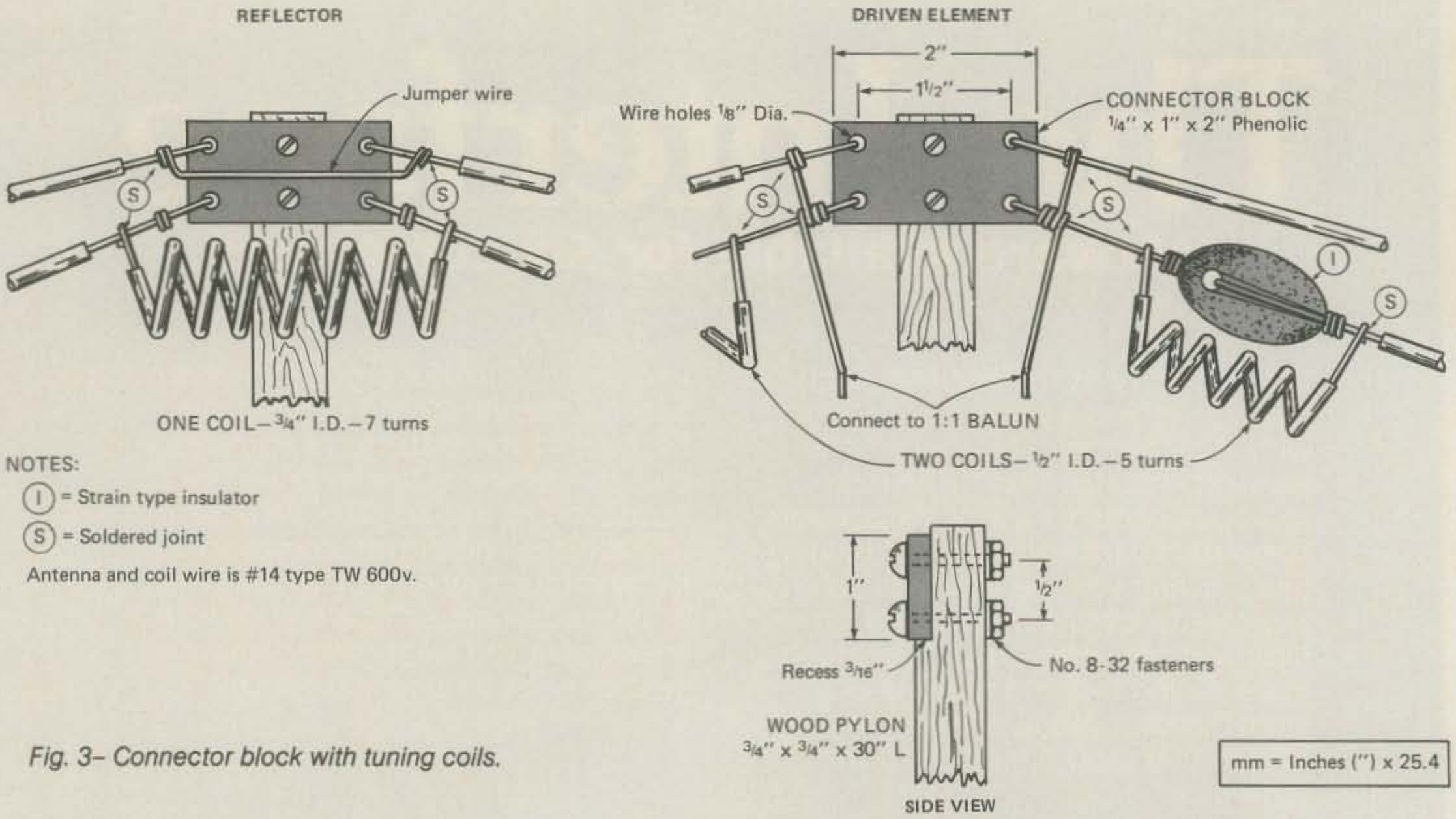

NOTES:

(I) = Strain type insulator

(S) = Soldered joint

Antenna and coil wire is #14 type TW 600v.

Fig. 3– Connector block with tuning coils.

current distribution. Feed line is the usual RG-8 or RG-8X, a lighter cheaper cable.

Tune-Up

Tune-up for a perfect match would require a clutter of five antenna gamma sections, which quickly draws itself to death. By using the transmatch correctly and "tuning" the coax with additional random lengths of cable, the v.s.w.r. readings are better than tolerable.

If the builder desires to center the working bandwidth in the 10/15/20 meter bands considerably lower or higher than my design frequency, a basic understanding of how the combination trap-loading coil functions will ease the pain of spotting the 10 resonant frequencies.

The 24.5 MHz band dipole is insulated from the 14 MHz extension by the resonant traps. Therefore, any changes beyond the trap have a negligible effect at the higher frequency section of the dual-band dipole. Altering the 24.5 MHz section also affects the 14 MHz end, and the trap becomes a loading coil. This extra series inductance results in a shorter 14 MHz band dipole.

The triband section on 28 MHz uses the inner set of traps. On 21 MHz these traps change into loading coils and the 21 MHz band traps take hold. On 18 MHz it's an end-loaded dipole.

Frequency shift is done by altering the length of the antenna and trap connector wires (L1 through L5), as well as the inductance of the 10 meter band tuning coils. The lead wires intended for the balun are temporarily connected together, and a calibrated grid dip meter, when coupled to one of the 10 meter band coils, will reveal the various resonant frequencies of both driven elements. At the reflector, if the 14 or 24.5 MHz band grid dip meter reading is weak and uncertain, replace the plain jumper wire with another having a one-turn coil for tighter coupling.

After the beam is raised skyward, the real fun begins. Dust off the antenna noise bridge and s.w.r., pwr, f.s. meters, find the lab notebook, sharpen pencils, and activate the rig with the low-power switch.

At the time of this article, the 18 and 24.5 MHz bands are "off limits" and no test transmissions were made. If HR-52 (son of HR-5, July 1981 *CQ*) happens to peak near the outskirts of these relatively narrow WARC bands, the system will still work FB.

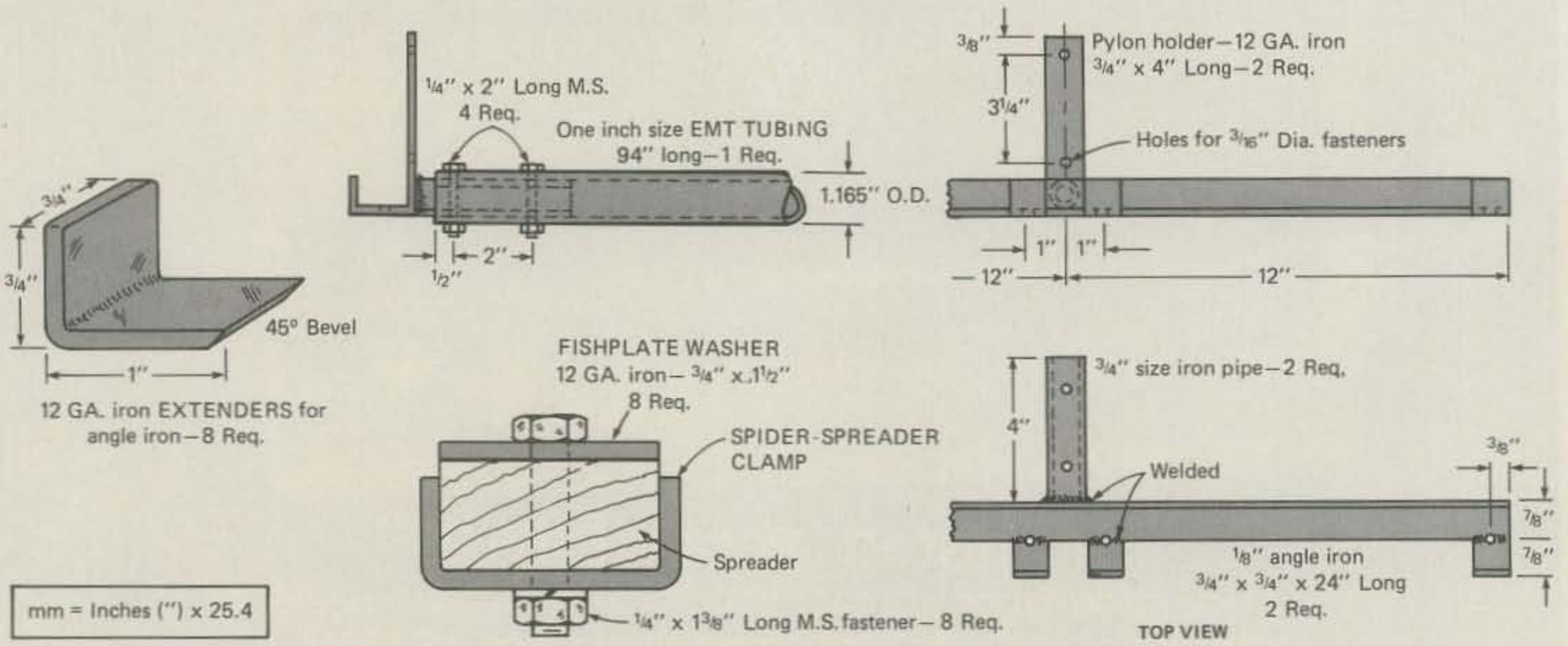

Fig. 4– Construction detail of spider and boom.

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CQ Reviews:

The Cushcraft R3 Vertical Multiband Antenna

BY JOHN J. SCHULTZ*, W4FA

The Cushcraft R3 Vertical Antenna is a multiband 10/15/20 meter antenna that stands about 23'9" tall. The total height of the R3 is somewhat more (roughly 4 to 8 feet) than various other 10/15/20 multiband verticals on the market. Its price is also somewhat more, but there are good reasons for both features.

Conventional trap-type multiband 10/15/20 meter verticals operate on the familiar idea shown in fig. 1. Trap #1 is parallel resonant on 10 meters and effectively decouples all of the antenna above it, leaving a ¼λ section below it as a radiator. Trap #2 is parallel resonant on 15 meters and in a similar manner decouples the antenna section above it while leaving a ¼λ active section below it. On 20 meters both traps #1 and #2 operate below their resonant frequencies and present an inductive reactance which makes the whole antenna length form a ¼λ.

In practice, if one carefully calculates the physical separation between the two traps, and if one carefully adjusts the resonant frequencies of the traps when they operate off frequency to present the required reactance to make the antenna as a whole function while presenting a reasonable match to a coaxial feed line, the idea can work quite well. But, one is always dealing with ¼λ vertical antenna sections being active on each band, which means that if the antenna is to be efficient at all, the "missing" ¼λ part of the antenna has to be made up by radials which are ¼λ long on each band on which the antenna is to be used.

Although some amateurs out of necessity use only one radial on each band, usually a minimum of three on each band are necessary for efficiency and reasonable bandwidth. But then again, some amateurs are so constrained for antenna space that only one radial is used on all bands, or none at all. In the latter case, the antenna will radiate, since it is still a piece of wire, as long as one can couple some power into it. But then in such cases one might as well just put up a piece of wire for a radiator.

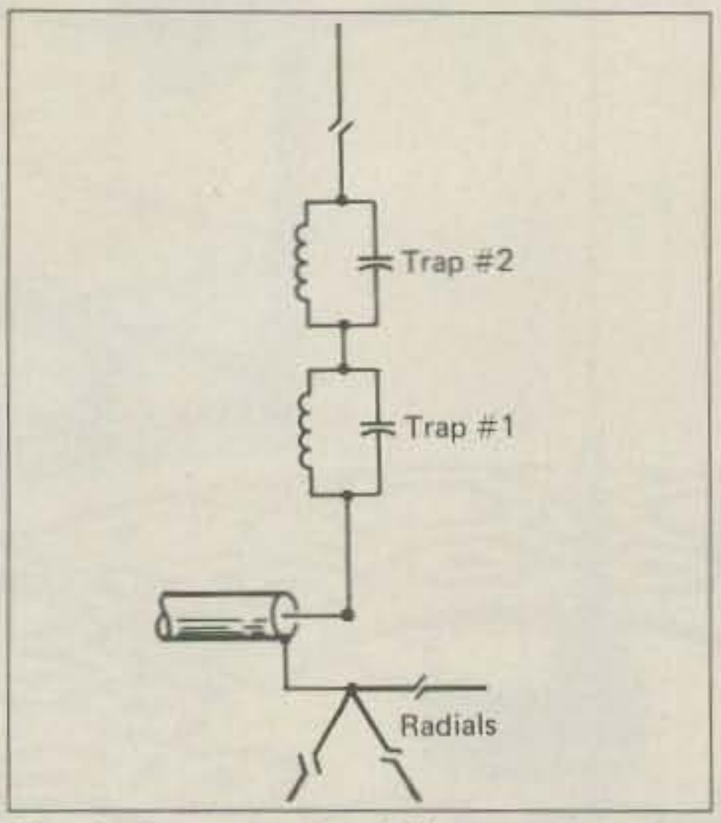
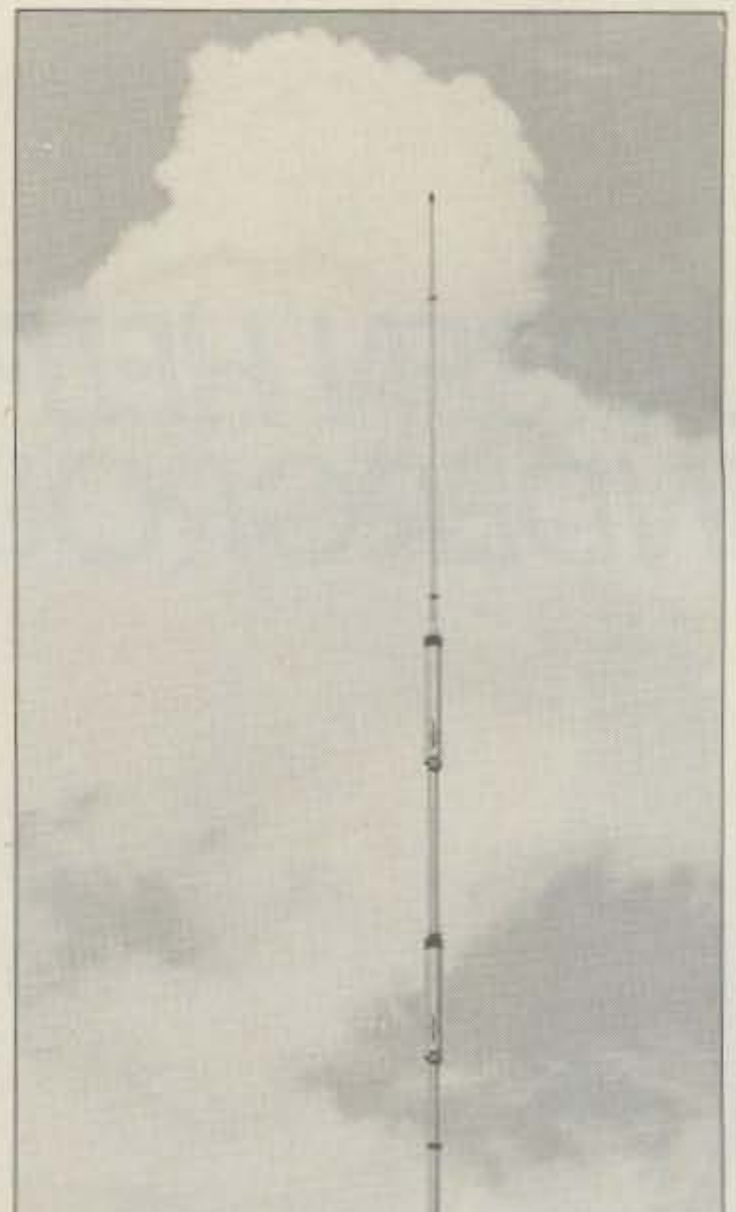


Fig. 1– A conventional ¼-wave trap-type antenna for 10/15/20 meters which requires radials.

If one cannot put up a reasonable radial system with a 10/15/20 meter trap-type vertical antenna, one might well consider some alternative ideas which do not require radials. As shown in fig. 2(A), the vertical trap-type dipole antenna is an idea. One can simply combine two trap-type ¼λ verticals to form a vertical dipole. The idea has been used by some amateurs, but mechanical mounting considerations can become quite a problem.

Another idea which has been around for many years is the end-fed ½λ vertical as shown in fig. 2(B). In this case, only a single base-mounted vertical element is required which should represent a ½λ on the desired band of operation. The feed end of the ½λ dipole is a high-impedance point, and so some sort of matching transformer (transmission line or otherwise) is necessary to match into a coaxial transmission line. The antenna form of fig. 2(B) has all sorts of electrical and mechanical advantages, and amateurs have been fascinated for years as to how to turn it into a multiband 10/15/20 meter antenna while having its physical length not quite a full ½λ on the lowest frequency band (so its vertical radiation angle doesn't become too high on 10 meters due to its electrical length exceeding 0.625λ on that band) and have it automatically match a 50 ohm coaxial transmission line on all bands. Among several very clever ideas to accomplish this was one developed by a VK2 station and this is shown in fig. 3. The complicated mechanical considerations in implementing the idea should be obvious and are true for various other similarly noble attempts.



The R3 functions as a completely free-standing antenna on 10/15/20 meters without any radial wires.

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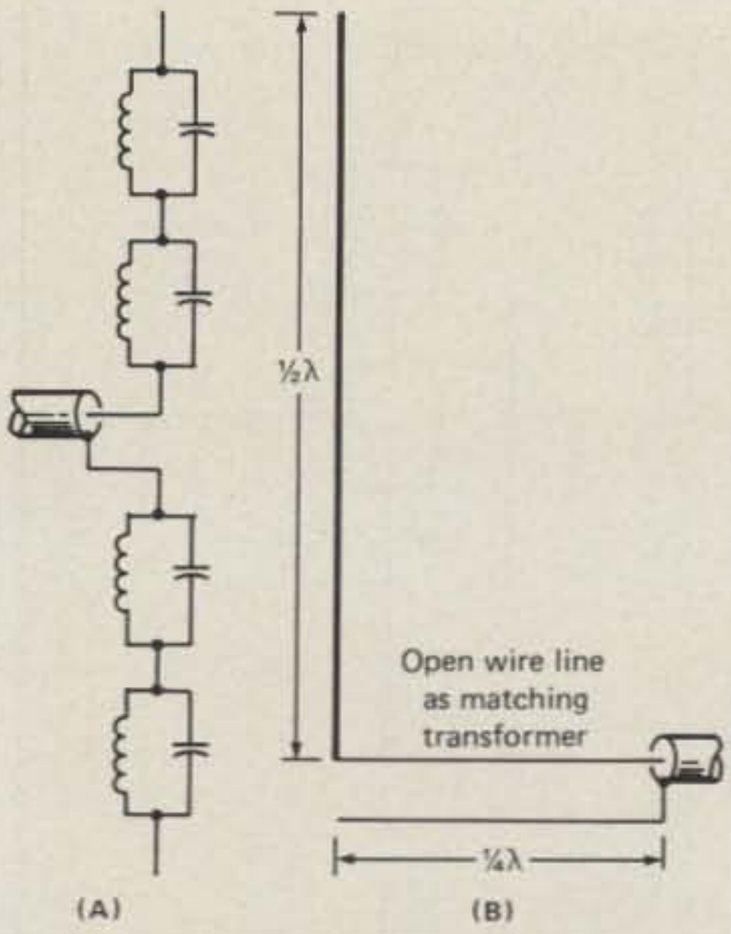


Fig. 2– Two ½-wave antennas which do not require radials. (A) shows two combined multiband ¼-wave trap-type antennas. (B) is a regular ½-wave vertical.

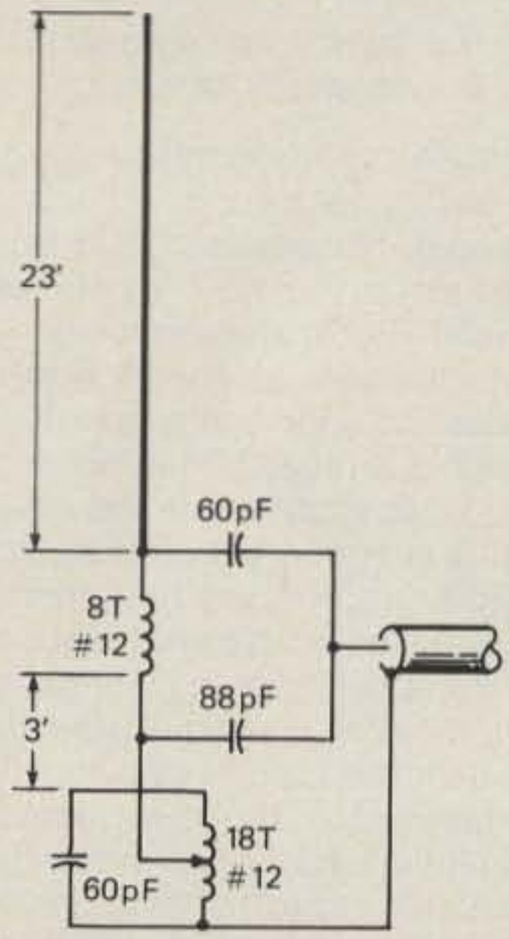


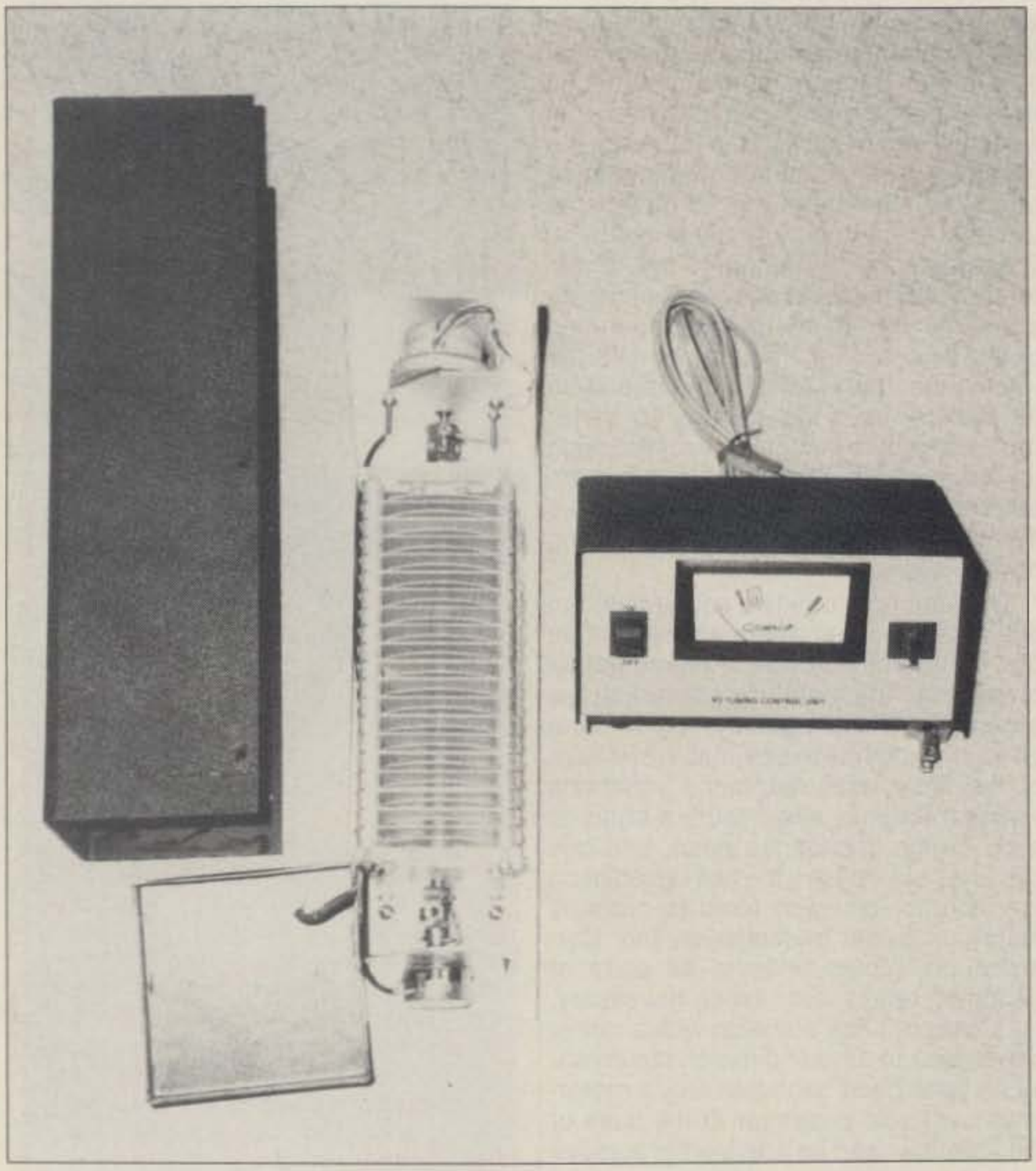
Fig. 3– Many ideas have been tried over the years to achieve a vertical antenna configuration that will provide equivalent ½-wave operation on 10/15/20 meters without bandswitching. This antenna was from a VK2 amateur.

The R3 antenna, on the other hand, does accomplish the idea of the VK2 antenna, but in a totally new manner. No direct comparison is intended, by the way, between the R3 and the VK2 antenna other than to illustrate practical development towards an antenna form that has long since been recognized as being the almost ideal one for a 10/15/20 meter vertical—one that truly does not require radials, represents a ½λ radiator element on each band, and can match a coaxial transmission line on each band.

The electrical concept of the R3 is shown in fig. 4. The dimensions given are only approximate and do not include the physical length added by the trap sections. However, the idea behind the antenna can easily be seen. The 10 meter trap isolates the lower section of the antenna so it operates as a ½λ radiator on 10 meters. The parallel resonant circuit at the base of the antenna matches a coaxial feedline by having the latter tap the inductor at a suitable low-impedance point. On 15 meters, the 15 meter trap isolates the antenna sections below it. The added physical length to the 15 meter trap plus the inductive reactance now added by the 10 meter trap operating below its resonant frequency make the whole antenna ½λ long on 15 meters. On 20 meters, both the 10 and 15 meter traps contribute inductive reactance and that plus the added physical length of the antenna above the 15 meter trap make the whole antenna electrically ½λ long on 20 meters.

The idea is basically a sound one, but one outstanding problem appears when one considers practical implementation of the idea. The matching network at the base of the ½λ electrically long antenna on each band has to be tunable because of the fairly wide reactance variations versus frequency, even within a band, at such a high impedance point, and one has to be able to vary the coil tap point on the inductor on each band to properly match a coaxial transmission line. Normally, one could imagine all sorts of switching relays, etc., being necessary, but Cushcraft has come up with a rather clever idea to tune and match the antenna on each band such that only a motor-driven variable capacitor at the base of the antenna need be adjusted to achieve a 1.2 to 1 or less s.w.r. at the extremes of each band in most installations. This means that even when using solid-state transceivers no separate antenna tuner is necessary in order to achieve proper output matching and full output power.

The "ring" that one sees at the base of the antenna in the photograph really acts as an inductor, which, in conjunction with the motor-driven variable capacitor contained in the "black box" visible at the base of the antenna, forms a continuously tunable parallel resonant circuit on 10/15/20 meters. It cannot easily be seen from the photograph, but tap points on the inductor ring extend from a molded assembly containing some capacitors which, in turn, couple into a connector for a coaxial cable connection. The approximate electrical equivalent of the assembly is shown in fig. 5. The motor-driven 180 pF capacitor tunes the parallel resonant circuit and the series resonant circuits formed by fixed capacitors and the inductive effect of extension arms to the inductor ring automatically select the correct tap points on the inductor ring for best power transfer on 10 or 15/20 meters. The only adjustment required to operate the antenna, once it has been installed and initially tuned, is to remotely adjust the 180 pF variable capacitor for minimum s.w.r. on any given band.



The control box for the R3, shown on the right, contains an a.c. power source for the reversible motor for the remotely tunable capacitor and a meter to indicate an approximate tuning setting. The housing for the capacitor, shown on the left, contains a reversible drive motor for the capacitor plus a potentiometer linked to the drive shaft of the capacitor which is meant to supply "feedback" voltage information to the meter on the control box for resettable capacitor settings on 10/15/20 meters.

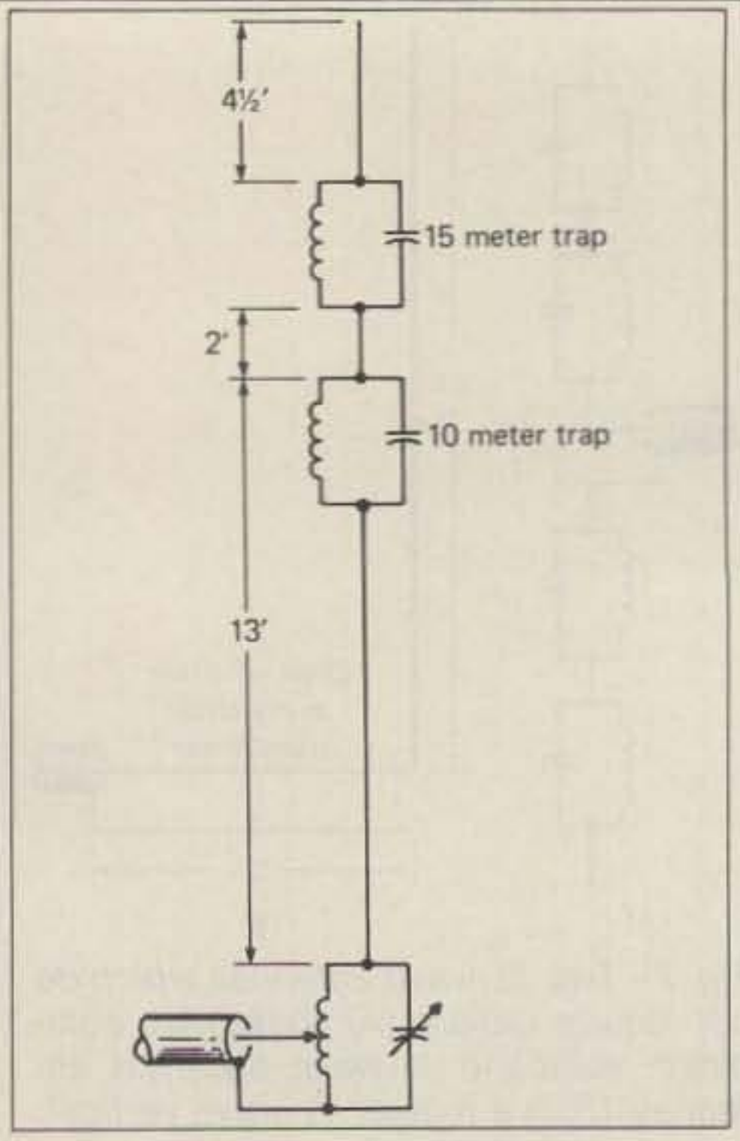


Fig. 4– The basic configuration of the Cushcraft R3 antenna.

If one does appreciate that the R3 is a significant advance over the usual 10/15/20 meter ¼λ vertical, one should not mind the little bit of work involved in assembling and initially tuning up the R3. The R3 hardware is of excellent quality. The lower base section (meant for attachment to a supporting mast by in-line coupling or side-by-side mounting) is of 2 inch OD aluminum tubing, and the aluminum tubing sections gradually decrease in diameter such that the very top section is ⅜ inch in diameter. The hardware provided is absolutely complete down to the provision of some silicone sealant meant to weatherproof the coaxial cable connection to the R3. Assembly instructions are very clear by using pictorial diagrams. Assembly of the vertical sections of the R3 is practically instant because of the obvious nesting of the various diameter aluminum tubing sections and the clearly marked trap placements.

The assembly of the capacitor tuning assembly took the most time. There is nothing difficult about it, but one should really approach it carefully and slowly. Approximately 30 parts are involved, ranging from various screw assemblies to the housing containing the motor-driven variable capacitor. However, one should appreciate the excellent quality of the parts involved, assemble the components slowly, and not really mind that it will take one to two hours to do a good job of it. Besides the usual coaxial feedline to the antenna, one also needs a four-conductor control cable. The latter can be any common type of antenna rotator control cable.

Overall, the assembly of the R3 should pose no problem. The only negative thing that can be said is that the R3 that was assembled did not have the terminals marked on the control box nor on the housing containing the motor-driven variable capacitor. (Current production has all terminals numbered.) The instructions do contain a complete schematic of the control unit (which can be wired for 110 or 220 volt operation), so it was hardly any great problem to sort out the correct wiring for the terminals. Nonetheless, it is an odd omission, since the R3's assembly instructions are otherwise excellent.

The installation of the R3 will, of course, depend upon one's individual situation. With due regard for safety, mounting the R3 "as high and in the clear as possible" is still good advice, the same as for almost any other type of antenna. Of course, since the R3 does not require any radials, one's flexibility in finding a good mounting location is usually greatly simplified. Cushcraft reports owners of R3's using fence-post locations, roof-mounted tripod installations, and even indoor horizontal attic-mount installations. However, they do readily caution that metallic-type obstructions close to the R3 or large metal surfaces underneath the R3 will tend to detune the antenna to the extent that a low s.w.r. may not be achieved using the original assembly dimensions. Full instructions are given as to how one can initially test for proper tuning and which antenna sections have to be varied in length a bit if the antenna has to be "pruned" to meet its s.w.r. specifications. Cushcraft does claim, however,

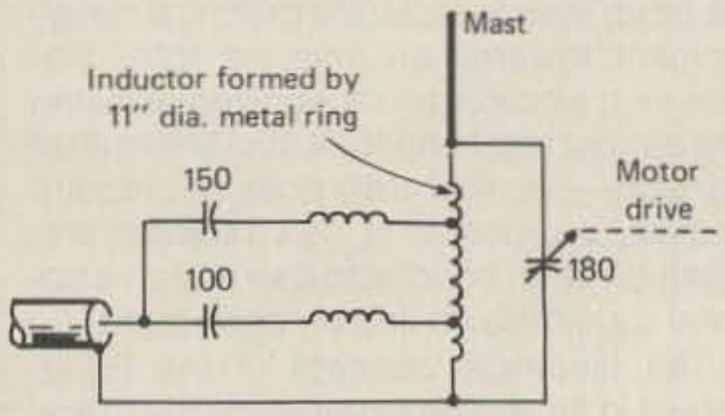


Fig. 5– The basic electrical equivalent of matching circuitry at the base of the R3 antenna.

that the variable matching network used in the R3 has a wide enough range to compensate for any normal installation, and it will even tune the R3 for an s.w.r. of 3:1 or less with the antenna lying on a cement floor!

The latter wasn't checked, but the R3 was tried out in two mounting locations. One was a balcony mount about the same height above ground as one might experience with a mounting on a single-family house. The other location was in an attic, using the R3 in a horizontal position. The attic, which is quite long (over 120 feet), also contained paralleled, full-length dipoles for 10/15/20, so some direct comparisons could be made between them and the R3. The R3 was mounted at the end of the attic farthest from the dipoles to avoid any interaction.

The R3 tuned up perfectly in both locations, although it must be stated that both locations were free of any nearby, large metallic surfaces or wire runs. Using a Ten-Tec Omni-C solid-state transceiver, full power output could be achieved at any frequency in the 10/15/20 meter bands without the use of an antenna tuner. Once the R3 had been tuned using the Omni-C, a solid-state kw linear loaded perfectly into the R3. The motor-driven variable capacitor takes about 35 seconds to go through a 180 degree rotation. This tuning speed appears to be a good value; it is slow enough to allow fine tuning within a band and not so slow that it takes an excessive amount of time to go, for instance, from tune-up on 10 to 20 meters. A small amount of backlash was noted in the tuning. It really did not require correction, but just as a matter of interest it was tracked down and found to be due to a bit of slippage on the shaft coupler used between the motor driving the variable capacitor and the shaft of the capacitor. A bit of epoxy cement quickly corrected the situation, although it should be emphasized that the whole thing amounted to "gilding a lily."

On the air, results using the R3 were very gratifying. The balcony location produced some amazing DX results, due, of course, to low-angle radiation being emphasized when the R3 is vertically mounted. Detuning effects due to rain, etc., were easily handled because of the remote, variable tuning incorporated in the R3 (a problem common to most antennas). However, as good as the operational results seemed to be using the balcony location, they could only be subjectively evaluated. On the other hand, the attic location of the R3 allowed for some objective evaluation *vis-a-vis* similarly mounted dipoles. For all practical purposes, the R3 matched the performance of the dipoles, even on 20 meters. The latter is rather surprising, since although the overall electrical length of the R3 is ½λ on 20 meters, its physical length is some 10 feet shorter. But the greatest difference that could be established between the R3 and the dipoles, when asking stations for A/B comparisons, was less than a ½ "S" unit in favor of the full-length dipoles.

As an overall conclusion, I would say that the R3 is an outstanding performer. It will not match in performance a beam mounted at 60–90 feet, but for the amateur who wants to work DX and who is restricted as to his antenna mounting possibilities, the R3 really does open up a world of new possibilities—namely due to its complete lack of requiring any radial ground system for efficient performance. Efficiency (the power actually radiated versus whatever power one couples into an antenna) should be significantly increased versus any possible ¼λ 10/15/20 antenna installation no matter how the R3 is mounted. Of course, as a note to those who do enjoy the advantages of a 60–90 foot high beam, I might mention the DX advantages of a secondary omnidirectional performer such as the R3. It can "catch" elusive DX at times before one can rotate a cumbersome beam.

Where there is a will there is a way. WD6DJT proves once again that amateurs are innovative when it comes to building antennas.

A Penny-Pinching 10 Meter Apartment Antenna

BY RANDOLPH H. PIRTLE*, WD6DJT

Like many apartment-dwelling radio amateurs, I have been faced with a supreme challenge of diplomacy: erecting an outdoor antenna system with management's permission. There are often many restrictions, and sometimes even the most tactful attempts at persuasion can leave the radio enthusiast with no antenna. With this problem in mind, I decided to design an indoor antenna system that was so simple that even I could build it.

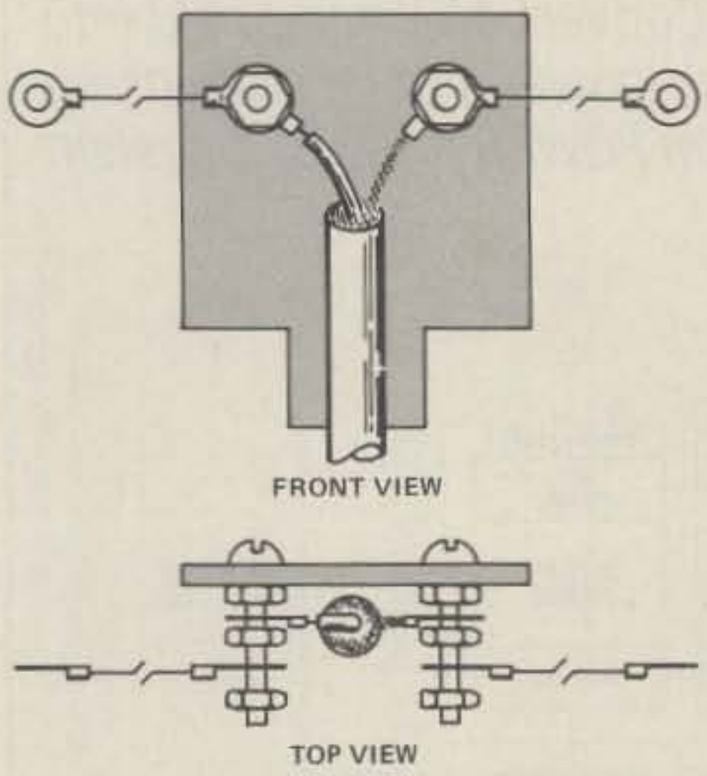


Fig. 1– Front and top mechanical views of the indoor antenna.

The Design

In designing my indoor antenna, at least one constraint was immediately obvious. The system needed to have dimensions that allowed it to fit in a small space. This question of proper size influences the potential range of usable resonant frequencies. In addition to size was the choice of antenna type. An indoor Yagi seemed impractical and a quad seemed absurd. That left the very simple half-wave dipole. It would be easy to design and easy to construct.

Using the equation

$$\frac{492}{f\ (MHz)} = \text{length (feet)}$$

I found that only a 10 meter half-wave dipole could fit comfortably into a small room without loading coils. I proceeded to find the exact theoretical length of my antenna with a resonant frequency of 28.500 MHz. I used the above equation once again and calculated the total length as 17.26 feet. Notice that the numerator of the equation is 492 and not the standard 468. This is because no insulators were to be used and, therefore, end effects would be negligible.

Now that I had decided on a 10 meter half-wave dipole and found the desired length, the question of using a balun remained. A little research told me that a 1:1 balun could be used between the feedline and antenna, but that it was not critical. Without the balun, transmitted signal pattern irregularities would be minimal.

Construction

My goal was to create something easy to build, but I also wanted to keep the cost down. For this reason I chose clear acrylic as the central wiring block. It is inexpensive and blends with most wall decor. Other necessary parts included 6 solderless terminals, 1 tube of instant glue, 1 coaxial cable (52 ohms), 2 machine screws, 6 steel hex machine screw nuts, 1 solderless coaxial male connector, and 20 feet of uninsulated narrow gauge wire.

Once the acrylic block had been cut to the shape shown in fig. 1 and the two holes drilled (they should be about 2 inches apart), I inserted a machine screw into both holes and secured them using hex nuts. I then stripped about 1½ inches of insulation off one end of the coaxial cable. The exposed shielding was unwrapped from around the center conductor and twisted into a single wire. On the end of the center conductor and the shielding wire, I clamped solderless connectors. These leads were connected to opposite posts on the acrylic block and were retained with hex nuts. On the other end of the coaxial cable, I attached the solderless male connector.

Now comes the only tricky part of the job. Using my dimensions, I cut the narrow gauge wire to a length of 17 feet 3 inches. Then from the same wire, I cut off a length equal to the distance between the posts on the acrylic block. That done, I cut the remaining wire into two equal lengths and clamped solderless connectors onto the four ends. Each element was then connected to an opposite post and secured by hex nuts.

To finish the job, I instant-glued the section of insulated coaxial cable just below the machine screw posts to the acrylic. I then tied some fishing line to the ends of the antenna wires. The fishing line insulates each element from the apartment wall upon installation.

Operation

Be sure to orient the antenna as shown in fig. 2. If the acrylic block is located above the transceiver, radio frequency feedback may cause problems on single sideband. Also, since the antenna is indoors, standing wave ratio can be excessive. With a tuner, I can keep the s.w.r. under 1.5:1 over a range of 500 kHz.

Unless the antenna is used in a room with a high ceiling, its height will probably be well below a half-wavelength off the ground. This theoretically increases the angle of radiation and decreases potential long-distance communications. However, even with my low 7 foot ceiling I have regularly made contacts beyond 3000 miles.

Conclusion

Other than long-wire antennas, this system is perhaps the simplest to design and build. The technique is age-old and I certainly cannot take credit for it. However, I have shown that a useful antenna is possible for under $10.00.

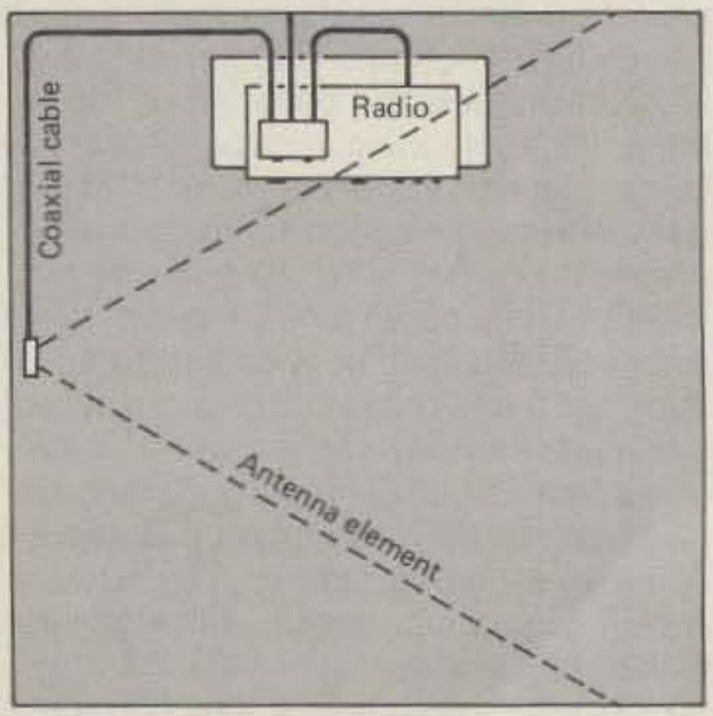


Fig. 2– Top view of the room showing the proper orientation of the antenna.

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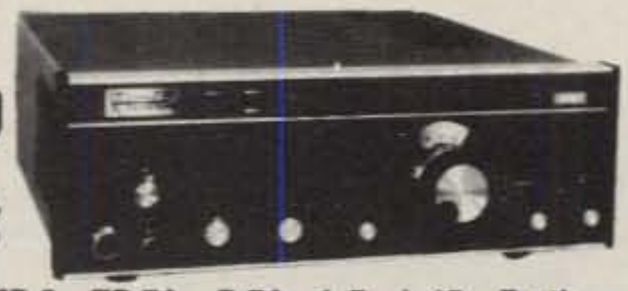

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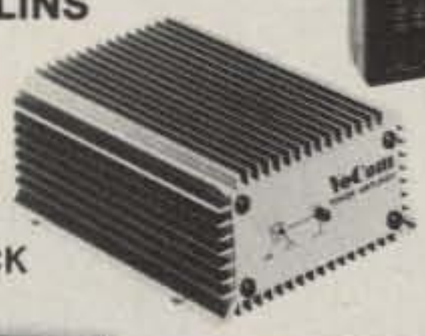

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W6XM comes through with a simple 160 meter vertical antenna that can be raised and lowered by one person.

A 160 Meter Vertical Antenna

BY ED MARRINER*, W6XM

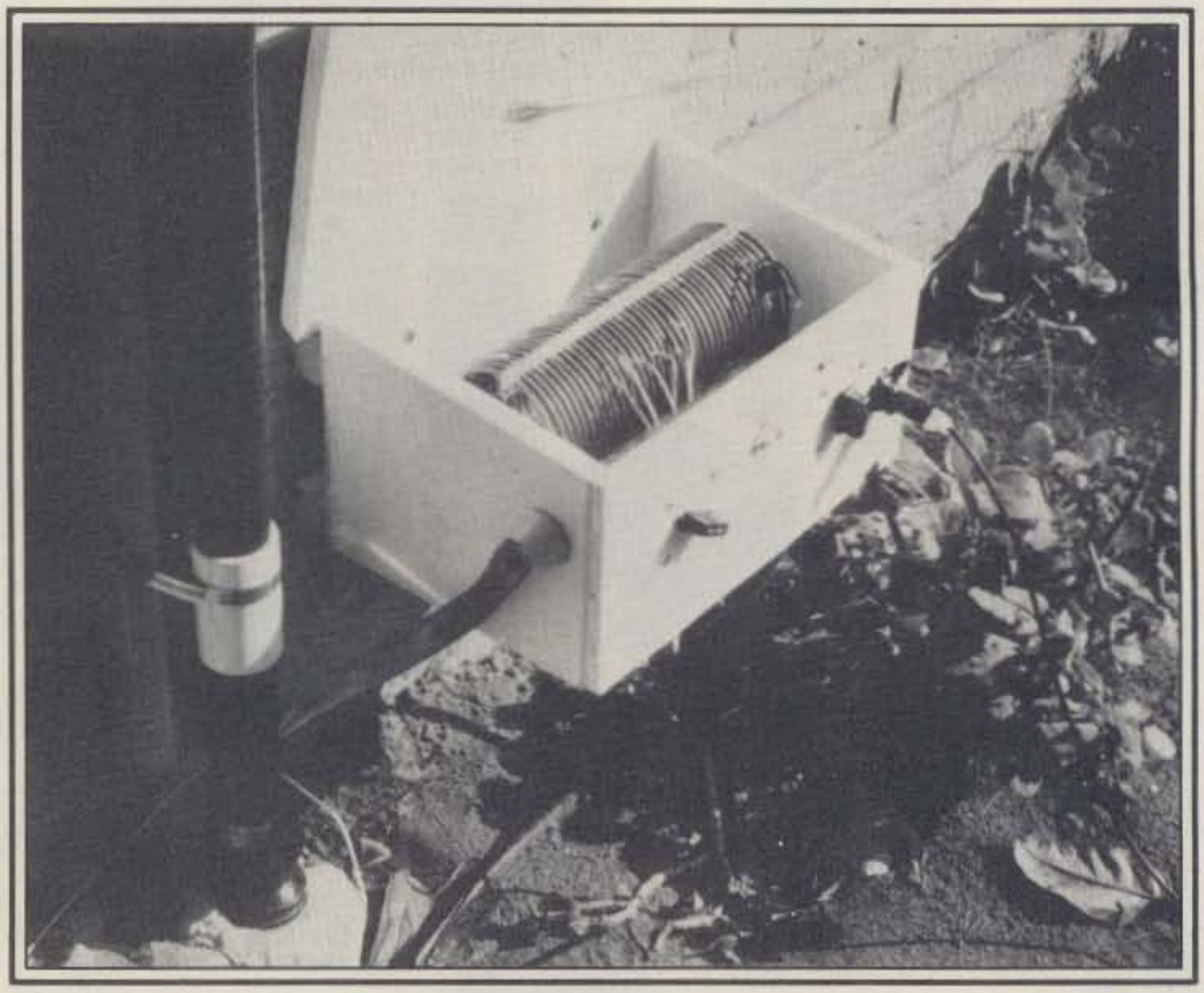
More manufacturers have added 160 meters to their transceivers as that band has become more popular. One of the most frustrating problems is what to do about an antenna?

A half-wave dipole would have to be 256 feet long. If you live in the city, this type of antenna is usually impractical. A 135 foot inverted "L" is difficult to put up on a city lot. If you bring the end into the shack, everything is hot with r.f. Also, the vertical portion should be 50 feet straight up; this requires a tall mast.

Many fellows getting on the band have a dipole on some band and just tie the coax feeder together and use it this way with an antenna tuner. They soon find out that they need something better. Those who have been on the 160 meter band a long time find that to work back east or west you need a vertical. Those who really get out have phased verticals and a good ground system. The book says the antenna should be 120 feet high and should have 120 radials, each 130 feet long. This is fine if you live on a farm. What to do?

My first vertical was a WA0RFF, which is no longer made. It was a 30 foot aluminum tube with a 260 uHy coil at the top using a tuned 8 foot rod. I made WAS. However, I could not handle it myself, and I had to guy it. I needed something I could handle by myself and made the one which I will describe.

It is a piece of 2 inch diameter, 20 foot long, aluminum irrigation tube bought from a sprinkler company for $20. If you cannot find this type of tube in your local area, all is not lost. Mr. Don Newcomb of Butternut Electronics, Route 2, Box 356E, San Marcos, Texas 78666, will sell tubing. (Send an s.a.s.e. for prices.) The 1½ inch tubing made of 6063-T832 alloy sells for $1.15 a foot. A 6 foot length is as long as he can ship due to UPS limitations, and freight is out of the question. I would use this all the way to the top and fit it together by inserting a small piece of tubing inside the larger tubing, riveting it with pop rivets. By doing this you would not have to guy the antenna, as it is rugged enough and will hold the coil at the top.



The copper base loading coil is made of 40 turns of 3/16 tubing, 4½ inches in diameter. The coil is tapped at several points to cover the whole 160 meter band.

My antenna resonates at 3600 kHz, and I had to bring it into the 160 meter band with a base loading coil.

Construction

Here is how I constructed my antenna. Taking a 20 inch long piece of 1⅞ inch o.d. PVC (white type), I filed and fitted it into the top of my aluminum tube. Next I secured it with stainless steel 10-32 nuts and bolts. Then I cemented a PVC cap on the top end of the tube. A coil made of 100 feet of #12 enameled copper wire was close wound on this tube. Every 2 inches I secured it with electric tape. When I got the coil all wound, I heavily wrapped it with Scotch-type electric tape. The top of the coil was soldered to a lug and fixed between the two brass nuts on the threaded part of the brazing rod screwed into the cap. The bottom was secured to the aluminum tube with stainless bolts. All joints were coated with GE RTV rubber compound, which turns into rubber.

The antenna was set on sawhorses and grid-dipped to see if it came out on 3600 kHz. Three pieces of 4 inch long 2⅜ inch PVC o.d. were sawed half way down the middle, making a clamp. The antenna was wrapped with one layer of tape and the PVC clamps tapped into place. The antenna was set on an insulator such as a beer bottle and raised into place against a 9 foot high 2 × 4 held to a block fence by carriage bolts. Stainless-steel hose clamps slipped over the PVC clamps, compressed the slot, and held the anten-

*528 Colima St., La Jolla, CA 92037

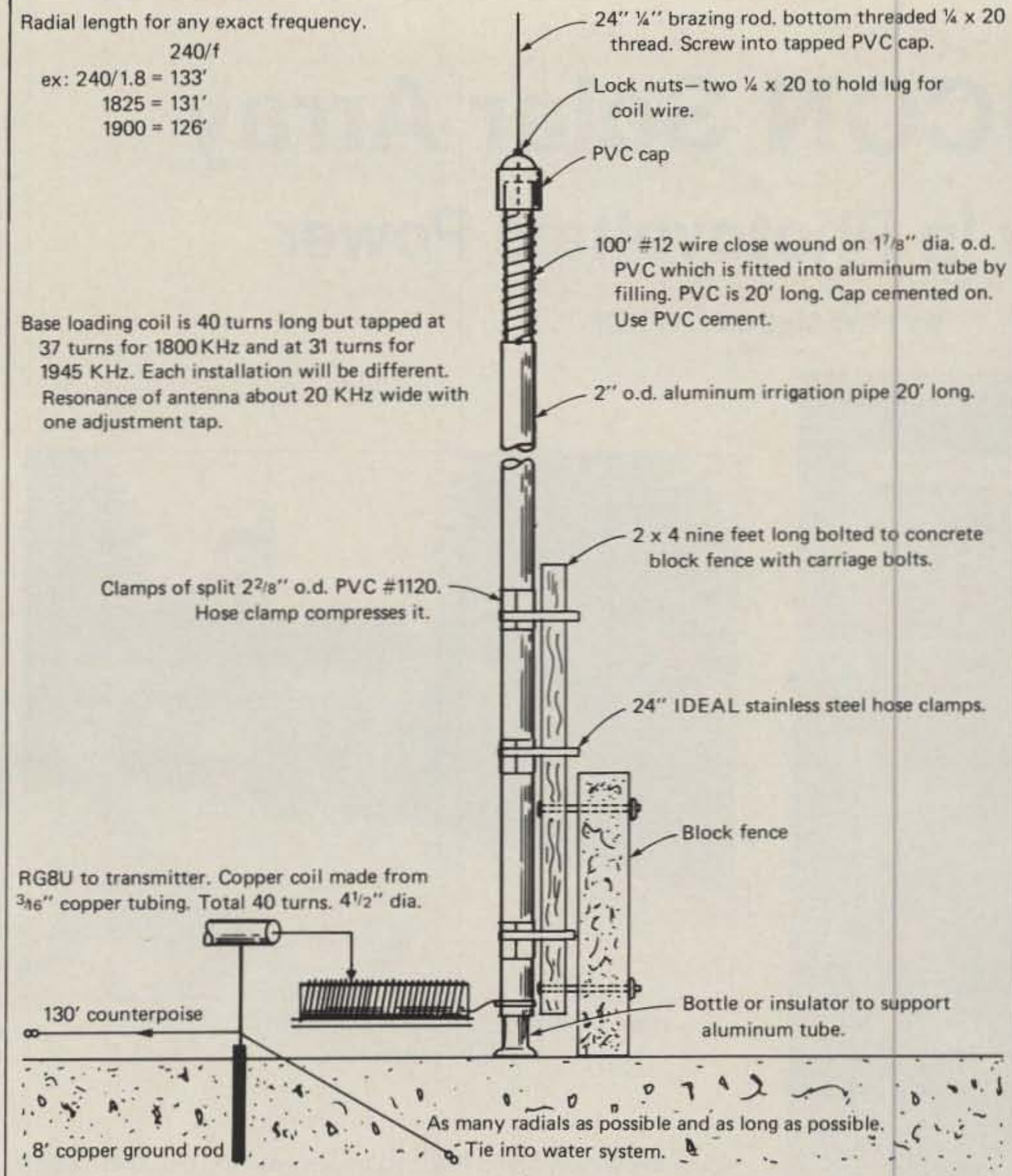


Fig. 1– The simple mechanical details for the 160 meter vertical antenna.

na securely. No guys were needed. I did the whole operation myself.

To tune the antenna I made a 40-turn coil of 3/16 copper spaced one turn diameter. I rolled mine on a tube 4½ inches in diameter, and then threaded it onto some plastic strips in which I drilled holes to keep the turns separate. My coil was supported on insulators and put in a big box at the base of the antenna. Next I drove an 8 foot copper rod into the ground and put out two radials 130 feet long and some shorter ones. It is important to get out as many radials as possible plus tie into your water-pipe system.

Tuning

For tuning I set a field strength meter on the fence and adjusted the tap until I got maximum output. At that point my s.w.r. was minimum. In my case I used a switch from a BC375E surplus tuner unit that had six positions. By tapping the coil at various places I could tune the entire band from 1800 to 1950 kHz. I found this series tuning worked best for me. I first tried the Marconi system, using a capacitor in series with a coil to ground and link to the transmitter. I found various lengths of coax changed the coil tuning, which could be an error in the meter itself. It was not stable as the series tuning. I found no discussion in the handbooks as to which is the best method.

This is a compromise antenna. It will get out in the daytime at least 30 miles around with good signal strength, and I can QSO 350 miles at noon across or up the coast (as in my location), but not inland.

As far as DX is concerned, you will need a lot of radials because of the ground losses. A vertical is very inefficient, but on 160 meters you have no choice, since all the stations seem to come in on ground wave. The better the vertical radiation, the further you will get. You will soon find out that it is not like the 80 meter band. A wire antenna just does not do the job unless you have a long sloper which is directional.

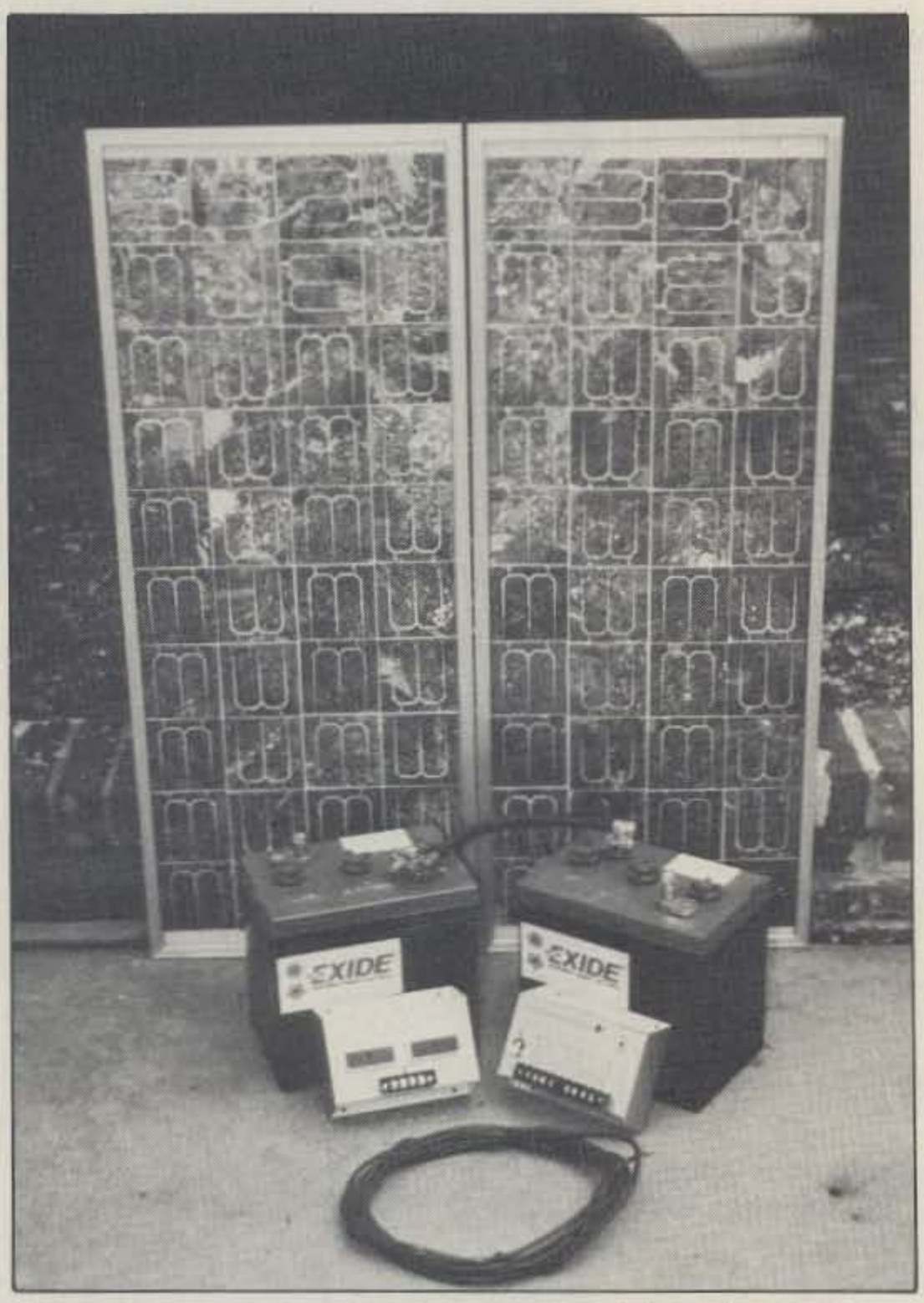
I hope this helps someone who has little room get on 160 meters. I envy those on farms who can put up phased arrays or 120 foot verticals with 120 radials. However, the 20 footer does the job! CQ

CQ Reviews:

The ENCON Solar Array

A Study In Photovoltaic Power

BY LEW McCOY*, W1ICP



This is the system described in the review. The solar panels are shown, and in front of them are the batteries, metering box, and sun-charger unit.

Here is WD8AHO installing the panels on the roof.

One nice thing about being on the staff of an amateur radio publication is that you have an opportunity to review new amateur and related equipment—and this can include a wide variety of items. This was the case with the Encon, Inc. solar array when I was offered the job of reviewing it. Like most people, I am interested in alternative sources of energy.

Probably the first question (aside from the cost) the average amateur would ask is, "Is solar voltaic power for me?" Hopefully, that question will be answered in this review. In the ordinary product review, the procedure is to describe the equipment and to tell how it works and whether or not it meets specs, etc. However, this review is going to try another approach. The equipment will be described, and in addition, I'll try to throw in some know-how about solar voltaic power and personal observations. I hope you will like this approach. If so, let the editor know and *CQ* will try more of the same.

*200 Idaho St., Silver City, NM 88061

Sunlight = Electricity

The process of converting light to electricity, in this case, is called "photovoltaic conversion." Basically, a solar cell is constructed of P- and N-type silicon material. When light (photons) strikes the solar cell, the P-silicon material absorbs the photons. When this takes place near the p-n junction, electricity is generated. If a load is connected to the solar cell, current will flow. While this is a generalization, the average solar cell will produce about ½ volt of electricity. A solar cell that has a surface area of approximately 1 square inch will produce about 150 milliamperes of current in full sunlight. By enlarging the solar cell area and putting cells in series, it is possible to obtain relatively large voltages and useful amperage figures. For example, a single Encon SX-110 solar panel measures approximately 17.5 by 42 inches. In full sunlight it will produce 36 watts, or 17.25 volts at 2.1 amperes (at peak power). In reduced light, the output is, of course, considerably lower, running about 1 ampere with 40 percent sun.

The system that I tested consisted of two panels which produced a peak power of about 70 watts at a 4 ampere charging rate in full sunlight. By charging rate, I am talking about what went into two series-connected, 6 volt, deep-cycle batteries. The reason for two 6 volt batteries is that the 6 volt types are available in higher current ratings than the 12 volt types. About maximum for a 12 volt battery is 105 *ampere hours*. The 6 volt units used in this case are Exide 185 *ampere-hour* batteries, which provide 12 volts at 185 *ampere hours*. Incidentally, that

The system batteries and charging units are mounted in the back of a closet.

This will give you an idea of what a solar-power amateur radio station looks like (except for the panels on the roof).

last sentence is enough to drive many amateurs right over the edge! Exactly what does "*ampere-hour*" mean? Does it mean that you can draw 1 ampere for 185 hours before the battery goes down? Or does it mean that you can draw 185 amperes for 1 hour?

Ampere/Hours Explained—Maybe

As far as I can determine, the ampere-hour rating is simply a method of providing a "ball park" figure of what a battery will do. And if that confuses you more, join my club. Probably one couldn't draw 185 amperes for 1 hour, but conceivably, one can draw 1 ampere for 185 hours. A lot of other variables get into the act, such as temperature, battery voltages, and so on. Exide Corp. publishes data on their deep-cycle batteries, and it might be useful to pass on some of that information. It might help in understanding **a**mpere/**h**our (**AH**) ratings.

The battery used in our tests is the PHv-DE30 which, as stated above, is rated at 185 AH. The Exide ratings consider the maximum amount of discharge at 80 percent of full rating. This would be 80 percent of 185, or 148 AH. However, they provide information that exceeds that rating. For example, for a 6 hour rate, 25.8 amp equals a 155 AH total. Or, a 24 hour rate is equal to 7.7 amp for a 170 AH total. And, a 72 hour rate of 2.8 amp, equal to 200 AH, is given (well over both the 80 percent and 185 AH rating). It is like some engineers say: 2 plus 2 equals 4—sometimes! If you give a battery engineer all the necessary data, such as the temperature, battery condition, and so on, he probably can give you a definite figure as to AH. However, a generalization is probably best. Also, one should keep in mind that these batteries are designed for heavy industrial use, such as running golf carts, fork-lift trucks, and so on. In amateur or home service they probably would never be subjected to such heavy use. Of course, the lighter the usage, the longer and better the battery will survive.

Operating Time—How Much?

Of course, all this boils down to what an amateur can expect to operate in terms of time and power using a solar voltaic system. In my case it was quite simple. I decided that I would use a 200 watt draw on transmit, which amounts to about 15 amperes at 13.6 volts. This is pretty close to what most of the modern-day rigs will draw (or could be loaded to) under a key-down condition, so it should give you a good idea of what you can do. Additionally, I had a 2 meter rig hooked up that drew 5 amperes on transmit and I used this along with the low-frequency gear.

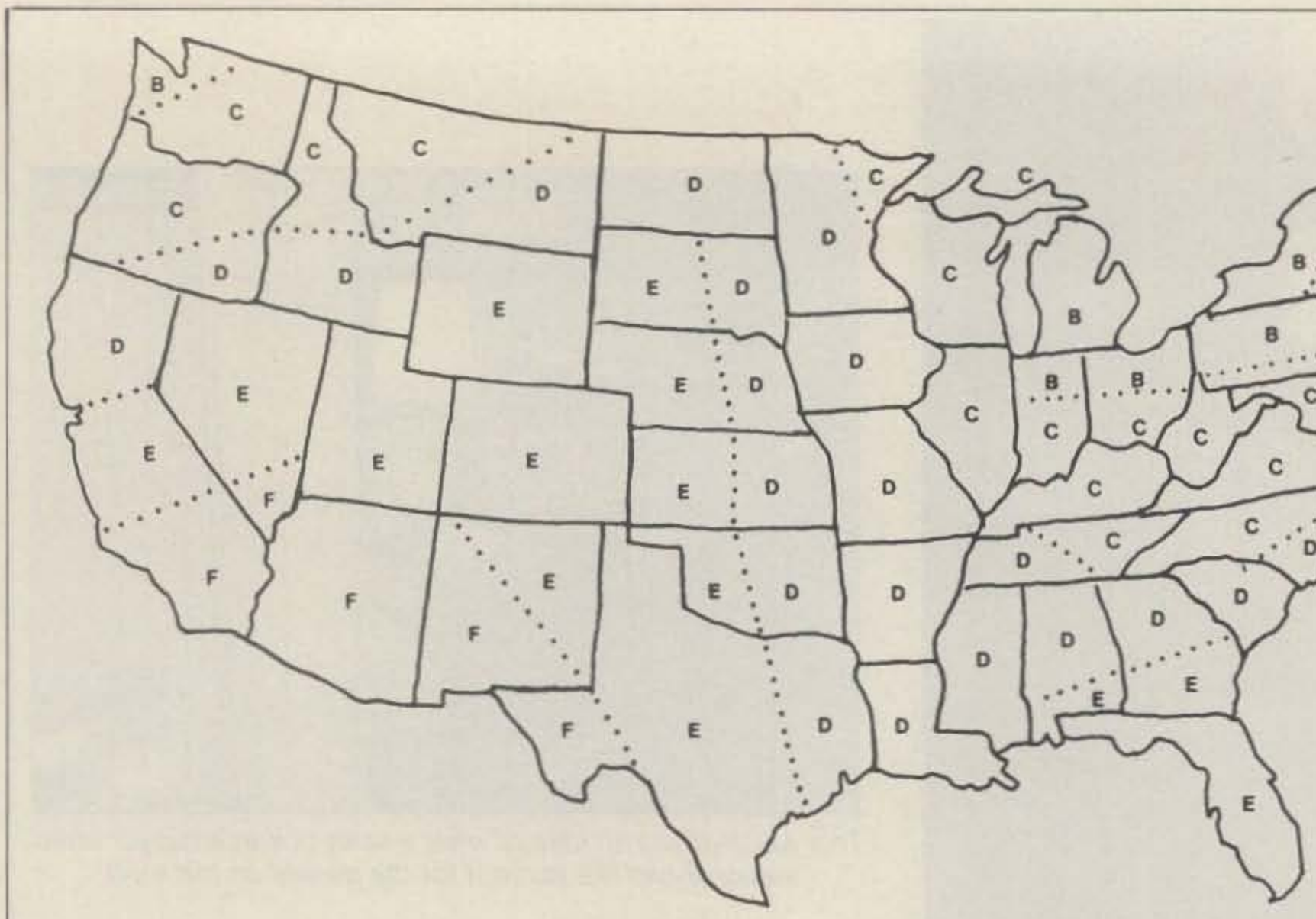
I determined, at least to my satisfaction, that if I had to (such as in an emergency operation), I could run a 15 ampere load for about 10 hours steady. An amateur would have to be really long winded to do that much "key down" operating!

At the outset, let me state that in no case, even during contest operating, did I run down the batteries. If you make the same tests I did, you'll be surprised at your actual transmitting time on any given day. Aside from the contest operating, I don't believe I ever went over 60 minutes of actual transmitting time. That includes the duty cycle on single sideband—a type of operation that is power saving. When you don't talk (spaces between words, etc.) you don't use as much power. What I am trying to say is that at no time during amateur radio use did I go over the power storage capabilities of the solar system.

If you have no method of measuring the current you draw with your equipment, it is easy to make a calculated guess. The instruction book will show you (or should show you) what the transmit current drain is. Knowing that figure, you can calculate how much you would draw from a battery storage system.

It depends, of course, in what part of the country you live as to how much power you will derive from a given system. Fig. 1 (from Encon material) will give you a rough idea. A single-panel system will produce a peak output of about 30 watts at 2 amps. Two panels, such as I tested, will produce 64 watts at 4 amps peak. Fig. 1 shows what to expect from these systems for your location in the country. I might add that the Encon catalog goes into considerably more detail than given here.

The system I tested consisted of two SX-110 panels, an SCI



Map Reference	Watt Hours Per Day Single Panel	Double Panel
A	96	192
B	112	224
C	128	256
D	144	288
E	160	320
F	192	384

Fig. 1– The map and the codes will provide you with a rough idea of what kind of power a single- or double-panel system will provide. While Alaska and Hawaii are not shown, it could be assumed that Alaska would be an "A" zone and Hawaii an "F" zone.

charger, a metering box, two batteries, and panel mounting hardware. The panels have a support system made from heavy-duty aluminum angle stock so that the panels can be mounted to a supporting surface and then adjusted for the best light angle. The weight of the two panels with mounting equipment is about 50 pounds, and as stated earlier, it measures 35" × 42" × 3".

The SCI charger is a small, inexpensive, efficient charge control unit for use in photovoltaic energy systems. The "SCI" stands for Specialty Concepts Inc., an excellent company that manufacturers support equipment for power-generating equipment. The SCI unit consists of a two-step battery charger and load management system. Its method of operation is as follows. When the sun rises in the morning, the charging relay closes, connecting the solar panels directly to the batteries. This is known as the **constant current** charge mode and is the first of the two-step charging sequence. When the batteries reach 15 volts (indicative of a 95 percent state of charge), the charging relay will open. At this point the float regulator takes over, supplying up to 3 amperes to the batteries. This is the "constant current" charge mode and is the second charging step. As the battery voltage approaches 14.1 volts, the current will taper off, eventually falling to the batteries maintenance current (typically less than 500 ma). If a load is applied at this time, the float regulator will supply 3 amperes to maintain the battery charge. If the load current is less than 3 amperes, the batteries will still be receiving a net charge from the float regulator. If the load current is greater than 3 amperes, the batteries will supply what the float regulator cannot.

In the latter condition, the battery terminal voltage will fall. When it falls below 12.5 volts, the charging relay will close again, reinitiating the "constant current" charge mode. This ensures that if a large load is applied during the day, the maximum use will be made of the power available from the panels. If no power is available (sun is set), the relay will be automatically prevented from closing.

The metering box consists of an easy-to-read d.c. voltmeter and an ammeter. These provide a visual monitor of the system. Finally, there are the two 6 volt, series-connected 185 AH Exide batteries.

The $100 Question: How Much?

We've read in the literature that solar cells are going to drop in cost until they will be competitively priced with the power companies. Unfortunately, this is only partly true. It is like a "Catch 22 proposition." Until the public starts to buy solar power in quantity, the prices will remain relatively high. The system that I tested costs between $1000 and $1500. Why not an exact figure? Simply because Encon is willing to work with radio clubs and individuals on a "budget" and can arrange discounts for clubs, repeater organizations, emergency groups, and so on.

After the initial outlay, there are practically no additional expenses—at least not for years. While battery manufacturers are careful to put relatively short terms on battery life (typically 5 years), in actual practice (non-commercial practice, that is) life spans of 15 years are customary. In my opinion, photovoltaic solar power is a very good deal for repeaters and emergency groups. Personally, if I were younger (not 66 and retired), it would be given very serious consideration. One thing for sure, it appears the power companies are going to keep on increasing their charges to customers, and I for one would love to sit and laugh at them if I had my own.

Another application for solar power would be for any amateur who lives in a mobile home, whether it be a trailer or motor driven vehicle. Such units use deep-cycle batteries to supply power when one doesn't have access to a.c. Being that the batteries are already in place, the cost of a single solar-panel installation certainly would be worthwhile.

So is it for you? Solar photovoltaic power is certainly worth looking into. Paul DeNapoli, WD8AHO, pictured in the roof-top photo, is the Communications System Director for Encon. He is a very active, enthusiastic amateur and will be happy to help you. So, if you have more questions, write or call Paul. The Encon catalog shows many different types of systems, plus all kinds of devices that can be operated from 12 volts d.c.

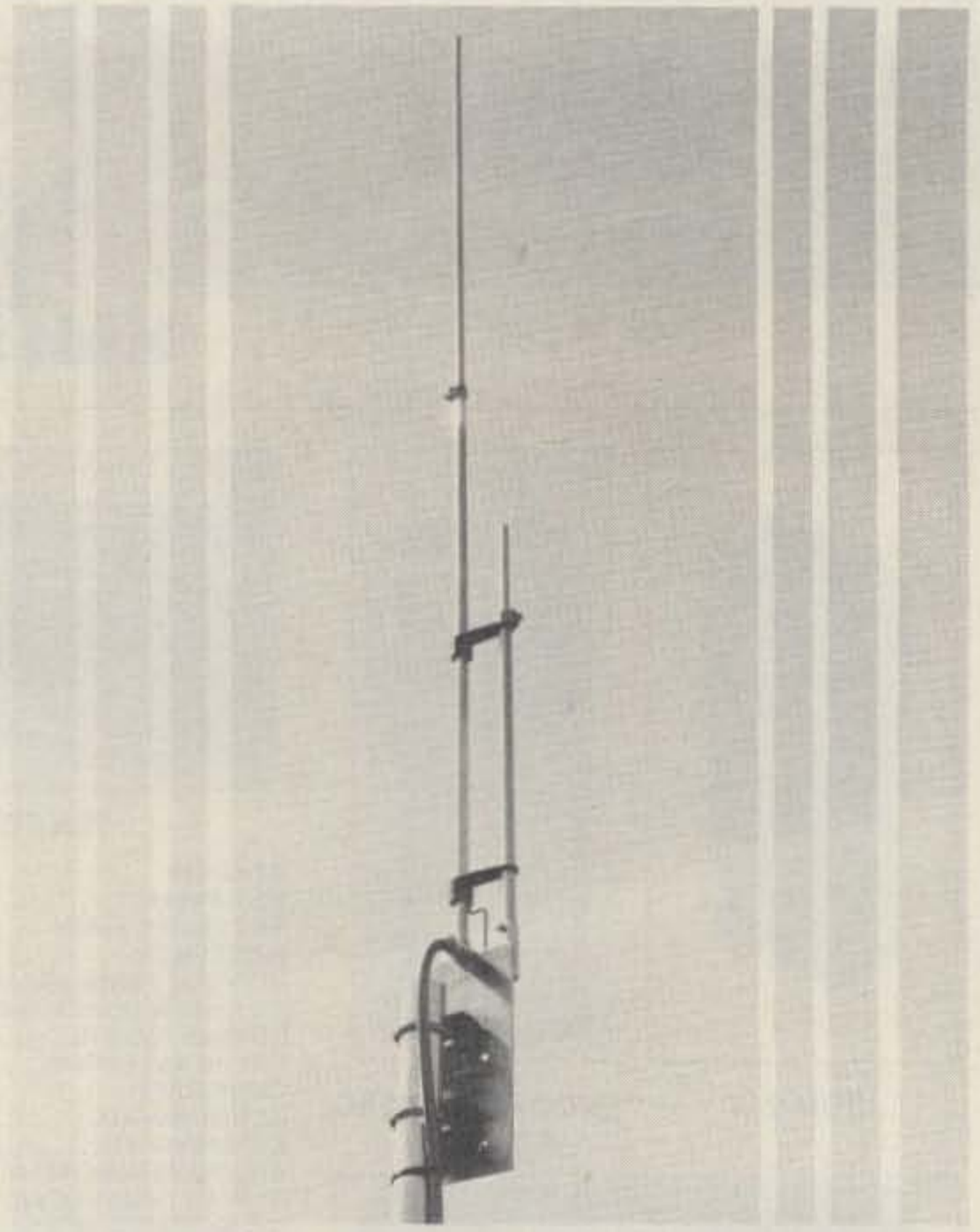
Life I said at the outset, this is a different kind of product review. What do you think of it?

Oh yes, what do I think of the Encon system? It has to rate at the top in design, construction, and performance. Their address is Encon Inc., 27584 Schoolcraft, Livonia, MI 48150. ▣

CQ Reviews:

The KLM JV-2 "J" 2 Meter Vertical Antenna

BY DAVE INGRAM*, K4TWJ



The KLM JV-2 is approximately 57 inches high and mounts on either 1½ or 2 support pipes.

Every few years the need or desire for a new and more effective 2 meter antenna seems to afflict a vast number of amateurs. This situation may be due to area weather conditions, station upgrades, or simply adding new capabilities to a weekend or vacation site. Whatever the reasons, all of us want maximum performance for our dollars spent.

The JV-2 antenna provides gain and performance. Our "fringe area" f.m.-direct communications with this antenna definitely have outpaced its ⅝-wave predecessor by several miles, and the improvement over a quarter-wave antenna has been phenomenal! Hmmm—maybe some type of plumbing or mast mount should be rigged for also using the thing mobile!

The antenna itself can be assembled and readied for use in a few minutes. The two radiating elements (one 19 inches and one 57 inches) each consist of two lengths of concentric tubing. These top sections are slipped into lower sections which are then placed in tubing holders on the steel mounting bracket. The radiators are then fitted with a plastic spacer, and their lengths are set according to KLM's tuning chart. A gamma match is included; its position is merely checked or slid up/down for friction adjustment. Finally, "U" bolts for a 1½ or 2 inch mounting pipe are placed on the steel bracket, and the antenna is ready for installation. (The mounting bracket is drilled for either, and both sizes of "U" bolts are included.) An SO-239 coax connector is used on the antenna mounting bracket. We suggest using a small amount of the new Coax Seal ™ on both sides of this connection for maximum weather protection. Frankly, we've been using the antenna in a variety of locations and haven't stopped moving it long enough for weatherproofing. This gem fits smoothly in an auto, allowing use at almost any location without the hassles of beam antenna assembly. This is a definite plus for on-the-move amateurs.

The first time we used this antenna was for a spur of the moment need. We were trying to contact the Robot operator on RS5 or RS7 (the Russian satellites), and our multi-element "twist" antenna couldn't be swung in that upcoming orbit's direction. In desperation, I ran outside with the J vertical and a length of new RG8X coax (using old coax on a new antenna is like putting four bald tires on a new car). The antenna was hung almost horizontally on a nearby bent pole and was cabled to the awaiting 40 watt, 2 meter rig. Whaddayaknow—our signals came back through the satellite solid copy! Switching down to the 2 watt level, our (weaker) signals could still be heard through the spacecraft.

I didn't contact the robot operator on any passes that day; numerous amateurs calling simultaneously cause the robot to hear massive carriers and total bedlam until all cooperate and only one station is transmitting. Please, gang, play according to those rules so we can all enjoy the fun. Fortunately, however, we managed a robot QSO on a "slack pass" (?) the next day, and while using the KLM "J"! The antenna was then moved and used for a variety of f.m. operations. The s.w.r. was always below 1.3:1 without any tuning. Nice.

Whether they're used in fixed or portable activities, 2 meter "J" verticals allow truly enjoyable and worry-free operations. The most surprising fact, however, is their noticeable gain. Since this factor can be real-life influenced by individual installation locations, proximity to nearby objects, etc., attempting to estimate specific figures wouldn't be logical here (a ¼-wave vertical operating across beach area, for example, can outpace a ⅝ vertical operating across heavily wooded areas). The KLM "J" with its superb construction, gamma match, and ground decoupler, however, will radiate a respectable signal from your 2 meter f.m. or s.s.b. rig. It can be mounted on a short or long pipe, on a wooden pole, atop the rotor pipe on a tower and beam setup, or on the side of a house with very little (if any) support interaction. Its low angle of radiation will do a creditable job of accessing fringe repeaters, and its "low profile" should blend with the most discriminating of locations or neighborhoods, whether motels, motor homes, or mansions.

If you're considering an inexpensive yet rugged 2 meter antenna, the JV-2 is a winner. We might also mention that KLM produces a similar "J" antenna for 6 meters (JV-6). Excepting physical dimensions, that radiator is almost identical to its 2 meter counterpart (radiating element approximately 15 feet, stub section approximately 57 inches). I've also used this antenna with a QRP setup on 6 meters, and its performance is also quite outstanding. That may be a lot of "J's," but it's also a lot of performance!

The manufacturer is KLM Electronics, P.O. Box 816, Morgan Hill, CA 95037.

*Eastwood Village No. 1201 So., Rt. 11 Box 499, Birmingham, AL 35210

Awards

a monthly feature by
A. EDWARD HOPPER, W2GT

NEWS OF CERTIFICATE AND AWARD COLLECTING

The April Story of the Month as told by Norm is:

Norman M. Talley, Jr., W4ARH
All Counties #370 4-8-82

"I was licensed in 1953 while attending Southern Technical Institute in Atlanta, Georgia. Shortly after graduation in 1954, I entered the Air Force. I operated as DL4JC while with the Security Service in Germany. I served a tour in Alaska as W4ARH/KL7, and operated in Italy as I1AFS and I1DFA while assigned to NATO's Southern Region Headquarters.

"I first became addicted to County Hunting through Ben, K5YWX (now W6TCD), while at Warner Robins, GA. Then came an extended vacation to Southeast Asia in 1968. I came back to County Hunting in 1970 in Louisiana, but left again in 1971 when I returned to Naples, Italy, for another 7½ years with NATO.

"I returned to South Carolina in 1978, but due to the nature of the job, I didn't get back to County Hunting until 1980. After retiring from the Air Force, I came back home to Georgia. From that point on the counties started falling rapidly into place due to the great bunch of people on the County Hunters' Net.

"The final county came after 14 years, 29 days, 1 hour, and 10 minutes (with breaks) when Mac, W0RKQ, drove up to Thurston County, Nebraska. He was one county away, and I was caught 20 miles from home with a broken antenna connection on the mobile. Several other things were broken getting back to the home station, arriving in my driveway just as the NCS was announcing him on the county line.

"I couldn't begin to list all the good friends who have contributed to the arrival of that final county. I hope one big "thanks" will be adequate to recognize all the fine people who have helped me make it. I guess old habits are hard to break, so I'll be heard on the County Hunters' frequency for some time to come."

Special Honor Roll
All Counties
#409 H.F. Skip Skaptason, VE4SK 12-9-82
#410 Dick Scott, N7AKT 12-18-82
#411 Leland A. DePue, KF5F 12-23-82

P.O. Box 73, Rochelle Park, NJ 07662

John Alley, W9JR, All Counties #188, mobiling in Pine Level, North Carolina in 1981. His story was in June 1981 CQ.

Awards Issued

Skip Skaptason, VE4SK, added All Counties endorsed All 14, All S.S.B. to his fine collelction.

Dick Scott, N7AKT, waited until he had them All and then requested USA-CA-500 through All Counties endorsed All S.S.B., All 20, All Mobiles.

Lee DePue, KF5F, also waited until he had them All and then applied for USA-CA-500 through All Counties endorsed Mixed.

Bill Sempert, K8OHC, added USA-CA-2000 endorsed Mixed to his collection. (Sorry that an error was made in the spelling of his name in Janaury *CQ*.)

Takashi Tabata, JA3WBK, now has USA-CA-500 and 1000 endorsed All 28 MHz.

Ferdinand Bertel, DJ3BE, was issued USA-CA-500 endorsed All A-1.

Mura Romeo, IS0RZW, applied for USA-CA-500 endorsed All S.S.B.

USA-CA Honor Roll

3000		2000		1000	
N7AKT	438	N7AKT	552	JA3WBK	755
KF5F	439	K8OHC	553	N7AKT	756
		KF5F	554	KF5F	757
2500					
N7AKT	498	**1500**		**500**	
KF5F	499	N7AKT	619	DJ3BE	1794
		KF5F	620	IS0RZW	1795
				N7AKT	1796
				KF5F	1797

Awards

Five Band WAP: As part of NZART activities for World Communications Year 1983, a Five Band WAP award will be available.

Required: QSO 30 eligible Pacific countries (as count for Oceania for WAC) each on five different bands, making a total of 150.

Action: Send list of log extracts (QSL's not required to be held) to NZART Awards Manager, 152 Lytton Road, Gisborne, New Zealand, with $6.00.

Reward: Wooden shield surmounted with NZART badge and appropriately inscribed. Extra postage if airmail required overseas is $3.00.

IARU Region III Operating Award: Offered to publicize Region III.

1. The award is available to licensed amateurs and s.w.l.'s.
2. Contacts made after 5 April 1982 are eligible, but certificates will date from 1 January 1983 as part of World Communications Year.
3. QSL cards not required. Send certified list of eligible contacts from log book.
4. Cost is $1.00 surface, $2.00 for airmail, for postage charges only.
5. Basic award requires 7 countries; Silver Star endorsement requires 12 countries; Gold Star endorsement requires 17 countries.
6. Awards may be endorsed for any mode or band.
7. Eligible countries: Japan, Australia, New Zealand, Korea, Philippines, Hong Kong, Thailand, Papua/New Guinea, Fiji, Singapore, India, Indonesia, Malaysia, Sri Lanka, Tonga, Western Samoa, Solomon Islands.
8. Send applications to NZART Awards Manager, 152 Lytton Road, Gisborne, New Zealand.

The Introduction of Rainbow Trout to New Zealand Centennial Award: The Rainbow Trout (Salmo gairdner) was transported to New Zealand from the Sonoma River (California) and arrived in New Zealand in early April 1883. Since then this species has become well adapted to New Zealand conditions and world famous as a sporting fish as well.

During April 16–23, 1983, Taupo will be host to guests from all over the world to celebrate the event with processions, beer fest, fishing contest, golf, art fairs, country and western events, etc.

NZART Branch 60 sponsors the Centennial Award, which is an attractive color picture on card suitable for desk stand or wall mount. It is well worth the effort to get the award. The rules are as follows:

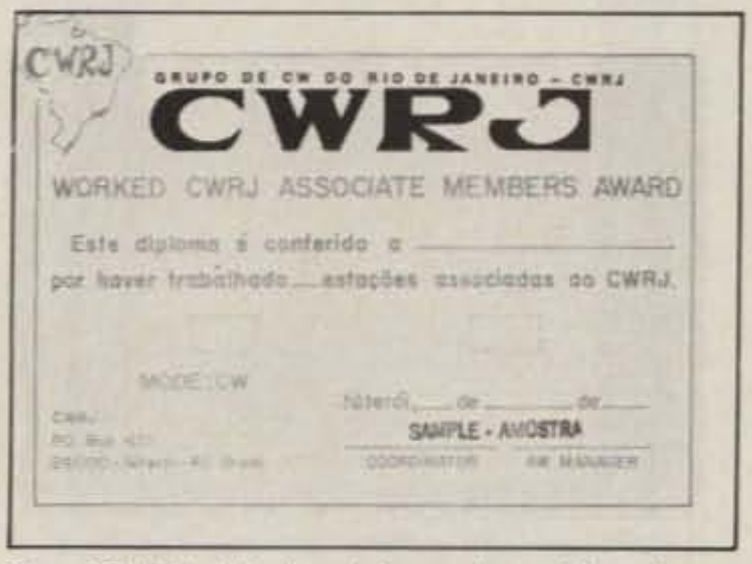
1. Contacts with stations in the vicinity of Lake Taupo between and including the dates 13th April to 23rd April 1983.
2. Same station on different day is a new contact.
3. Same station on a different band or using a different mode on the same day is a new contact.
4. Use of repeater(s) is allowed, but counts as one band.
5. Have to say the name of the award during the contact.
6. Basic award is 10 contacts; Gold Star for every 10 thereafter.

7. Overseas awards, 3 contacts.

8. Enclosed $1.00 with copy of log data to: Centennial Award, Box 910, Taupo, New Zealand.

Branch 60 members will be active all bands, all modes during the period.

The CWRJ Awards Program of the CW Group of Rio de Janeiro State: All awards are c.w. only. Information can be obtained from W5XW Associate Member #54, CWRJ U.S.A. Representative. CWRJ Team Members as of October 1982 are (PY1) AFA, AFG, AJK, ASI, BZF, BGI, BMF, BOA, BQQ, BUG, BUL, BVY, CBW, CC, CCX, CCY, DCG, DEA, DFF, DGB, DIN, DJY, DN, DPG, DUB, DUH, DWM, EBK, EWN, FB, HQ, LG, MHQ, MKA, RJ, TCJ, UET, URQ, VB, VEC, VKA, VLR, VMV, VOY, WDS, WO.



The CWRJ Worked Associate Members Award.

Worked CWRJ Associate Members Award (WAMAW): C.w. only. Work 10 CWRJ associate members and/or CWRJ operator team members. Endorsements, 2: first is 5 additional CWRJ associate members, second is same.

Send log data, call/date, certified. Fee is 6 IRC's. QSO's valid after 1-1-82. Manager is PY1EWN, P.O. Box 621, 2400 Niteroi, RJ, Brazil.

Note: CWRJ Associate Membership is available to foreign amateurs with a profound interest in Brazilian CW Groups' activities, awards, etc. S.a.s.e. to W5XW for details in English, PY1EWN in Portuguese, DJ3WM in German.

The CWRJ Brazil's Frontiers Award.

Brazil's Frontiers Award (BFAW): C.w. only. Work 5 countries which have frontiers (borders) with Brazil: FY, PZ, 8R, YV, HK, OA, CP, ZP, LU, CX. Send certified log data, call/date. Fee is 6 IRC's. QSO's valid after 1-1-82. No endorsements.

The CWRJ "YL" Flowers Award.

Manager is PY1DFF, P.O. Box 1045, 24000 Niteroi, RJ, Brazil.

CWRJ "YL" Flowers Award (YLAW): C.w. only. With the first letter of the suffix of the call sign of stations worked in the 10 meter (28 MHz) band spell the names of 5 flowers (English or Portuguese names). Stations worked must include 5 YL operators. YL stations may be used to substitute letters in the names of flowers (as in poker: Wild Cards). YL contacts may be on any band. Contacts may be any country. Endorsements: none.*

Send log data, certified, calls (listed in order to form names of flowers) YL info, date. Fee is 6 IRC's. QSO's valid after 1-1-82. Manager is PY1DWM, P.O. Box 24039, 20522 Rio de Janeiro, Brazil.

The Worked CWRJ Awards.

Worked CWRJ Awards (WRJA): C.w. only. Applicants must have the basic CWRJ Award plus five others from the CWRJ Awards Program. Endorsements: none.* Send certified log data numbers/names of awards. Fee is 6 IRC's. Manager is PY1DFF, P.O. Box 1045, Niteroi, RJ, Brazil.

Important Notes (GCR applies):

1. All awards c.w. only, 2-way, or s.w.l. All bands mixed unless otherwise noted.

2. A single CWRJ operator team member may be used for more than one CWRJ award, but only if worked on other bands, or on different date.

3. CWRJ associate membership is available to foreign amateurs.

4. *On initial application, any award will be endorsed "QRP" upon request and proof.

5. Endorsement seals fee: none. Send s.a.s.e. and 1 IRC for surface mail.

All Africa Award: To qualify for the All Africa Award, confirmation must be submit-

ted of one contact from each of 34 different call areas in Africa. Please note that all call areas must be on the continent of Africa. Islands round about Africa do not count for AAA.

Contacts *must* include one contact from each of the 6 ZS areas (i.e., ZS1, ZS2, ZS3, ZS4, and ZS6) plus one contact each with Botswana A2, Lesotho 7P8, and Swaziland 3D6 (ZD5). These 9 contacts are necessary. The other 25 contacts may be with any of the areas later listed, one contact confirmed from each area. When the original areas have changed country prefixes, all the present prefixes that constitute the original area will count, as well as former country prefixes. All contacts must have been made after November 1945 with minimum reports of 338 or 33.

A list indicating callsigns, mode of operation, date, and signal report must be submitted, accompanied by QSL cards confirming contacts.

In the case of applications from members of societies that are member societies of the International Amateur Radio Union, applications will be accepted if properly listed, duly checked, and certified as being correct by the awards manager of the society concerned. The certificate is issued free of charge to members of the S.A.R.L. and a charge of R1,50 (10 IRC's) post-free to non-members is required.

List of call areas from which 25 contacts may be obtained to add to the 9 compulsory contacts previously listed:

Name of Country	Prefix
Algeria	7x2, 7x3
Angola	D2-3, CR6
Benin	TY
Bophutatswana	H5
Burundi	9U5
Cameroons	TJ
Central African Repub.	TL8
Chad	TT8
Congo Brazzaville	TN8
Congo Kinshasa	9Q5
Dahomey Republic	TY2
Djibouti	J2
Fr. Somali	FL8
Egypt	SU
Equatorial Guinea	EA0
Eritrea	ET2
Ethiopia	ET3
Kenya	5Z4
Liberia	EL
Libya	5A
Malawi	7Q7
Mali	TZ
Mauretania	5T5
Mocambique	C9
Morocco (Ceuta Melia)	CN8
Niger Republic	5U7
Rwanda	9X5
Senegal	6W8
Sierra Leone	9L1
Somali Republic	601 & 602
Sudan	ST
Tangier	CN2
French Morocco (Tangier)	CN
Gabon	TR
Gambia	C5 (ZD3)
Ghana	9G1
Republic of Guinea	3X
Rep. of Guinea Bissau	J5, CR3
Ifni & Rio de Ora (Now part of Morocca CN8)	EA9
Ivory Coast	TU2
Tanzania	5H3
Togoland	5V4
Transkei	S8
Tunisia	3V8
Uganda	5X5
Venda	V9
Volta Republic	XT2
Zambia	9J2
Zimbabwe (Rhodesia ZE)	Z2

Note: ZS2MI is on Marion Island and does not count for the AAA. Send all applications to the Awards Manager, South African Radio League, P.O. Box 3911, Cape Town, 8000, Republic of South Africa.

Top Band Certificate—160 Meter:

1. To qualify for this certificate ZS stations must submit proof of contact with at least 5 ZS divisions within the Republic of South Africa and one other contact from ZS3, 3D6, 7P8, or A2C, *or*

2. ZS stations must submit proof of contact with 3 DX stations within 1600 kilometers (1000 miles) of the borders of the Republic of South Africa, *or*

3. ZS stations must submit proof of *one* contact with a DX station beyond 1600 kilometers of the borders of the Republic of South Africa. A list of call signs, mode of operation, date, and a minimum signal report of 338 or 33 must be submitted with the QSL cards and posted to The Awards Manager, S.A.R.L., P.O. Box 3911, Cape Town, 8000, Republic of South Africa.

4. DX stations within 1600 kilometers of the borders of the Republic of South Africa must contact 3 ZS divisions in the Republic of South Africa to qualify for this award.

5. DX stations beyond 1600 kilometers of the borders of the Republic of South Africa need to contact only a single Division of the Republic of South Africa.

6. DX application lists without QSL cards from members of societies which are members of the IARU are acceptable if duly checked and certified by their awards managers.

7. All contacts must be made after 1st January 1960 with minimum reports of 338 or 33.

8. The certificate is issued free of charge to members of the S.A.R.L., but non-members are required to pay a charge of R1,50 (10 IRCs).

(Thanks to Koos, ZS1AW, for the data on these two awards.)

The UN-DU Award of the Philippine ARS: Data was in *CQ* February 1981 and updated in October 1981. Here is data for U.S. applicants: Loren A. (Pete) Peterson, K6EDV, 845 Ramona Drive, Santa Rosa, CA 95404, has been appointed as authenticator for all U.S. hams applying for this award. All U.S. applicants should send their QSLs, Xerox copies, and alphabetical list to K6EDV. After copies have been authenticated, QSL's, copies, and list will be returned to the applicant who will then send copies and list only to P.A.R.A., 17th floor, Philcomcen Bldg., Ortigas Avenue, Pasig, Metro Manila, Philippines. This eliminates the chance of original QSL's being lost.

The Best Little DXpedition in Texas: If you were fortunate enough to work the special event station W5VD (very distinctive) between 1200Z March 12th and 1800Z March 13th when it was operated at the Chicken Ranch, you can get the special certificate and QSL. Apply to: W5VD, P.O. Box 3225, Bryan, Texas 77801.

The Chicken Ranch Award.

Notes

As this is being written at the end of December, may I thank all of you for your cards and letters. Please realize that it is absolutely impossible for me to answer them all, but you know my wishes for a great 1983 for all are with you.

A sad blow was the loss of my friend and a very active County Hunter Howard Gifford, WA2WCW, who had been a great help to me for a long time. He will be greatly missed. His photo/story was in November 1979 *CQ*.

Another reminder: As of 1 January 1983, La Paz, Arizona, is a new county formed from the northern third of Yuma County. (Thanks to Mort, WB7VIZ, and John, K7SE, for this data.) Also as of 1 January the All Counties Plaque will cost $40.00 (the cost to us went up 1 November). As of 1 January 1983 three and four county lines will not be accepted for USA-CA. These are from parks and reservations, etc., not wholly within a single county. To avoid confusion, give out one county within one state.

A letter from N7DYS states that he would be happy to make skeds with anyone needing Camas County, Idaho. Write to: Mark W. Johnson, N7DYS, Box 251, Fairfield, Idaho 83327.

A note from KC5ND offers skeds for anyone needing Rockwall County, Texas. Write to: Wayne Brandon, KC5ND, Rt. 1, Box 177-E, Rockwall, Texas 75087.

73, Ed, W2GT

ANTENNA/TOWER SALE!

PRO-SEARCH COMPUTERIZED ANTENNA SYSTEM CONTROL

THE MOST ADVANCED ANTENNA CONTROL SYSTEM AVAILABLE—Computerized—Talks—Scans Programmable—Auto Brakes Order Your Pro-Search Today!

AVAILABLE FOR EXISTING CDE OR TELEX ROTORS OR WITH NEW TELEX HAM 4 OR TAILTWISTER MOTOR UNITS!

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Pro-Search Talking Controller List $551.91 - Now Only $489!
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Pro-Search Talking Controller With Telex Ham 4 Motor $599!
Pro-Search Non Talking Controller W/Ham 4 Motor Only $479!
Pro-Search Talking Controller With T2X Motor - Only $649!
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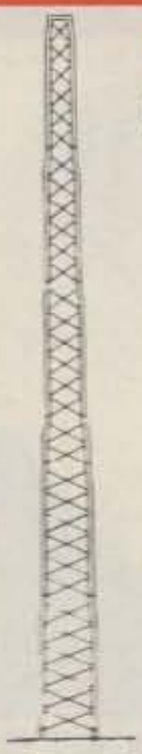
- Mount and Rotate Additional Antennas at any Elevation **On Your Existing Tower!**
- Use with H Frame to Stack & Rotate VHF/UHF Antennas **On Your Existing Tower!**
- Add a Second Tribander and up to Four VHF Antennas **On Your Existing Tower**—Great for Contesting!
- Will Safely Support and Rotate full 360 degrees up to 11 sq ft and 200 lb. Antenna Load.
- Complete with Rotor/Control and all Mounting Hardware
- Fits all Towers—Guyed—Free Standing—Crankup

Suggested List Price $695—Introductory Special $599!
ORDER YOURS TODAY—IN STOCK FOR IMMEDIATE SHIPMENT!



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 fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	269	24	293
HBX48	48 ft	10 sq ft	303	BXB7	349	26	375
HBX56	56 ft	10 sq ft	385	BXB8	419	30	449
HDBX40	40 ft	18 sq ft	281	BXB7	313	26	339
HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429

Tri-Ex®

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-supporting—no guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq. ft., 50 mph	$ 499
W-51	51 ft.	9 sq. ft., 50 mph	$ 799
LM-354	54 ft.	16 sq. ft., 60 mph	$1449
LM-470D (Motorized)	70 ft.	16 sq. ft., 60 mph	$2499

Masts—Thrust Bearings—Other Accessories Available at Sale Prices—Call!

RG-213U

$.29/ft $279/1000 ft
Up to 400 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield
- Low Loss Foam Dielectric
- Non-contaminating Vinyl Jacket

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
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

- ½" Alum. w/poly Jacket ..... $.79/ft
- ½" LDF4-50 Andrew Heliax™ $1.49/ft
- ⅞" LDF5-50 Andrew Heliax™ $3.99/ft

select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax™	$22	$22	$22	$22
⅞" Heliax™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259	$1.25	Nickle PL259	$.90
UG21B N Male	$2.95	UG23D N Female	$2.95

ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld	$.12/ft	14 Ga. Copperweld	$.10/ft
14 Ga. Stranded	$.10/ft	18 Ga. Copperweld	¼ mi $30
450 Ohm H.D. Line	$.16/ft	H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun			$11
Van Gorden Center Insulator			$6

HUSTLER

4BTV 40-10 mtr Vert $79 5BTV 80-10 mtr Vert $99
G6-144B 2-mtr Base $79 G7-144 2-mtr Base $109

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$10	$10	$12	$15	$19
2KW Super	$14	$15	$19	$24	$33

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT

HF6V 80-10 mtr Vertical	$129
RMK-II Roof Mount Kit w/radials	$39
STR-II Stub Tuned Radial Kit	$20
TBR-160HD 160-mtr Coil Kit	$49
2MCV-5 2-mtr Base Vertical	$39

Free Shipping in Continental U.S. on HF6V Antennas!!

CUSHCRAFT

A3 3-el Tribander	$179			A4 4-el Tribander	$229		
R3 20/15/10mtr Vert	$229			A743/A744 40mtr Kit	$69		
10-3CD	$76	10-4CD	$89	15-3CD	$99	15-4CD	$109
20-3CD	$179	20-4CD	$239	40-2CD	$279	AV5	$99
A50-5	$65	A50-6	$89	A147-4	$25	A147-11	$39
214B	$69	214FB	$69	3219	$79	220B	$75
228FB	$189	416TB	$59	424B	$63	617B	$179
147-20T	$63	144-10T	$45	144-20T	$69	432-20T	$49
14TMB	$25	ARX2B	$39	AMS147	$29	PD-2	$25

Many other Cushcraft models in Stock—CALL!

HY-GAIN

V2S 2-mtr Base Vertical	$39
TH5MK2S Broad Band 5-el Triband Beam	$319
TH7DXS 7-el Triband Beam	$379
TH3MK3S 3-el Triband Beam	$219
TH3JRS 3-el Triband Beam	$159
TH2MK3S 2-el Triband Beam	$139
HY-QUAD 2-el Triband Quad	$279
402BAS 2-el 40-mtr Beam	$199
205BAS 5-el 20-mtr Beam	$299
155BAS 5-el 15-mtr Beam	$179
105BAS 5-el 10-mtr Beam	$119
204BAS 4-el 20-mtr Beam	$229
203BAS 3-el 20-mtr Beam	$139
153BAS 3-el 15-mtr Beam	$79
103BAS 3-el 10-mtr Beam	$59
DB1015BAS 3-el 10/15 mtr Beam	$159
64BS 4-el 6-mtr Beam	$55
66BS 6-el 6-mtr Beam	$109
18HTS 80-10 mtr Hy-Tower Vertical	$339
LC-160 160-mtr Coil Kit for 18HTS	$39
214 14-el 2-mtr Beam	$35
2BDQ 80/40 mtr Trap Dipole	$49
5BDQ 80-10 mtr Trap Dipole	$99
BN86 80-10 mtr KW Balun W/Coax Seal	$19

MACO (WILSON) ANTENNAS

SY-33 3-el Triband Beam	$199
SY-36 6-el Triband Beam	$269

MOSLEY

CL-33 3-el Triband Beam	$229
TA-33 3-el Triband Beam	$199
TA-33JR 3-el Triband Beam	$149
S-402 2-el 40-mtr Beam	$279

HYGAIN/TELEX CRANKUPS

ON SALE! FREIGHT PAID! SPECIAL PRICES! SAVE$$!

Model	Height Up	Down	Wind Load	List	Sale
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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

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Transi-Trap™ Surge Protectors—In Stock Now!

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- Model LT/N 200W N Type .. $39
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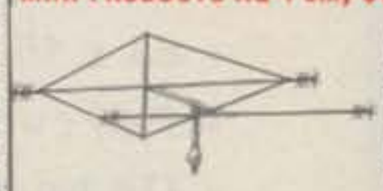
- Model R-T 200W Deluxe .. $29
- Model HV 2KW Deluxe $32

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
432-16LB 432 MHz Long Boom 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

Alliance HD73 (10.7 sq ft rating)	$99
Alliance U100 (for small beams & elevation)	$49
Telex HAM 4 (15 sq ft rating)	$199
Telex Tailtwister (20 sq ft rating)	$249
Telex HDR300 Heavy Duty (25 sq ft rating)	$439

Standard 8 cond cable $.19/ft
(vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft
(vinyl jacket 2-#16 & 6-#18 ga)

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10 ft Sections 20G $32.50 25G $41.50 45G $93.50

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$789
FK2558	58 ft	13.3 sq ft	$879
FK2568	68 ft	11.7 sq ft	$959
FK4544	44 ft	34.8 sq ft	$1099
FK4554	54 ft	29.1 sq ft	$1219
FK4564	64 ft	28.4 sq ft	$1329
25G Foldover Double Guy Kit			$199
45G Foldover Double Guy Kit			$229

*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!

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3/16" EHS Guywire (3990 lb rating)	$.12/ft
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)	$6.95
1/2" EE (1/2" Eye & Eye Turnbuckle)	$8.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle)	$9.95
3/16" Preformed Guy Grip	$1.79
1/4" Preformed Guy Grip	$1.99
6" Diam - 4 ft Long Earth Screw Anchor	$12.95
500D Guy Insulator (5/32" or 3/16" Cable)	$.95
502 Guy Insulator (1/4" Cable)	$1.95
5/8" Diam - 8 ft Copper Clad Ground Rod	$11

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.43/ft
HPTG6700 Guy Cable (6700 lb rating)	$.59/ft
9901LD Cable End (for 2100/4000 cable)	$4.95
9902LD Cable End (for 6700 cable)	$5.45
Socketfast Potting Compound (does 6-8 ends)	$8.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	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

HDT-3 3 ft Tripod	$19	HDT-5 5 ft Tripod	$29
HDT-10 10 ft Tripod	$49	HDT-15 15 ft Tripod	$69

Heavy Duty Tripods include mtg hdw-UPS Shippable

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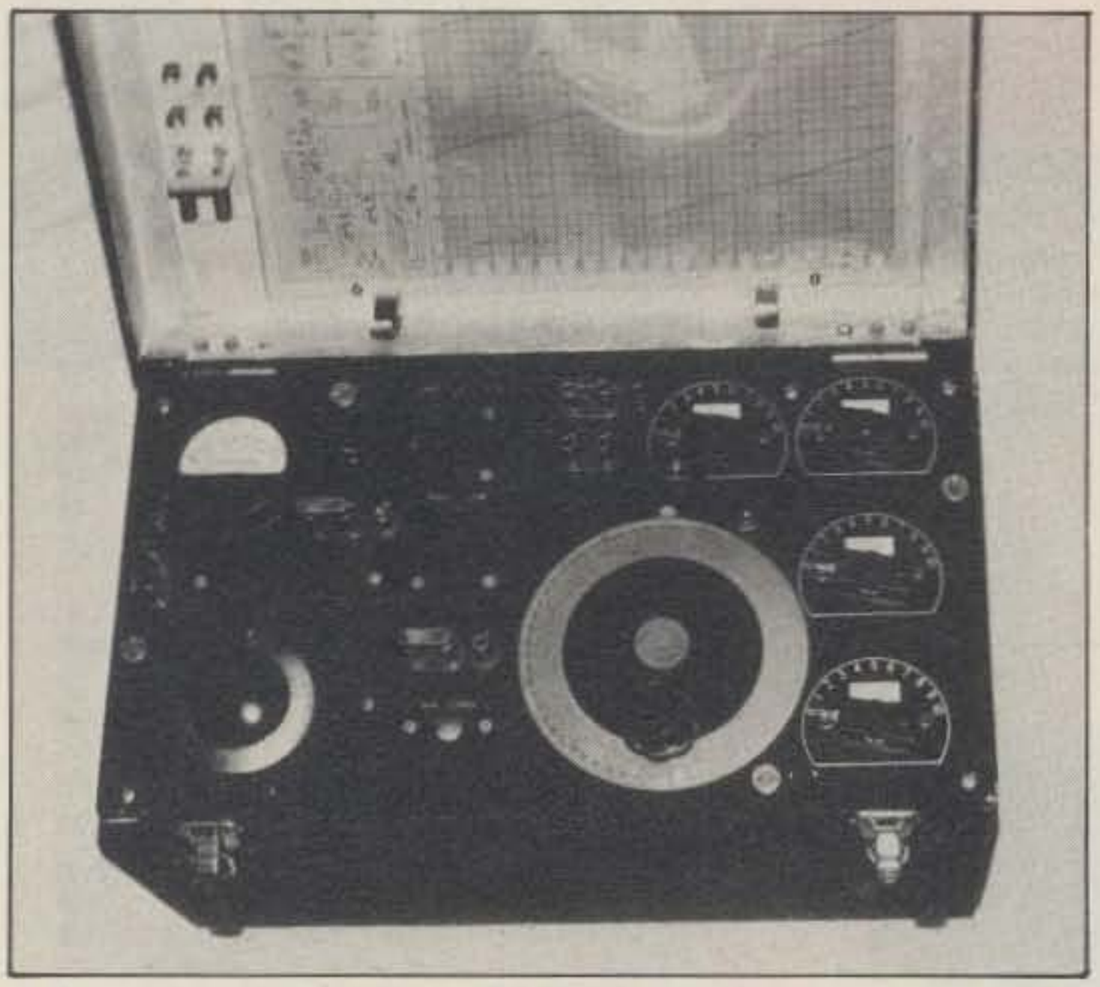
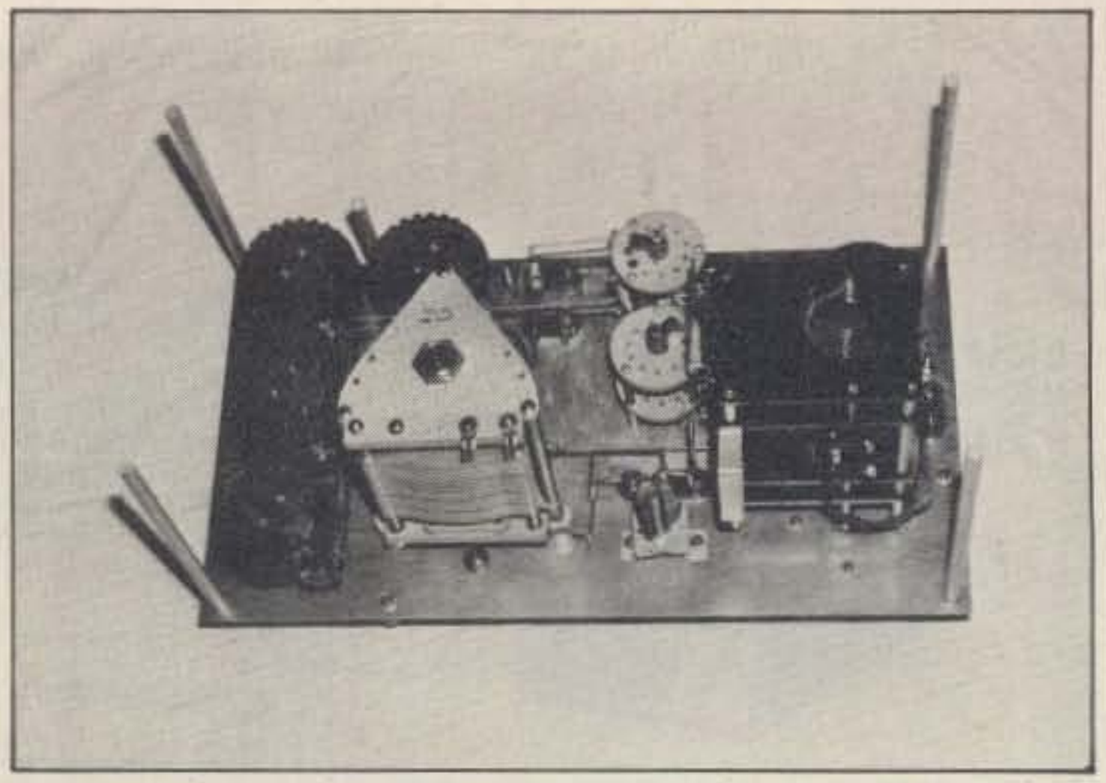
CIRCLE 2 ON READER SERVICE CARD

The exterior view of the Z-Box with the protective lid open. Adapters and interpolation chart are in the lid.





An interior view of the Z-Box. The r.f. coupler is on the right, tapped resistors on the left, with variable capacitor and selector switches in between.

Hmmm! It might just work on 160. W5JJ comes up with a nostalgic piece of test gear used in tuning up some really big antennas.

THAT WONDERFUL Z-BOX

BY CARL C. DRUMELLER*, W5JJ

Just after the end of WW II I went to work for the CAA (now called the FAA) as a Radio Engineer. It was there that a quite remarkable piece of test equipment came to my admiring notice. I had been an operator at an entertainment broadcasting station before the war, and such test gear had never been encountered. At BC stations, measurements of antenna reactance, radiation resistance, etc., normally were made only at certification tests. At a CAA four-course, five-tower Low Frequency Range routine checks necessitated precise tuning and exact impedance matching at the interface between transmission lines and each tower's base tuning network. That was where the Z-Box had its moment of glory!

Just what *was* a Z-Box? (Note the past tense; few still exist.) It was a substitution and comparison device capable of comparing both resistance and reactance and capable of indicating whether reactance was inductive or capacitive. It did this over a frequency range of 200,000 Hertz to 400,000 Hertz, thereby lapping over from the higher end of the low frequency band into the lower end of the medium frequency band. Its type of construction did not lend itself to use within the h.f. band, thereby making it of little use to radio amateurs. Re-engineering it to function on higher frequencies would have been a formidable task. Witness the several similar devices available, noting the crude construction and inaccurate measurements!

Some years ago a friend brought me a Z-Box, a treasured gift indeed. Doubly so when I inspected it and found it to be serial number 1. Although a bit "war weary," it appeared to be in usable condition except for a burnt-out thermocouple in the r.f. galvanometer. That was no surprise, for it took only one incautious move of a coupling control or tuning control to zap a thermocouple! There was a 1/8 amp fuse that was supposed to protect the meter, but it seldom blew quickly enough to save the delicate thermocouple.

The basic circuit of the Z-Box was simple indeed, as figs. 1(A) and 1(B) show. The actual schematic wiring diagram was a bit more complex (see fig. 2).

The parts shown in fig. 2 were mounted in a stout aluminum enclosure measuring 10″ × 10″ × 18″. The total weight was 29 pounds, not an impressive weight, but one that seemed much more by the time you'd carried it to all five tower tuning houses!

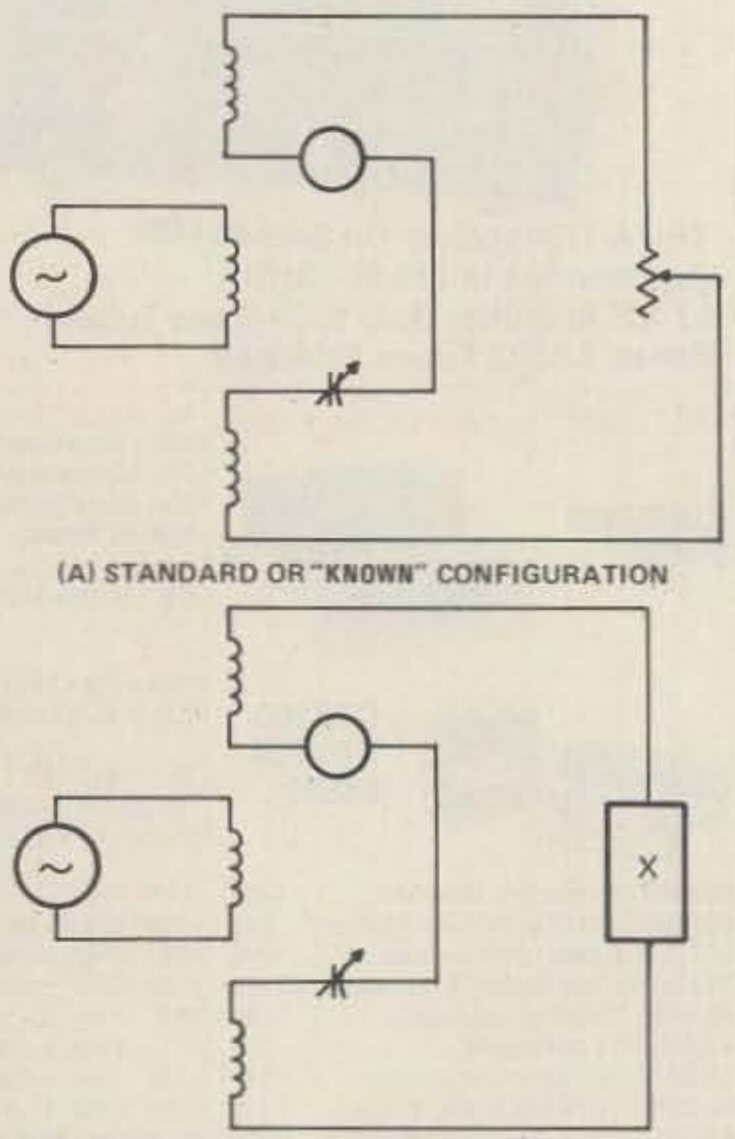


Fig. 1– The CA-1280 Impedance Measuring Unit (Z-Box) manufactured by Pioneer Electric and Research Corporation. (A) is the standard or known configuration, and (B) is the configuration for determining the nature of an unknown load.

*5824 N.W. 58th St., Warr Acres, OK 73122

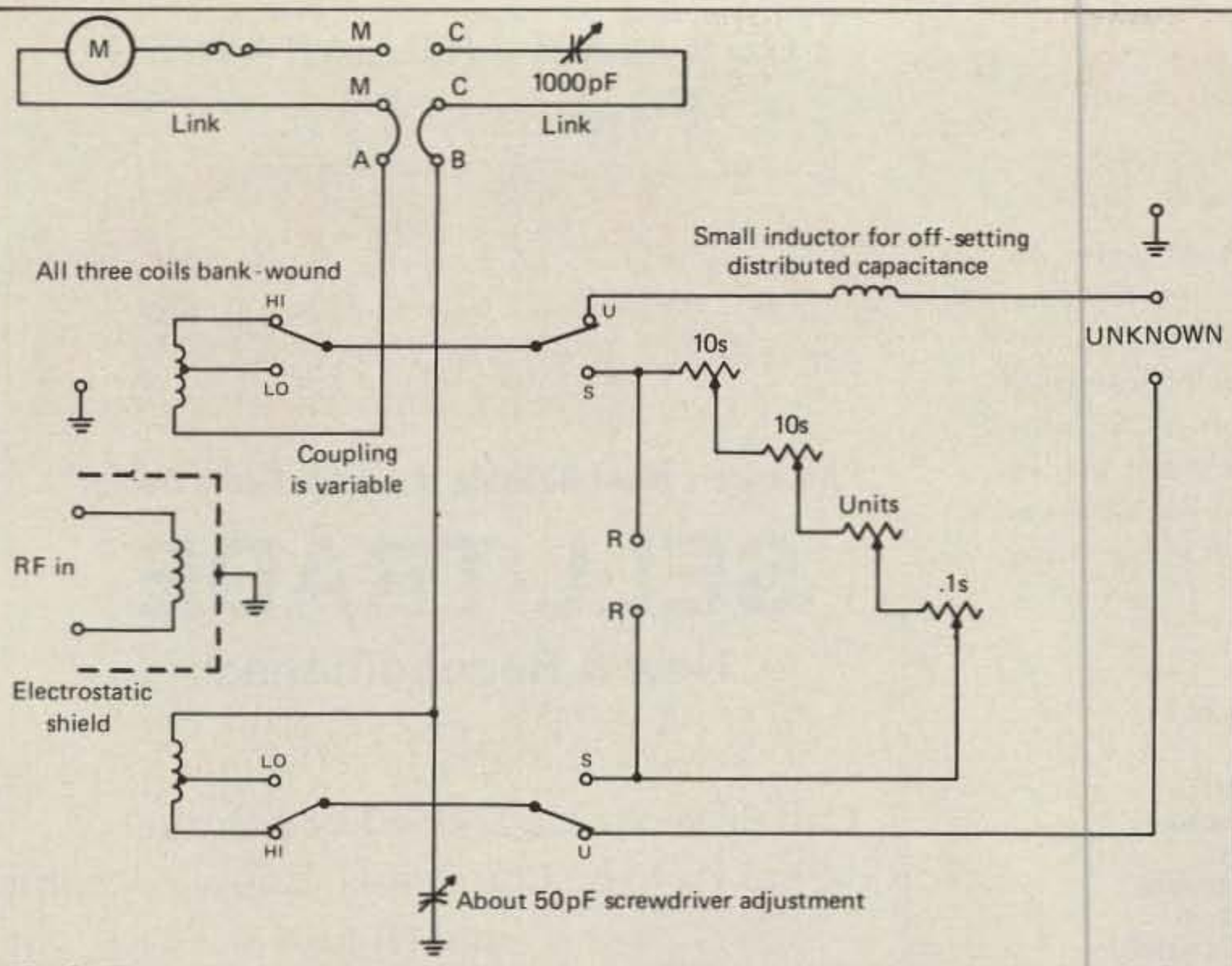


Fig. 2– The schematic diagram for the CA-1280 Impedance Measuring Unit, or Z-Box.

Note that the adjustable resistances, the meter, and the variable capacitor each can be isolated for use independent of the Z-Box.

Here's one way that the Z-Box was used. In tuning, say, a corner tower of a Low Frequency Range, one would feed steady low-power r.f. into the input terminals. At first, the variable coupling between the electrostatic-shielded primary coil would be set near minimum; that is, the primary would be removed vertically from in between the two halves of the secondary. Then the resistances (note that they do not constitute a true decade as there are two sets of **Tens** and no **Hundreds**) are set to the value of the transmission line (perhaps 70 ohms) and the **Known-Unknown** switch placed in the **Known** position. With the **High-Low** switch in the appropriate spot, remembering that **High** relates to wavelength and not frequency, the variable capacitor was rotated to achieve resonance as indicated by maximum current in the galvanometer. A suitable maximum can be regulated by adjusting the coupling between primary and secondary; these coils were bank-wound to keep the size reasonable at such low frequencies.

As the second stage, the input to the tower's tuning mesh was attached to the **Unknown** load terminals. It would be simple if one could say that next the tuner's frequency and coupling adjustment were manipulated until the tower reflected into the Z-Box precisely the same load as the resistances. Perhaps that might be possible, but only if one had unlimited time and patience.

The "smart" way to approach the desired load was to reset resonance by the variable capacitor and note whether this move resulted in more or less capacitance being needed. That told you whether the tower's load was reactive and in what manner (capacitive or inductive). Then one switched in the reference resistance and set it to produce the same meter deflection as the tower's load. This indicated whether the coupling was too tight or too loose. With such information, one could make the needed corrections, usually in small steps and with many switches between **Known** and **Unknown**. Once I saw a man win a $5.00 bet by tuning a tower with only three moves, but that was a rare exception! Usually it required quite a number of moves before the capacitor dial setting and the galvanometer needle deflection remained unchanged as one went between **Known** and **Unknown**.

Now for a look into the interior of the Z-Box. For one who appreciates good workmanship, this is undiluted pleasure! It's truly beautiful—beautiful, that is, for one who formed his ideas and ideals of radio construction in the days before engineers started worrying too much about circuit losses. The wiring is square-cornered, linking components that look rugged enough to withstand the shock of the firing of a salvo from a battery of 18 inch guns if the box were on a battleship! It strongly reflects the standard of construction espoused by General Radio in its heyday of manufacture of both components and completed equipment. Those who knew and used such equipment regard them as the true classics of radio apparatus.

The resistors were wire-wound, but of a type of winding that was termed "non-inductive." That was more or less true for the low frequency at which the Z-Box was used. Such resistors, however, would be too inductive for use in the amateur h.f. band.

Note the small inductor used at the **Unknown** load input. This served to cancel the distributed capacitance of the internal wiring.

The relatively small variable capacitor was factory adjusted to balance the two halves of the secondary of the r.f. transformer.

It is not known what engineering genius initially came up with the idea behind the design of the Z-Box, but a whole generation of engineers and technicians owes that person a sincere vote of appreciation for having provided the means of a simple solution to a vexatious problem!

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CIRCLE 83 ON READER SERVICE CARD

AFC6BG Goes QRT

Major General Robert F. McCarthy (left), commander of the Air Force Communications Command, presents Senator Barry M. Goldwater, K7UGA, a Military Affiliate Radio System (MARS) message of appreciation from Secretary of the Air Force Verne Orr, WA6IOG. Tom Moore, W7FCQ, longtime volunteer manager of the station, stands between General McCarthy and Senator Goldwater. (U.S. Air Force photo by Major Carl F. Freeman, WA4AQW)

HQ AFCC, Scott AFB, Ill.: A radio station that was a "link with home" for Vietnam-era service people and their families has ceased operation. The Military Affiliate Radio System (MARS) station at the Town of Paradise Valley, Arizona, home of Sen. Barry M. Goldwater, K7UGA, went off the air on January 15. The senator has been involved in amateur radio activities as well as the MARS program for many years.

In operation since the 1960s, Senator Goldwater's MARS station, AFC6BG, served as a phone-patch relay point for many service people in Southeast Asia who talked to family and friends in the U.S. With the reduction of phone-patch traffic in the 1970s, the station became a radio teletype "gateway" station for the Pacific.

"I think all Americans can contribute to their country in some way," stated the Senator when questioned about the origin of his MARS mission involvement. "You don't have to have a uniform on. You just have to have the desire to help."

Secretary of the Air Force Verne Orr, WA6IOG, sent the Senator a MARS Message citing the service provided by the station. "Operated exclusively by your dedicated volunteers, and at considerable personal expense to you, AFC6BG has provided the Department of Defense and the nation, in times of emergency, a service unparalleled in military communications. We all owe you and your people a tremendous debt of gratitude that can never be adequately repaid," stated part of Secretary Orr's message.

Among those attending closing ceremonies at the station was Major General Robert F. McCarthy, commander of Air Force Communications Command, who reviewed the historic value of the station's operation.

General McCarthy presented plaques of appreciation to Senator Goldwater, Tom Moore, W7FCQ and AFA6PU, the station manager, and a dozen volunteers who helped operate the station.

The decision to close the station was based on a combination of declining mission activity and the anticipated cost of modernizing the station's equipment.

Most of the morale and welfare family contacts previously handled by the station are now made over regular telephone voice circuits during non-duty hours. Balancing the current flow of 30–40 messages per day against expected costs of acquiring and maintaining modern equipment, the decision was made to delete the station's radio teletype mission and to convert the morale and welfare message function to voice circuits only.

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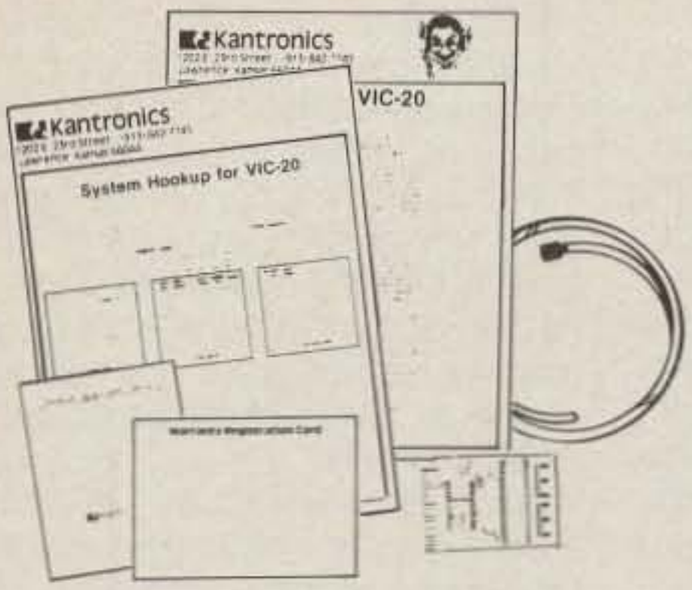

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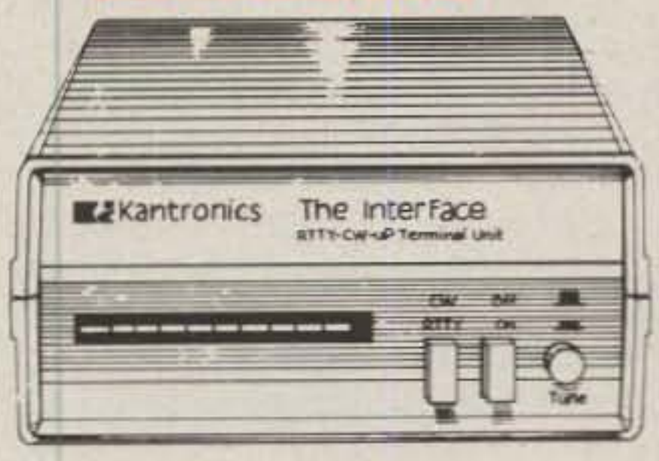

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CIRCLE 119 ON READER SERVICE CARD

Radio Propagation During The Next Total Solar Eclipse

You say that Eric has been to all the good places, but you'd still like to go on a DXpedition that's unusual? K6BW has the answer, the reason, and suggestions on how to get there.

BY LOUIS BERMAN*, K6BW

An excellent opportunity to study the effect of a solar eclipse upon radio communications will be afforded DXers on June 11, 1983. On that day, a total solar eclipse lasting up to 5 minutes with a maximum track width of 120 miles will take place over Southeast Asia, including Java, Celebes (Sulawesi), and New Guinea. This eclipse happens about three years after the last sunspot maximum. It is not too soon for interested DXers to begin preparing for this event.

Since the 1930s, a few scattered studies of the effect of a solar eclipse upon the ionosphere have been made,[1] but more quantitative data on the pronounced changes in radio wave propagation within the various ionospheric layers (*D, E, F1, F2*) are needed. Here is where radio amateurs can make a distinct scientific contribution by investigating these effects.

Of particular interest will be the changes in propagation in the *D* and *E* ionospheric regions involving the lower bands, since these regions undergo the greatest variation; changes in the *F1* and *F2* regions involving the higher bands, while less affected, should not be ignored. Experiments at any particular site should be conducted several days in advance to determine the normal activity of the bands and to provide a calibration scale. On the day of the eclipse, experiments should begin well before the moon encroaches upon that part of the corona it obstructs (there is no visible change in sunlight at this time) and continue throughout until well after the end of the partial phase to see if there are any delaying effects in the ionosphere.

One favorable observing site is in Java at Yogiakarta, Magelang, Surakarta, Tuban, and Surabaya, where the sun will be at an altitude of about 60° and toward the north. Mid-eclipse time will be around 0430Z; duration of totality will be close to 5 minutes. Two other places are in the Celebes at Ujung Pandang and at Port Moresby, New Guinea, with a mid-eclipse and duration of totality 0500Z, 5 minutes 06 seconds respectively for the former and 0603Z, 3 minutes 17 seconds for the latter. At Christmas Island, the eclipse is partial, with mid-eclipse occurring at 0413Z.[2]

Several options for conducting the experiments are possible. One is to latch on to one of the astronomical expeditions preparing to observe the eclipse. Astronomers would welcome such an accommodation not only for its scientific value but as an aid in providing contacts between themselves and their stay-at-home colleagues and kin. A second alternative is to team up with radio amateurs living in the area. A third option is to go it alone and select a location that would provide rare DX. A fourth is to sail on a ship chartered by any one of several travel bureaus to observe the eclipse from onboard with other paying passengers.[3] The advantage here would be the ship's maneuverability, making use of extensive weather forecasts to find a spot where a clear sky would prevail. A cloudless sky may be the astronomers' concern, but to radio amateurs cloudy weather would not matter even if they were denied the rare opportunity to witness one of nature's grandest spectacles.

In all cases, attempts should be made to utilize the beacon signals emanating from the 10 or so worldwide time service stations[4] and from a 14.100 MHz beacon network now being organized. This group includes K6OPO/B, KH6O/B, 4U1UN/B, JA2IGY, 4X6TU/B, OH2B, CT3B, and ZS6DN/B. Each station will key 1 minute apart in succession with 4U1UN/B starting at 00:00:00 and sending four 9-second dashes at successive r.f. output power levels of 100, 10, 1, 0.1 watts. Station ID and sign off will be at the 100 watt power level. K6OPO/B then repeats the sequence beginning at 00:01:00, followed by KH6O/B at 00:02:00, and so on consecutively for the other stations. The entire process is repeated every 10 minutes with 4U1UN/B transmitting again at 00:10:00, etc.

Preparations should be made well in advance to arrange schedules and to decide on operating techniques with radio amateurs in different parts of the world. If this change slips by, another one, not as good, will come November 22–23, 1984, almost entirely over water in the South Pacific Ocean with the eclipse track beginning in Indonesia near sunrise and ending at sundown off the Chilean coast. Good luck!

Louis Berman, Ph.D. , K6BW, is a retired Professor of Astronomy from the University of San Francisco, Dept. of Physics. CQ

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*1020 Laguna Ave., Burlingame, CA 94010

[1] *See references in Terman's* Radio Engineering Handbook, *McGraw-Hill, p. 730. Also see articles in* QST, *July 1970, pp. 32–34; July 1972, pp. 40–41; January 1979, pp. 26–29; July 1979, pp. 11–28.*

[2] Sky and Telescope Magazine, *July 1982, pp. 30–32.*

[3] *One such bureau is World Travel Quests, 690 Market Street, San Francisco, CA 94104; phone (415) 397-6202.*

[4] QST, *January 1979, p. 13, or ARRL's* The Radio Amateur's Handbook, *Chapter 18, Table 1.*

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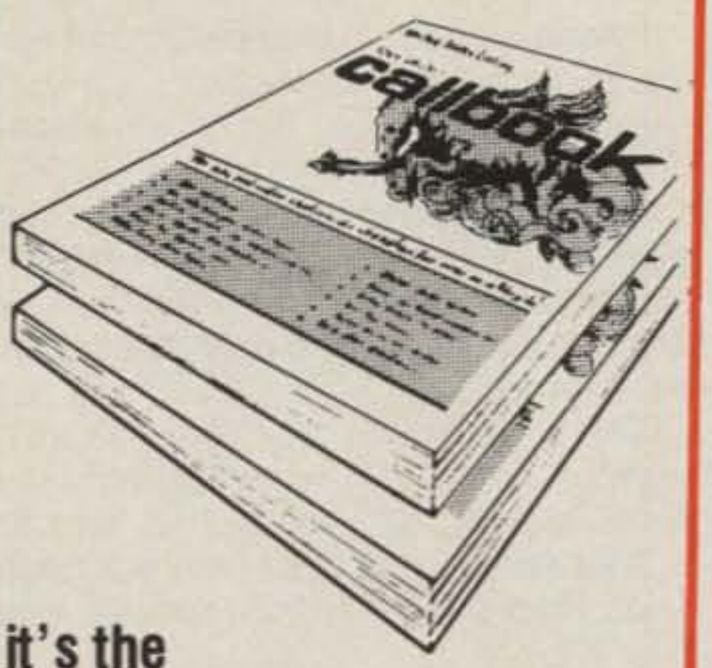

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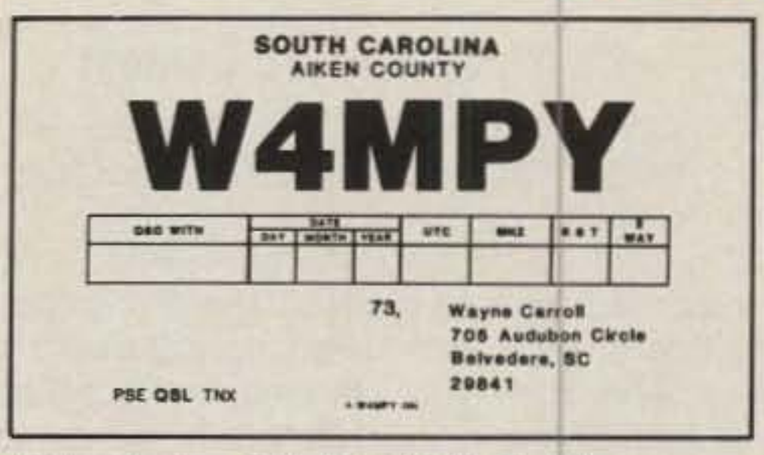

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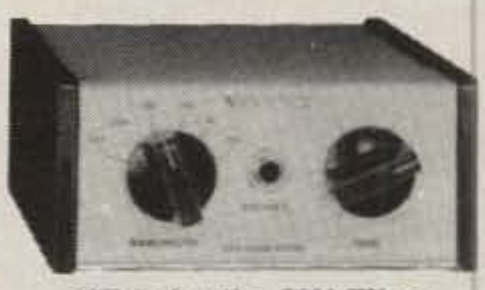

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CIRCLE 15 ON READER SERVICE CARD

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Add another trophy to the ever-growing list of donors for our WPX Contest. This one is for the s.s.b. section March 26–27, at just about the time you will be reading this column. Ted Pauck, K8NA, who has been donating the U.S.A. 21 MHz award, will now also donate one to the U.S.A. 14 MHz winner. This does not give you much time to prepare for it, but it should be an incentive to try harder. If you do not read this information before the contest, make sure you send in your entry before May 10th to our new WPX Contest Director, Steve Bolia, N8BJQ, 7659 Stonesboro Dr., Huber Heights, OH 45424. Who knows, you may already be a winner.

The Saint Clair ARC of Belleville, IL, will operate K9GXU from April 24th to the 30th during its annual antique radio display to commemorate Marconi's birthday. Operation will be on all bands, 10 through 80 meters. Phone 10 kHz up from General band edges; c.w. 20 kHz inside Novice bands. Send your report with a large s.a.s.e. to SCARC, P.O. Box C, Belleville, IL 62222 for your certificate.

The last weekend in April has usually been the date for the King of Spain Contest, with that attractive first prize, an all-expense-paid trip to Catella (Barcelona) to receive your award. Like last year no announcement has been received, so it would serve little purpose to again list it as an official announcement.

We tried to get some confirmation out of Poland that the SP's were back on the air and would be holding their annual contest month, but with no success. That brief SP activity heard a couple of months ago evidently was only a temporary operation by special permission.

The announcement of an IARS/CHC Contest scheduled for March 12–13 on c.w. and March 19–20 on s.s.b. was received much too late to make the March issue. If you participated, you have until May 1st to get your entry to Ted Melinosky, K1BV, 525 Foster Street, South Windsor, CT 06074. Include a large s.a.s.e. if you want a copy of the results.

Again I must insist that announcements must be received no later than the 15th of the third month prior to the month of your event. Deadline for the July issue is April 15th, and May 15th for the August issue. Send material to my home address please. Material sent to the home office is forwarded to me, but there is a delay.

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	**Mar.**	**26-27**	**CQ WW WPX S.S.B. Contest**
	Apr.	6-7	DX-YL to N.A. YL CW Party
	Apr.	9-10	CARF Commonwealth Phone
	Apr.	13-14	DX-YL to N.A. YL Phone Party
	Apr.	16	Holiday-in-Dixie QSO Party
	Apr.	23-24	Helvetia "H-26" Contest
	May	7-8	County Hunters SSB Contest
	May	7-8	G-QRP SSB Activity
	May	7-8	Florida QSO Party
	May	14-15	Georgia QSO Party
	May	21-23	Michigan QSO Party
	May	**28-29**	**CQ WW WPX C.W. Contest**

** See January 1983 issue.*

DX YL to N.A. YL Contest

C.W.: April 6–7 S.S.B.: April 13–14
1800Z Wednesday to 1800Z Thursday

This is a YL affair in which DX YL's will contact YL's on the North American continent. (KH6 and KL7 are considered DX.)

All bands may be used, but contacts with OM's, Nets, repeaters, or cross-band do not count. The same station may be worked on each band and mode for QSO credit.

Phone and c.w. are separate contests and require separate logs.

Exchange: QSO no., RS(T), and state or country.

Scoring: One point per QSO. Your multiplier is determined by the number of states, VE provinces, and DX countries worked. Counted once only, not once on each band.

There is a power multiplier of 1.25 for stations using 150 watts or less at all times, on c.w., 300 watts p.e.p. on s.s.b.

Final Score: Total QSO points × (states + provinces + countries) × power multiplier if any.

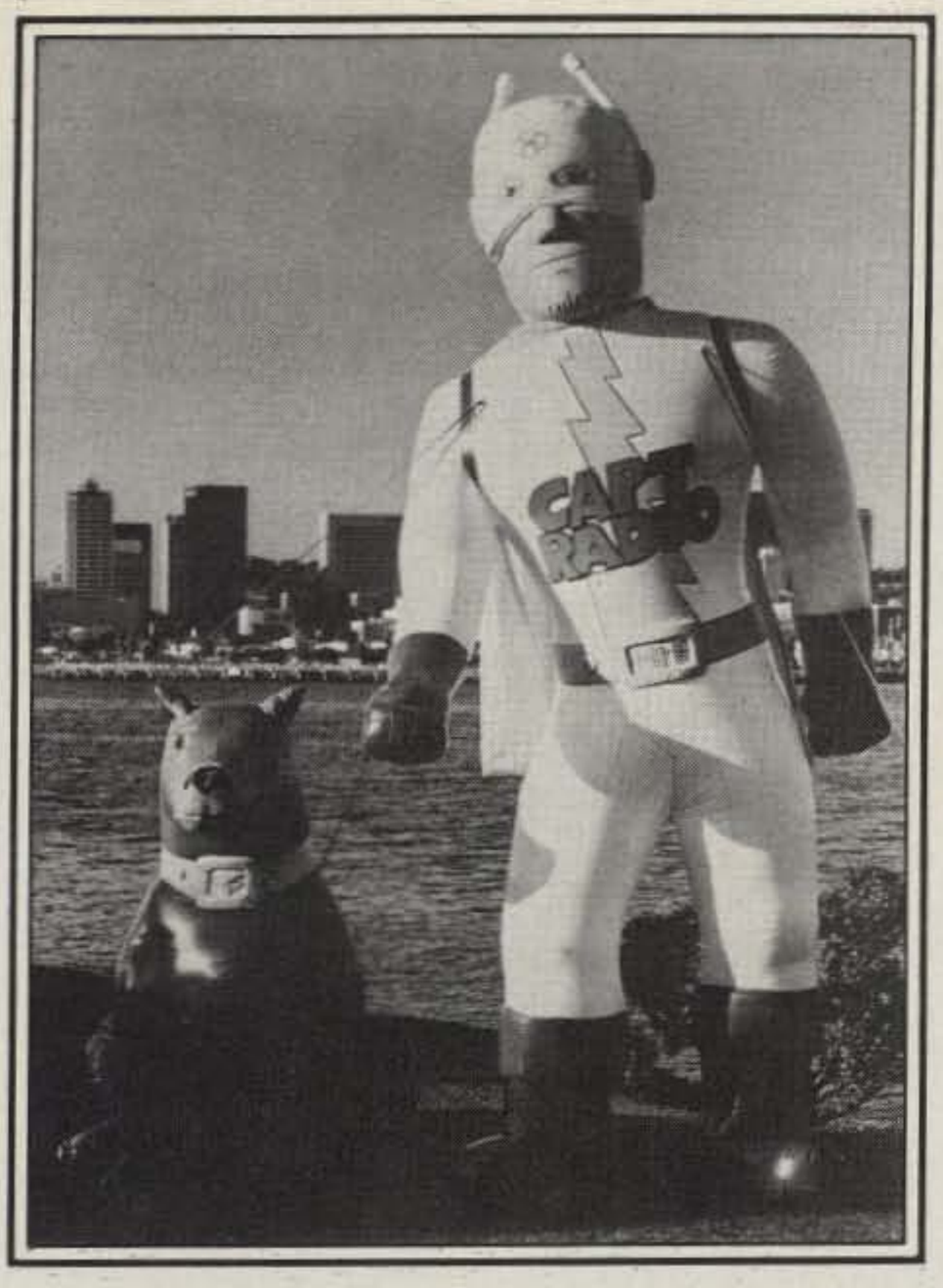
There is a penalty of 3 additional and equal contacts for each duplicate contact removed by the Contest Committee.

Awards: Six cups will be awarded to the first place winners, DX and N.A., on phone, on c.w., and on combined phone/c.w. scores. Certificates to second and third place winners.

Submit separate logs for each contest; include a summary sheet showing the scoring, transmitter power, and other essential information. The usual signed declaration is also requested.

Entries must be postmarked no later than April 28th and received no later than May 23rd. They go to: Rose Ellen Bills, N2RE, 17 Craig Place, Pennsville, NJ 08070.

Whenever possible we try to make a personal presentation of our contest awards. Here's our own Dick Ross, K2MGA, at the Contest Forum during the ARRL New England Convention last October presenting 1981 CQ WW Contest plaques to (center) John Dorr, K1AR, First Place U.S.A. Phone winner, and (right) Bill Myers, K1GQ. First Place U.S.A. C.W. winner. Both are very active members of the Yankee Clipper Contest Club. The phone award is donated by the Potomac Valley Radio Club, and the c.w. award by the Frankford Radio Club. (Photo via W1VRK)



On the banks of the majestic Stamford River, grateful neighbors of our own Frank Anzalone, W1WY, recently erected a statue in tribute to him. Frank was honored for all of his public service via amateur radio to the community these many years. The CQ Contest Committee Orchestra played "Hail to the Chief," and many notables spoke Frank's praises. The statue, an idealized version of Frank (this is how his friends and neighbors see him), features his constant companion, Spot the Wonder Dog. It was a great day for a great man.

CARF Commonwealth SSB Contest

1200Z Sat. to 1200Z Sun., April 9–10

This one is organized by the Canadian Amateur Radio Federation and is not to be confused with the RSGB Commonwealth, a c.w. contest held in March.

Eligibility is limited to amateurs licensed to operate within the Commonwealth and British Mandate Territories. Entries may be single or multi-band, single operator, and on s.s.b. only.

Exchange: RS plus a 3 figure contact number starting with 001.

Scoring: Each completed QSO is worth 5 points. In addition, a bonus of 20 points may be claimed for the first, second, and third contact with each Commonwealth call area on each band. Add total points from each band for your final score.

The same station may be worked once per band. Contacts between stations in own call area have no point value.

Frequencies: Plus or minus 20 kHz of 3600, 3760, 7080, 14130, 21200, and 28480.

Awards: Certificates to the top-scoring entry in each Commonwealth area in each class. The CARF Trophy goes to the overall winner in the multi-band class.

Penalty points may be deducted for taking credit for duplicate contacts or bonus points.

Summary and checklist sheets are available from the CARF; include an s.a.s.e. with your request.

Include a summary sheet, dupe sheet, checklist of call areas worked, and the usual signed declaration with your entry, which must be mailed within a month to: CARF Contest Committee, P.O. Box 2172, Station "D," Ottawa, Ontario K1P 5W4, Canada.

Holiday-in-Dixie QSO Party

1800Z–2300Z Saturday, April 16

Holiday-in-Dixie is an annual 10-day celebration held in Shreveport, Louisiana, commemorating the Louisiana Purchase. To help promote the event, radio amateurs set up stations at Hamel's Amusement Park on the Red River and operate on four bands: 10, 15, 20, and 40 meters.

On c.w. look for Holiday-in-Dixie stations 60 kHz up from the bottom of each band. On s.s.b. try 7240, 14280, 21380, and 28580.

An attractive commemorative certificate will be sent to anyone establishing two-way contact with any one of the "H-I-D" station. All that is required is to send a QSL card verifying the contact to: Holiday-in-Dixie QSO Party, P.O. Box 1485, Shreveport, LA 17164. Enclose an s.a.s.e., and be sure to include a signal report and the name of the operator of the station you contacted.

In addition to the certificate a commemorative doubloon will be sent to the first 100 stations sending in a report, so get your QSL in early.

ARCI QRP Spring Contest

1200Z Sat. to 2400Z Sun., April 23–24

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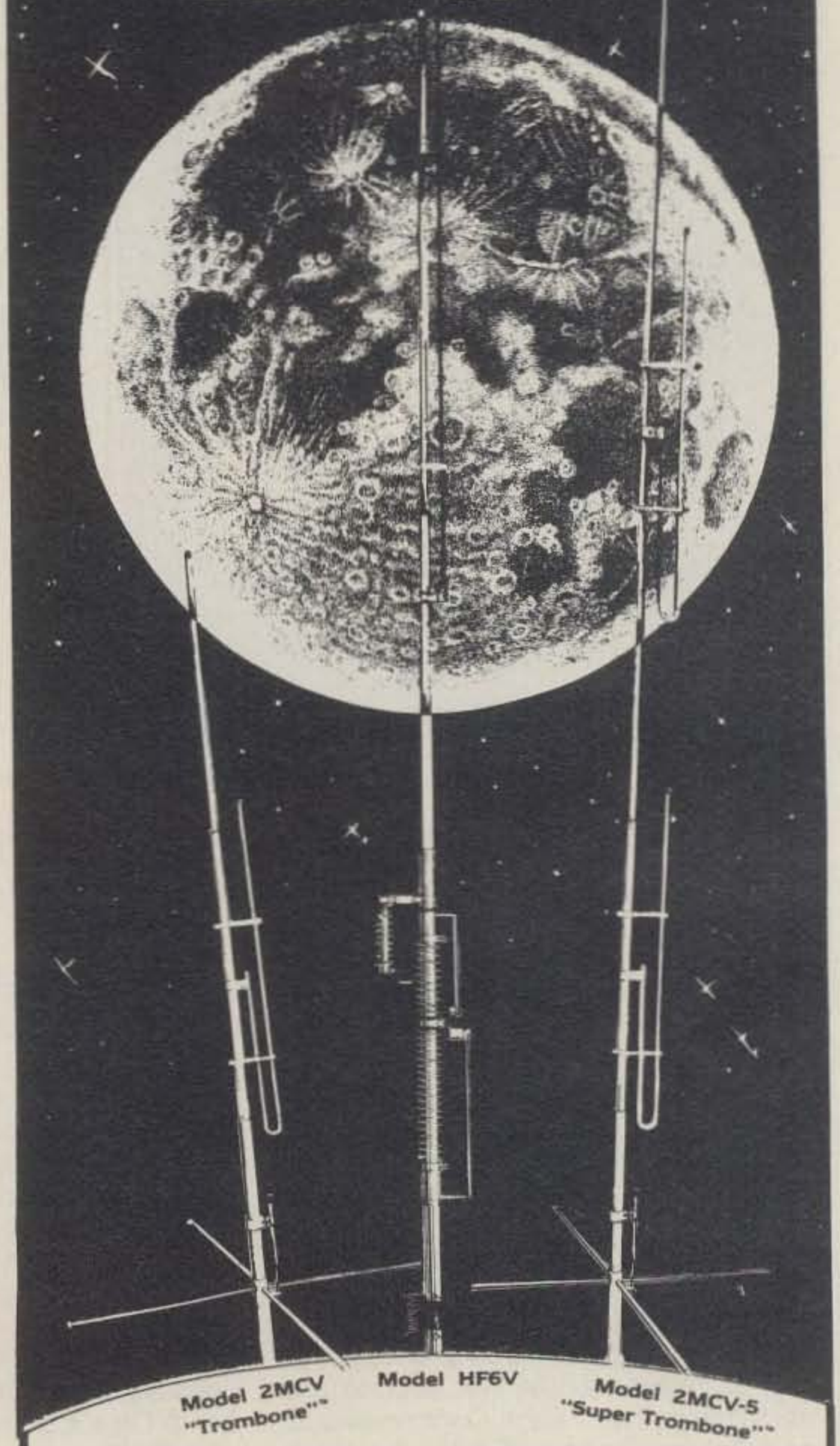

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North America Contest Results
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WB5HBR	135,415
KB2VO	117,180
WD5ELJ	104,220
VE7YB	43,050
W0LHS	31,635
WB4UBD	25,160
WD0FSJ	24,150
N8AKF	22,440
VE2QO	12,240
WA6WGL	11,570
KJ4Z	6,555
WB4CKY	6,120
K0JH	5,440
W2KHQ	4,200
TI2DO	2,730
WB4TDB	1,360
W8TCO	180

ON4UN was Top worldwide with a score of 455,655. WB5HBR, KB2VO, and WD5ELJ were #7, #8, and #10 respectively world wide.

members and non-members. Operating time is limited to 24 hours out of the 36-hour contest period. The same station may be worked on each band and each mode for QSO and multiplier credit.

Exchange: RS(T) and state, province, or country. Members will include their QRP number; non-members their power.

Scoring: Contact with a member 5 points, with a W/VE non-member 2 points, and with DX 4 points.

There is a power multiplier of watts output as follows:

4 to 5 on c.w., 8 to 10 p.e.p. . . . . ×2.
3 to 4 on c.w., 6 to 8 p.e.p. . . . . ×4.
2 to 3 on c.w., 4 to 6 p.e.p. . . . . ×6.
1 to 2 on c.w., 2 to 4 p.e.p. . . . . ×8.
Less than 1 c.w., less than 2 p.e.p. . ×10.
Over 5 on c.w., over 10 p.e.p. . check log.

There is a bonus multiplier of ×2 for stations using solar or wind power, and ×1.5 is using battery power.

Final Score: Total QSO points × (states + provinces + countries worked on each band) × power multiplier × bonus multiplier if any.

Frequencies: C.W.—1810, 3560, 7040, 14060, 21060, 28060, 50360. S.S.B.—1810, 3985, 7285, 14285, 21385, 28885, 50385. Novice—3710, 7110, 21110, 28110.

Awards: Certificates to the highest scorers in each state, province, and country with two or more entries. Scores will also be credited for the annual "Triple Crown" QRP award.

Logs must be received by May 21st and they go to: William W. Dickerson, WA2JOC, 230 Mill Street, Danville, PA 17821.

Swiss Helvetia Contest

1300Z Sat. to 1300Z Sun., April 23–24

This activity again offers an excellent opportunity to work some of the rare Swiss Cantons and to build up your total for the attractive new Helvetia Award.

Confirmation of all 26 Cantons is required. Only contacts made after January 1, 1979 are valid.

All bands may be used, 10 through 160, but not the new WARC bands, phone or c.w. The same station may be worked on each band for QSO and multiplier credit, but only on one mode (either phone or c.w).

Exchange: RS(T) plus a three-figure contact number starting with 001. Swiss stations will also include two letters indicating their canton.

There are 26 Cantons: AG, AI, AR, BE, BL, BS, FR, GE, GL, GR, JU, LU, NE, NW, OW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each HB QSO is worth 3 points. The sum of Cantons worked on each band is your multiplier (a possible total of 26 on each band).

Final Score: Total QSO points multiplied by the sum of Cantons worked on each band.

Awards: Certificates to the top scorer in each country and in each W/K and VE/VO call area.

Indicate a Canton in a separate column for each band the first time it is worked. Check your log for duplicate contacts; include a summary sheet showing the scoring and your name and address in block letters. The usual signed declaration is also requested.

Mail your log within 30 days to: USKA Traffic Manager, G. Stalder, HB9ZY, Tellenhof, 6045 Meggen, Switzerland.

Applications in the form of QSL cards for the Helvetia Award go to: Walter Blattner, HB9ALF, P.O. Box 450, Locarno 6601, Switzerland.

County Hunters SSB Contest

Three Periods GMT
0001–0800 Sat., May 7
1200 Sat., May 7 to 0800 Sun., May 8
1200–2400 Sun., May 8

This is the 12th annual contest sponsored by the Mobile Amateur Radio Awards Club to increase activity for the County Awards program.

Emphasis is on mobile operation. Fixed stations may work other fixed stations but only once regardless of the band. Mobiles may be worked from each county or band change. Mobiles contacted on a county line count as one QSO but two multipliers. Net frequency contacts are not permitted.

Exchange: Signal report, county and state, country for DX stations. (Mixed-mode contacts are permitted providing one station is on s.s.b.)

Points: Contacts with a fixed W/K or VE count 1 point; 5 points if a DX station (KH6 and KL7 are DX). Mobile contacts count 15 points; mobile teams 30 points.

Multiplier: Each U.S. county and each VE station worked.

Final Score: Total QSO points times (counties + VE stations) worked.

Frequencies: Plus or minus 10 kHz, 3930, 7230, 14285, 21385, 28635. There will be a "Mobile Window" 5 kHz each side of 3930, 7230, and 14285.

Awards: Certificates to the top 10 fixed and top 10 mobile stations in the U.S. or Canada, and to the top scoring station in each DX country. There are five plaques: overall U.S. or Canadian winner, DX station, first and second place mobiles, and top mobile team.

It is suggested that you write W0QWS for detailed rules, log forms, and summary sheets. Include a large s.a.s.e. with your request.

All entries must be received by June 15th and go to: John W. Ferguson, W0QWS, 3820 Stonewall Ct., Independence, MO 64055.

1982 YL Anniversary Party

WD4NKP made a clean sweep, winning the First Place Gold Cup on both s.s.b. and c,w., and the Corcoran Award for the combined s.s.b. and c.w. scores. Second place went to K4AOH on s.s.b. and on c.w. Third place went to VE2DPO on c.w. and DJ0EK on s.s.b. DJ0EK also won the Hager DX Award.

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CQ-A

Here's a handy reference chart for 160 meter buffs. You can save the batteries in your calculator for more important tasks.

A CHART FOR 160 METER COUNTERPOISE LENGTHS

BY ED MARRINER*, W6XM

This is a chart for determining counterpoise lengths for 160 meter vertical antennas based on the formula 240/f (MHz).

More amateur stations are using vertical antennas on 160 meters than short random wires because they get more DX! The vertical is used in spite of its inefficiency (*i.e.*, not a half wave tall with 120 radials around it). Ground conductivity, which varies according to location, also creates losses to radiated power, yet the vertical gets out better over 300 miles.

Unless you live on a farm, it is impossible to put up a 120 foot 160 meter vertical and have 120 radials 130 feet long. The best we can hope for is to use a shorter vertical. About 30 feet seems to be the minimum practical length, with at least four counterpoise radials—always more than one radial.

The use of vertical antennas requires a counterpoise, or radials. If the antenna is mounted up in the air, it should have a counterpoise that is ungrounded. Many of the 160 meter operators have fouhat the higher the antenna is mounted above the ground, the louder their signals will be. They are mounting them on top of their towers, which requires radials or a counterpoise. In broadcast work 120 radials are recommended for full efficiency. Less than that is a compromise with ground losses. Remember that BC station verticals are mounted on the ground. For amateur work less loss can be obtained by elevating the antenna and using a counterpoise system.

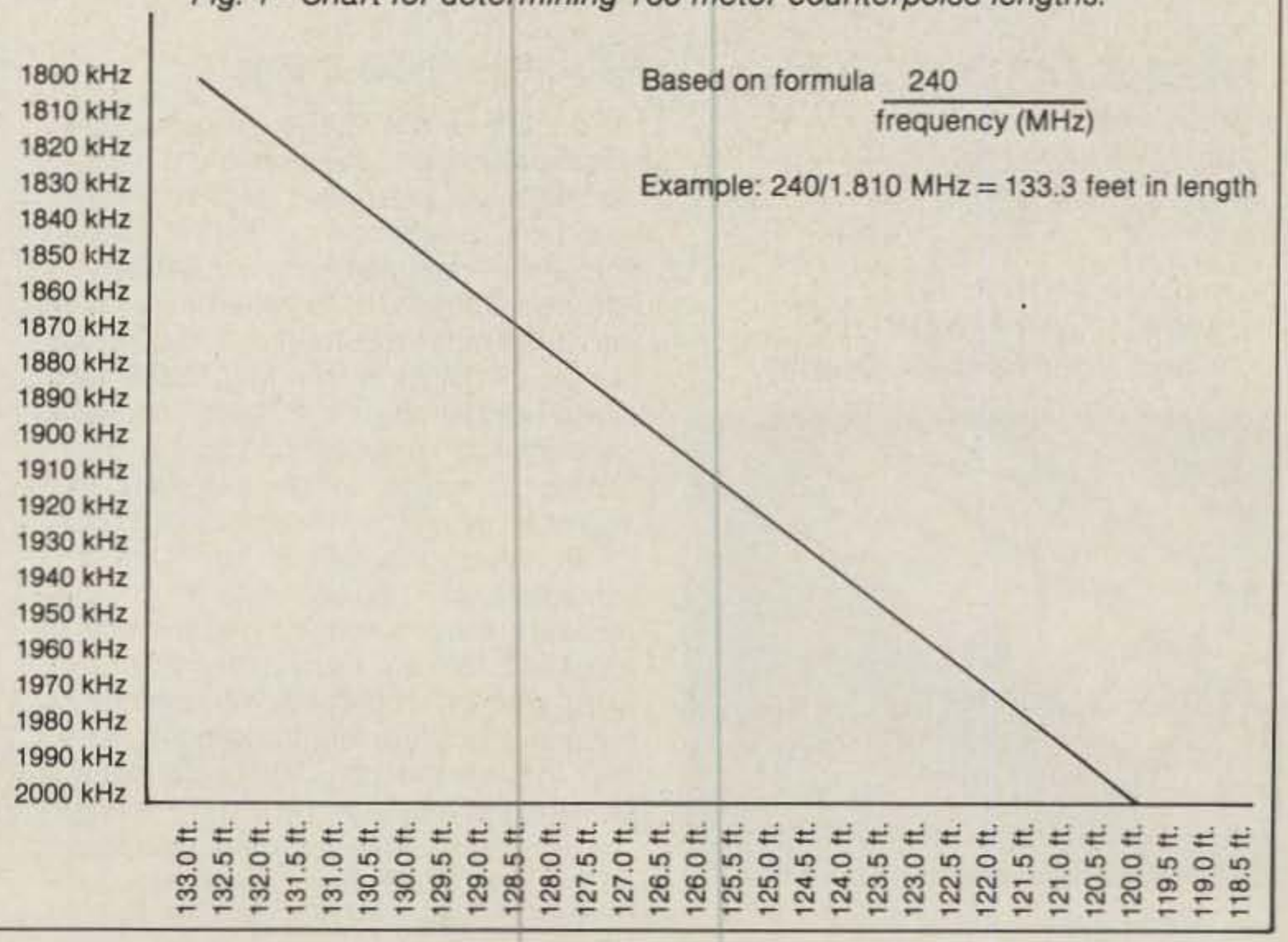
My conception of a counterpoise is a radial suspended above the ground and not connected to it. A radial can be a wire buried in the ground. However, some loss can be expected with this method due to heating of the soil.

It seems to me after listening to some of the best stations on 160 meters, that a vertical antenna mounted up in the air (the higher the better) with a counterpoise works best. Maybe the counterpoise radiates where a ground-mounted vertical with buried radials does not? There is really not too much solid discussion on 160 meter systems in the books. That is what makes 160 meters fun; there are unlimited things to experiment with.

A Marconi-type vertical where the bottom of the ground-mounted antenna is connected to the earth ground, and buried radials through a coil, has more losses than one mounted up in the air. In either case you have some loss in the coil, but in the Marconi you have the ground losses, too.

In either case here is a handy chart for determining lengths of radials or counterpoises for any part of the 160 meter band you desire, without having to do the paperwork. Most verticals only cover a small portion of the band. Thus, the counterpoise should be cut to the operating frequency.

Fig. 1– Chart for determining 160 meter counterpoise lengths.



*528 Colima St., La Jolla, CA 92037

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OK Electric Powered Wire-Wrapping Tool

The Model OK-9, with its reinforced Lexan™ housing, is a powerful and easy-to-use tool. Its rugged motor and positive gear drive are designed for high production, long life, and low maintenance. It is rated to accept bits for wire sizes 20–30 AWG, double insulated, and weighs only 10.5 oz. The tool is available with an optional anti-overwrapping device as Model OK-9-BF. The OK-9 features a 9 foot two-wire cord.

For more information, contact OK Machine and Tool Corporation, 3455 Conner Street, Bronx, NY 10475, or circle number 104 on the reader service card.

MFJ-202B Noise Bridge

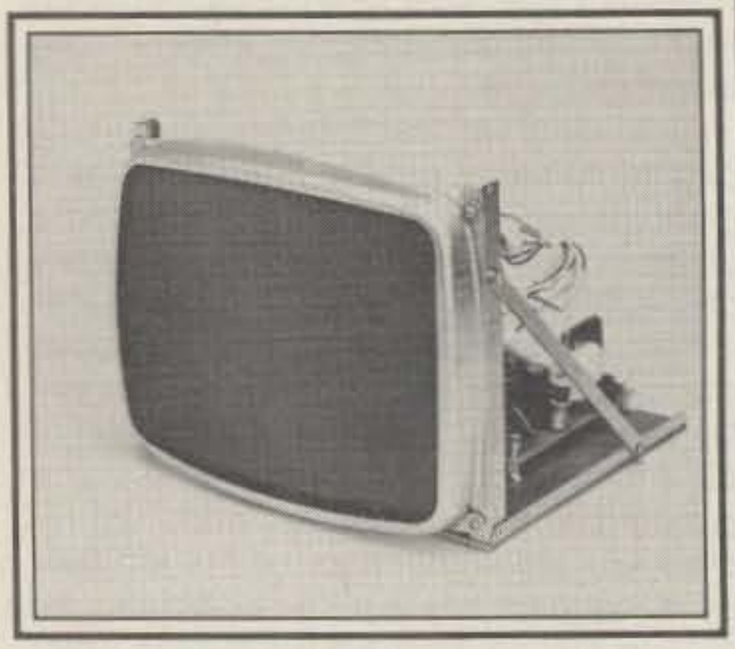
The MFJ-202B Noise Bridge allows quick adjustment for maximum performance of any antenna. You can measure resonant frequency, radiation resistance, and reactance of your antenna. It tells you whether to lengthen or shorten the antenna for minimum s.w.r. over any portion of the band. The MFJ-202B measures resistance to 250 ohms and has a capacitance range of ±150 pF. It includes a built-in range extender that shunts large unknown impedances down to its measuring range. You can tune transmatches, adjust tuned circuits, measure inductance, r.f. impedance of amplifiers, baluns, transformers, and other r.f. circuits. It can also be used to determine electrical length, velocity factor, and impedance of coax cable. With a transmatch and dummy load, it can synthesize r.f. impedances for test purposes.

The MFJ-202B front panel has push-

button ON/OFF and range extender switches, reactance adjustment, and a resistance adjustment. It measures 4½" × 2 × 4½" and is housed in a black aluminum cabinet with eggshell white front. The MFJ-202B RF Noise Bridge is available for $59.95 plus $4.00 shipping and handling. For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or circle number 105 on the reader service card.

Dotronix, Inc. DTU-12 Amateur Data Display

Dotronix, Inc. offers commercial-grade U.S. manufactured CRT displays for Morse code translators, SSTV, ATV, or personal computer applications. The DTU-12 from Dotronix, Inc. is available in kit, chassis, or chassis/a.c. power versions, either P4 (white) or P31 (green) phosphor. It requires only 12 volts at 1.5 amp, and standard TTL horizontal and vertical control signals, with 2.5 volt video drive. Scan rate is 15,750 Hz.



The kit is $85 (CRT/circuit only); chassis $95; a.c. supply $35 (for chassis version). These are brand new, commercial-grade displays, factory adjusted for proper geometry and supplied with written specifications. For more information, contact Dotronix, Inc., 160 First Street S.E., New Brighton, MN 55112, or circle number 102 on the reader service card.

Tokyo Hy-Power Labs HC-2000 Antenna Tuner

The HC-2000 is a 2000 watt p.e.p. (50 watts maximum on 1.9 MHz) h.f. antenna coupler with a power/s.w.r. meter and 12 position antenna switch (6 through the tuner and 6 bypass). It will tune coaxial fed antennas, balanced line antennas (balun included), or end-fed wires. The HC-2000 is band switched for 1.9, 3.5, 7, 10, 14, 18, 21, 24.5, and 28 MHz bands, plus it has 6 to 1 vernier dials on the capacitors for easy fine tuning! Scales on the dual meters include s.w.r., 2 kw, 200 w, and 20 w. Connectors are SO-239's and Johnson terminals.

Suggested retail for the HC-2000 is $329.95. For more information contact THL Sales Department, Encomm, Inc., 2000 Ave. G, Suite 800, Plano, TX 75074 or circle number 101 on card.

dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

Heavy Schedule of Amateur Matters in January

The FCC's schedule of activities for January was dominated by numerous matters of interest and concern to the Amateur service. According to Messrs. Jim McKinney and John Johnston of the Private Radio Bureau, the following three issues were addressed by the Commission on 20 January 1983:

1. Proposed NPRM on an "amateur no-code" license class. During the summer of 1982, the Commission ordered the Private Radio Bureau to prepare a draft NPRM in the matter of a no-code license class for the Amateur service. In particular, the Bureau was instructed to consider two options:

A. A license class similar to the digital class license issued by the Canadian government (the Commissioners, however, refrained from specifying the technical level of the new U.S. license's exam);

B. An "easy-to-get" code-free license with a technical exam on the order of that now required for the Technician class license.

Despite last-minute appeals by the ARRL to the Commission for an 18-month delay in the issuance of the NPRM, the Commission directed that the proposed Notice be released for public comment. (Docket No. 83-28).

2. Proposed NPRM on the procedures to be used by those who voluntarily administer amateur exams. Under the provisions of PL 97-259, the Commission was directed to set up a volunteer system for administering amateur code and theory exams. The ARRL petitioned for such a system last year (RM 5229), and the League's comments, as well as those provided by the Capitol Hill Amateur Radio Society, were used to develop the proposed NPRM. The Commission voted to release the proposed NPRM for public comment (Docket No. not available at this writing).

3. Proposed NPRM on a GE proposal for a 900 MHz Personal Radio Communication Service (PRCS). The proposed NPRM would seek comment on GE's proposal to provide remote telephone service to the public. The service would employ 25 kHz channels in a band at 900 MHz, and would provide direct access to a person's telephone from a remote or mobile unit. Additionally, a person could access his or her telephone by means of signals relayed through special repeaters. This matter is only of interest to amateurs because many possess the technical capabilities required to install and operate the repeaters that would be used. The Commission approved the release of the NPRM (Docket No. 83-26).

Note added in proof: As we go to press, we have learned that on 27 January 1983, the Commission will consider new draft provisions for amateur use of AMTOR, a digital, highly reliable, request-repeat radioteleprinter code (also known under the trade name SITOR in the commercial services; see *QST*, August 1982, p. 55, for the ARRL's petition requesting permission for amateurs to use AMTOR).

Since the matter of adopting Rules which permit amateurs to use AMTOR should be non-controversial, it is possible that the Commission could issue an Order to adopt the Rules under the Administrative Procedures Act (versus having to go through full rule-making procedures involving an NPRM).

Amateurs Abide By Restrictions on New 10 MHz Band

Amateur incursions into the restricted portion of the new 10 MHz band (i.e., the subband from 10.109 to 10.115 MHz) are no longer a major problem, according to Richard Smith, Chief, Field Operations Bureau, FCC. At one time the number of violations observed by the FOB ran as high as 40 per day, raising fears that the temporary Secondary allocation of the 10.1–10.15 MHz band to the Amateur service would be withdrawn. "Today," says Smith, "the number is down to one or two violations per day, and we feel that we have the situation well in hand."

Readers are again reminded to steer clear of the subband 10.109–10.115 MHz, a portion of the band that is reserved for the exclusive use of certain government agencies.

Plans for Amateur Assistance on Enforcement Matters Moving Ahead

Among the provisions of PL 97-259 (the so-called Goldwater Bill), which the President signed into law last September, is the go-ahead for amateurs to assist the Commission in matters pertaining to enforcement of its Rules for the Amateur service. To this end, a draft plan for implementing Amateur-Commission cooperation in the area of enforcement is now being prepared. Further, the possibility exists that an approved plan could be implemented as early as this summer *if* it can be "turned on" through internal administrative actions. Should the Commission require the plan to go through full rule-making procedures, however, the starting date would be delayed by several months.

Cable Television Association Addresses CATV Leakage

Writing in the November 1982 issue of *CATJ* (the journal of the Cable Television Association), Wayne Sheldon, A CATA director, noted that a panel of experts on CATV which met at last fall's ARRL Western Region Convention agreed that " . . . any amount (of interference) that caused interruptions of communications by the Hams was too much and must be remedied by one method or another."

A member of the panel, George Sears, Engineering Director of Gill Cable (San Jose, CA), noted that his company had voluntarily removed signals from Channels E and K (within the 144 and 220 MHz bands, respectively) because of CATV signal leakage problems involving the Amateur service. Despite Gill Cable's attempts to clean up the leakage problems on these two channels, said Sears, " . . . accidents, squirrels, and weather inevitably caused problems."

Chris Imlay, Legal Counsel for the ARRL, pointed out to the panel that all cable operators were not so cooperative in correcting leakage problems. As a result, the ARRL was forced to petition the FCC for relief; the matter is now the subject of RM-4040. In this regard, Imlay read comments to the FCC on RM-4040 which were filed by a major operator of cable systems in the U.S. The comments, paraphrased by Sheldon, stated:

"Amateurs had two choices if they experienced interference from the cable. First, since their antennas were very directional, all they had to do was point them in another direction to eliminate the problem." (The cable operator did not indicate how the amateur was then to communicate on the desired path!)

"Second, since the Ham operator's equipment is tuneable, he could move to another frequency." (Here, the cable op-

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Media-Tech, 8603 Conover Place, Alexandria, VA 22308

erator apparently is ignoring the fact that the frequencies in question are allocated to the Amateur service and not to cable users.)

The cable operator's comments are, of course, ridiculous, and even Sheldon was moved to say that "With *friends* like this running around loose, the cable industry doesn't need any enemies."

Sheldon urged cable operators not to ignore the complaints of amateur operators regarding interference from CATV operations, and urged CATA members involved in such r.f.i. complaints to seek help from the Association's Engineering Office.

Broadcaster Threatens Commission's "Last Man In" Rule

According to reliable sources in Washington, the Commission's "last man in" rule is under heavy fire from a broadcaster who is the subject of an r.f.i. investigation. The broadcaster involved, WVEU TV in Atlanta, GA, operates on Channel 69, and its tower is co-located with numerous land mobile installations. The latter, unfortunately, have been experiencing serious desensing and interference problems resulting from the TV station's signals and its spurious components, and so, the station was ordered to operate on reduced power until the issue is settled.

Under the "last man in" rule, the last operator to occupy a site is responsible for cleaning up any r.f.i. problems which result from his operation. Here, WVEU TV is the "last man in," and so, the Commission expected the TV station's operators to seek technical solutions to the problems encountered by the land mobile operators.

Instead, the station, which is minority owned, is seeking political support in Congress to void the "last man in" rule and to place the responsibility for cleaning up the r.f.i. problem elsewhere.

Because the "last man in" rule can be applied to all radio services administered by the Commission, and because it is one of the most potent weapons the Commission has for fighting new r.f.i. problems, the WVEU TV case has implications which go far beyond the case at hand. As such, amateurs and operators in other radio services are monitoring developments closely to see if the technical merits of the FCC's position will prevail.

ARRL Supports Adoption of ANSI Proposal on Standards for Human Exposure to R.F.

Under General Docket 79-144, the FCC is now looking into the matter of r.f. exposure standards for human beings. Focus on this problem stems from the fact that energy in electromagnetic-waves can present a hazard to life. For example, X-rays and gamma rays can produce ionization and subsequent genetic damage, while r.f. radiation of sufficiently high intensity can heat biological tissue.

According to the Office of Science and Technology, FCC, studies have shown that the human body absorbs r.f. energy at a maximum rate in the 30 to 300 MHz region. Accordingly, the Commission has undertaken the task of developing r.f. safety standards which take account of frequency dependence. The most restrictive standards, of course, will be in the band where biological effects are the highest.

The ARRL's Committee on the Biological Effects of RF Energy has followed the Commission's inquiry closely, and it continues to participate formally in the FCC's work on this matter. As part of its efforts, the Committee has reviewed the work of the American National Standards Institute (ANSI). ANSI recently completed an eight-year study of human exposure to r.f., with particular emphasis on frequency dependent effects. In particular, according to *AMATEURADIO* (the ARRL's public information newsletter), ANSI looked for the "worst case" conditions throughout the spectrum and set r.f. exposure standards for human beings at one tenth these levels. The Committee believes these levels to be acceptable, and so, the ARRL endorsed the ANSI proposed standards and urged the FCC to adopt them as the national standards.

Finally, in the matter of biological effects caused by r.f. radiation, Dr. Michael Marcus, Office of Science and Technology, FCC, notified your Editor that the Environmental Protection Agency (EPA) has released an advanced NPRM which indicated that this Agency intends to act on the issue. While no specific EPA proposals have surfaced to date, Washington insiders expect the EPA's proposed standards to be a variant of the standards proposed by ANSI.

AMSAT Prepares for New "Satellite Basics" Net

According to *Amateur Satellite Report*, the Radio Amateur Satellite Corporation's newsletter for the amateur space program, a new "Satellite Basics" net is in the "talking and thinking" stage. Consideration of a new net resulted from a number of requests for AMSAT to provide introductory-level material in an easily accessible way. Creation of a new net is made all the more urgent by the fact that several existing nets will be moving to Phase IIIB satellite this summer. As such, at least one new h.f. net will be needed to serve as a "breeding ground" for new users of OSCAR satellites.

If you're interested in joining a new AMSAT "Satellite Basics" net, contact AMSAT Net Manager W8GQW, 1617 West McKaig Road, Troy, OH 45373. Amateurs wishing to join AMSAT should contact The Radio Amateur Satellite Corporation, P.O. Box 27, Washington, D.C. 20044.

ARRL President Clark Attends White House Ceremony

ARRL President Clark, W4KFC, one of several dozen heads of organizations who have agreed to serve on the U.S. Council for World Communications Year 83, attended ceremonies at the White House in December when President Reagan officially announced U.S. participation in WCY83. Also in attendance were other members of the Council, the FCC Commissioners, and Under Secretary of State William Schneider, K2TT.

A reception to celebrate WCY83 was later held at the Department of State. Attending for the ARRL was Perry Williams, W1UED, Washington Area Coordinator. The reception, hosted by Secretary Schneider, provided an informal atmosphere for discussions between Williams and representatives from the Commission, the Senate, and the telecommunications industry.

Vernon P. Wilson, KT4K, Retires After 18 Years With FCC

Vernon P. Wilson, Chief, Regional Services Division, Field Operations Bureau, FCC, retired on 7 January 1983 after 18 years of service with the Commission.

Wilson began his career with the FCC in 1964 as an electronic engineer in the Boston field office. Shortly thereafter, he

moved to Philadelphia, where in 1971 he was promoted to Engineer in Charge of that city's field office. Moving to Washington in 1972, Wilson joined the Enforcement Division, and in 1972 he became Chief of the Regional Services Division.

On his retirement, Wilson said that he plans to divide his time between Maine and Florida, where he will likely spend many hours operating as KT4K.

Breathalyzers Lose Round to R.F.I.

Four models of breathalyzer machines produced by Smith & Wesson were recently found to be susceptible to radio frequency interference (r.f.i.) by that manufacturer. As a result, the company has notified Virginia state officials that when the devices are operated in strong r.f. fields, test results could contain major inaccuracies.

Questions about the accuracy of tests performed by Smith & Wesson's breathalyzers are known to have led to the dismissal of at least one drunk-driving case in Virginia. And according to *The Washington Post*, that state's attorney general's office has recommended that state police "temporarily stop using their breathalyzer machines."

Pay-TV Service Gets Tough with Illegal Seller of Decoders

Super TV, a pay-TV service which operates on Channel 50 in Washington, D.C., and on Channel 54 in Baltmore, MD, is suing a Manassas, VA, retailer for 1.45 million dollars in damages. The suit against Walker Technical Services results from that retailer's illegal sales of pay-TV decoders. Use of such decoders allows viewers to watch descrambled programs without having to pay for the service.

Super TV, which filed the suit in Alexandria (VA) federal court, is also seeking a permanent injunction against the sale of decoders by Walker Technical Services.

FCC Shuts Down Anti-Castro Broadcaster

The FCC has shut down another anti-Castro broadcaster in southern Florida who was operating just below the amateur 40 meter band. According to Joe Casey, Chief, Investigations Branch, Enforcement Division, Field Operations Bureau, the latest station to be closed had no apparent connection with previous operations of this type. The Commission has issued the operator of the station a forfeiture in the amount of $500 and has warned him that further violations will result in stiffer penalties.

Lame-Duck Congress Sees Radio Marti Voted Down in Senate

Despite last-minute appeals from the White House and from individuals such as Armando F. Valladares, a Cuban poet who was imprisoned in Cuba for 22 years, the Senate killed President Reagan's plan to beam propaganda to Cuba. The plan, if it had passed, would have created Radio Marti for the purpose of providing the Cuban people with information about their country and about President Fidel Castro's support of revolutionary activities in Central America and Africa.

What apparently led to defeat of the Administration's plan was fear by midwest senators and U.S. broadcasters (notably WHO in Des Moines, IA) that Cuba would retaliate by jamming domestic broadcasts in the a.m. band.

Majority Leader Howard H. Baker, Jr. indicated that he would give the plan high priority in the 98th Congress.

Cordless Phones Radiate Long Distances

In a letter to your Washington Editor, Dave Beauvais, KB1F, noted that in his area (Amherst, MA) the base unit frequency used for cordless phones (1745 kHz) sounds like a CB channel when the 11 meter band is open. According to Beauvais, he can hear " . . . dial tones, pulse dialing, and several layers of heterodyned voices."

Beauvais lives in a rural area, and so, the interference is probably coming from the nearest small city which is 12 miles away! The fact that the signals propagate over such distances is probably due to the use of house wiring as antennas for cordless phone operations.

Since the base unit frequency of 1745 kHz is just below the edge of the amateur 160 meter band, there is the possibility that amateur operations in the band 1800–2000 kHz will result in r.f.i. to cordless phones. Of more concern to users of these phones, however, should be the potential for unauthorized use of their phone line by third parties who are also equipped with cordless systems. In addition, eavesdropping by outsiders is a threat to one's privacy.

FBI to Encode Its Transmissions

According to the Associated Press, criminals and spies throughout the U.S. are eavesdropping on FBI radio communications, and are thereby reducing the effectiveness of the Bureau. The situation has now become so intolerable that the Justice Department has asked Congress for $12 million to purchase encoding devices.

Of particular concern to the FBI is the use of f.m. scanners by "organized crime figures, drug traffickers, career criminals, and even the news media and curious citizens." Because of eavesdropping, says the AP, " . . . fugitives have escaped, citizens have been injured, FBI agents have been threatened, investigations have been thwarted, and the lives of agents and citizens have been endangered."

In addition to encoding the f.m. radio transmissions from the FBI's 59 field offices across the nation, steps have already been taken to classify the frequencies used by the Bureau.

Your Washington Editor would like to thank Messrs. James McKinney (Chief, PRB) and John Johnston (Chief, Personal Radio Branch, PRB) for information on FCC agenda items for January 1983.

Antennas

a monthly feature by
KARL T. THURBER, JR., W8FX

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Antenna Accessories For The Hamshack: Part VII

In recent issues of CQ, columnist W8FX has presented descriptions of a wide variety of r.f. and antenna accessories for the well-equipped hamshack. In this concluding column on accessories, he rounds up several important contemporary and "yesteryear" accessories for what we think you'll find to be an exceptionally interesting discussion.

To date, we have examined a very wide range of antenna and r.f. accessories. These have included both in-line and off-line devices, from the s.w.r. bridge to the r.f.i. filter, and a great deal in between. Last month, we discussed the antenna noise bridge (ANB) and the grid-dip oscillator (GDO). This month, we will finish up with a brief discussion of two other useful hamshack accessories: the signal generator and the frequency counter. We will also highlight some interesting old-time accessories, and provide some hopefully useful words of advice on test equipment selection and maintenance. Let's look at the signal generator first.

The R.F. Signal Generator

The r.f. signal generator is a workbench instrument which contains an oscillator and associated circuitry to produce variable reference signals for transmitter and receiver calibration, alignment, testing, and servicing. Many also contain built-in audio generators for modulating the r.f. carrier; others include various crystal marker functions.

The signal generator is much like the GDO, but it is a shop-type workbench instrument rather than a "hand-held" one, as are most GDOs. The signal generator is normally more stable and better calibrated than is the GDO, and includes not only a simple r.f. oscillator, but a buffer or isolation stage or stages, as well as an attenuator to allow its r.f. output level to be precisely adjusted.

The signal generator is useful in testing, aligning, and servicing receivers and transmitters, and at just about any other time when one might need a convenient source of r.f. Commercial and laboratory-type units are quite expensive, costing at least $500 or more, but for most ham applications relatively inexpensive $100 to $200 models usually can fill the need.

317 Poplar Drive, Millbrook, AL 36054

A signal generator or r.f. oscillator is handy for general workbench applications, including circuit test and alignment. Inexpensive "modular series" oscillator by Heath covers 310 kHz to 110 MHz on fundamentals; a 1 kHz audio output is also available for tracing circuit defects. Other items in the 5280 series include a four-function milliammeter, sine/square wave oscillator, RCL bridge, signal tracer, and common power supply for the units in the series. (Photo courtesy Heath Co.)

Like the GDO, the main problem lies in coaxing sufficient accuracy out of inexpensive units. However, signal generators can be calibrated with the aid of a regular communications receiver, using signals from WWV, or cross-checking against known signals on a well-calibrated communications receiver or transceiver. As with GDOs, accuracy can also be effectively increased by using the signal generator in conjunction with a frequency counter for a running check on the generator's output frequency.

Low-price Heath IM-4100 frequency counter kit allows frequency measurement at low cost and with high accuracy. Unit shown here has an input attenuator with three positions and an over-range indicator. Before purchasing a frequency counter, check the specs carefully, particularly with respect to frequency range, input sensitivity, and accuracy of the time base. (Photo courtesy Heath Company)

In shopping for a signal generator, look for one that sports a high output (at least 100,000 microvolts), decent accuracy (plus or minus 3% or better), and outputs on fundamental frequencies to at least 30 MHz and usable harmonics to 150 MHz (higher if you plan to use the generator for u.h.f. work). Desirable features include a temperature-compensated oscillator circuit, marker generator and crystal-checker functions, and an internal modulation capability.

Although primarily a servicing and workbench instrument, I'd rank the signal generator not far behind hamshack staples such as the ANB, GDO, s.w.r. bridge, and wattmeter in terms of overall versatility and usefulness.

The Frequency Counter

An increasingly popular item of r.f. test equipment is the frequency counter. In fact, it's almost as commonplace in the hamshack today as are the digital voltmeter and s.w.r. bridge—mainly because of recent advances in solid-state and large-scale integration (LSI) technology which make the device a very affordable one.

The frequency counter is a complete instrument for measuring frequency by counting the periods of a waveform and displaying the count as a numerical value in Hertz (Hz); there are several methods for accomplishing this task which we won't detail here. Most contemporary counters come with whole-digit display and cover at least up to 40 to 50 MHz. Front-end scalers or "pre-scalers" can extend coverage to several hundred MHz.

With frequency counters well in the affordable range, the big problem is how to select the *right* counter for your needs. To make this choice, it's especially important to determine the uses to which the counter will be put. For example, will it be used for reading the frequency of an h.f. transmitter, or for checking out a u.h.f. rig? Will it be used as a general-purpose workshop instrument, or for checking out a mobile rig? And what kind of accuracy and sensitivity really is required?

The frequency counter is one instrument in which it is especially advisable to become familiar with the specifications. All counters read frequency, but the specs tell how accurate and versatile the instrument is. Obviously, frequency range is a prime consideration: you can't read out the 2 meter band on a 50 MHz

counter. For the most part, a 500 MHz counter will fill most amateur needs, although it is a good idea to see if a lower range counter can easily be updated by using a scaler to enable a higher range later on.

Accuracy is an extremely important consideration. There are three main sources of errors in a frequency counter. These include the ±1 count ambiguity, time-base instability, and trigger noise. The ±1 count ambiguity occurs because the input pulses and the time base normally are not synchronized. Time-base instability is usually due to powerline frequency fluctuations (when this method of reference is used), or crystal drift when this type of oscillator is used as the gate time source. Trigger error is caused by the fact that the frequency counter can't differentiate between a true signal and noise mixed with the signal.

How much overall accuracy is required? For the amateur operating up to about 2 meters, an accuracy of about ±3 ppm (±0.0003%) is adequate. A counter having this degree of accuracy (±3 ppm) would be in error by only about ±450 Hz at 150 MHz. Note, however, that the ppm specification holds only over a stated temperature range; the temperature range should be mentioned in the time-base specs for the spec to be useful. Preferably, the time-base specs should include temperature stability, short- and long-term stability, and stability due to line voltage changes. For outdoor use, or for very high accuracy work (accuracy greater than ± 1 ppm), consider the use of a crystal oven; if the crystal temperature is kept stable, the oscillator will also be stable.

Also important are the input circuit specs, since this circuit must amplify and process a wide range of signals. The sensitivity at the higher frequencies is a very telling spec. For example, a sensitivity of 150 mv at 450 MHz may be common with inexpensive counters, but it isn't adequate to measure the output of a 100 mv signal generator. "Ballpark" minimum sensitivities might be 150 mv at 500 MHz and 75 mv at lower (h.f.) frequencies, although this is very subjective and depends on the application.

Besides the basic parameters of frequency range, accuracy, and input sensitivity, other factors are important. These include the type of display (LED, fluorescent, Nixie tube, etc.); number and size of digits in the display; and special features and options (frequency range extenders, high-stability time bases, portable power packs, overload protection, etc.).

A particularly useful accessory, especially for use with inexpensive frequency counters, is the counter preamp. The preamp allows one to observe and measure very small signals that otherwise would not be visible on the counter. These include signals from receiver oscillators, low-level transmitter stages, time bases, etc. Pagel Electronics, among several, markets a compact, battery-operated line of preamps that is representative. Their u.h.f. preamp, for example, covers a range of 1 MHz to 500 MHz, with a gain of 25–30 dB at the midrange. An insulated probe is used on the BNC-type input for small-signal detection. A 3–4 foot 50 ohm cable is used to connect the preamp to the counter. Most of these preamps can also be used with oscilloscopes, r.f. voltmeters, and other types of test gear.

A good counter will last a long time, so it is worthwhile to shop carefully to select one that is accurate, reliable, and convenient to use. If possible, get a "hands-on" demonstration of the unit to see if it appears to meet your measurement needs. And, once the counter has been purchased, learn how to use it properly—always measure unmodulated signals, be sure the signal is strong enough, avoid excessive signal levels, and use the counter with personal safety in mind.

Accessories of Yore

While this is a column primarily concerning current antenna and r.f. accessories, it is interesting and instructive to review some of the antecedents of present-day hamshack instruments. Three that I would like to highlight here are the

absorption wavemeter, the **frequency meter**, and **Lecher wires**.

We have already alluded to the **absorption wavemeter** in a previous column as a sort of proto-field strength meter and also as a function included in the GDO. The absorption wavemeter was a test instrument designed to determine frequency by absorption of energy from the source under test. The device had a tuned circuit which was loosely coupled to the transmitter or oscillator; maximum energy was absorbed from the r.f. source (as indicated by the unit's meter or indicator bulb) when the circuit was adjusted to resonance with the r.f. source. The frequency could then be determined by referring to a calibrated dial on the device or by using a separate chart. Most wavemeters were either bandswitching or they used a set of plug-in coils to cover the h.f. ham bands from 160 or 80 meters, up to 10 meters, and sometimes higher.

Depending upon how accurate the device's calibration was, the wavemeter could handle a number of jobs fairly well. This included checking the fundamental frequency of v.f.o.'s and oscillators, detecting transmitter harmonics, checking for parasitic oscillation, and adjusting final amplifier neutralization. The absorption wavemeter could also double as a field strength meter and an a.m. modulation monitor, as well. Since most units were fairly sharply tuned, they could give a positive indication of whether or not one was operating on the correct band (accidentally tuning up a transmitter on a harmonic frequency used to be a common class "C" tuneup problem that invited receipt of a so-called FCC "pink ticket").

A real standout among these older instruments was the Bud Model GM-79 "Gimix," a calibrated bandswitching absorption wavemeter that covered from 3.5 to 30 MHz. The Bud unit was fairly representative. It had a pilot-lamp resonance indicator, although a milliammeter or microammeter could be plugged into it for greater sensitivity and accuracy of adjustment; a pair of headphones could also be plugged in for aural monitoring. A similar Triplett instrument, the Model 3256 "Frequency Meter," performed a comparable function, and it included a built-in d.c. milliammeter and boasted direct frequency calibration.

However, *beware*: If you use the wavemeter (or any *other* type of "probing" instrument) with your ham gear, you should observe two important cautions: (1) be careful when probing around a live transmitter circuit to be sure that you don't inadvertently touch any high-voltage or r.f.-hot points in the rig; and (2) be sure not to "overcouple" the device to the r.f. circuit under test to prevent excessively broad and inaccurate readings caused by overloading the unit.

Earlier in this column we discussed the frequency counter. Its ancestor is the **frequency meter**, a basic instrument that indicated the frequency of a signal applied to it. The most common kind is the heterodyne frequency meter, which contains a frequency generator or oscillator that is tuned to beat (heterodyne) with the frequency to be measured. The two signals are the same at zero-beat, and they can be read out on a meter or by using a conversion chart. In some respects, it is actually a refinement of the even older wavemeter.

Few amateurs built their own frequency meters, since for them to be truly accurate, the device had to be exceptionally stable, both mechanically and electrically. Most amateurs relied on the less-accurate but more easily constructed absorption wavemeter (described earlier) for routine transmitter checking, and on their receiver and band-edge calibration marker or crystal calibrator for an indication of the frequency of their transmitted signal.

Some amateurs who knew a good deal in the surplus market when they saw one bought the war-surplus BC-221 frequency meter (sometimes seen under its Navy "LM" designator). This little unit, although perhaps anachronistic by today's standards, could be depended upon for surprisingly accurate frequency measurements, yet could be purchased for as little as $40 or $50. The instrument did have a disconcerting tendency to drift, however, and it had to be used in connection with a complicated calibration book to make actual frequency readings.

The frequency meter has, for the most part, given way to the frequency counter. However, a modern-day "frequency meter" is manufactured by the International Crystal Manufacturing Co. The FM-2400CH is a portable, solid-state meter specifically designed for mobile transceivers and receivers, and it covers the spectrum from 25 to 1000 MHz; frequency stability is an impressive ±.0005% without temperature correction. It can also be used as a wide-range signal generator and f.m. deviation meter.

Lecher wires are something of a novelty today. They consisted of two parallel conductor wires or lines that were coupled to a transmitter or oscillator in order to physically measure the wavelength. The two wires formed a transmission line that had very pronounced resonance effects and on which standing waves appeared. The wavelength of the frequency being measured was equal to two times the distance between any two consecutive current loops, or maximums.

This handy, if somewhat unwieldy, device was practical only at v.h.f. and u.h.f. frequencies because of the dimensions involved. Lecher wires were normally constructed on a two-by-four or wooden planking; the two wires were tightly stretched between end pieces using turnbuckles. For determining the transmitter's frequency, a small wire loop and flashlight bulb were loosely coupled to the rig's output tank circuit. The Lecher wire apparatus was also loosely coupled to the transmitter tank circuit. A shorting bar was then moved down the wires until a pronounced dip was observed. The shorting bar was then run down the wires until a second dip was observed. The distance between the two points was equal to a half-wavelength, and by means of a sharp pencil or a slide rule (no calculators then!) the wavelength could be converted to frequency.

Certainly not in the category of r.f. test equipment, a good all-purpose power supply is a worthwhile addition to the hamshack workbench. Heath unit shown here is for the designer's and experimenter's workbench and features one fixed 5 volt d.c. output and two continuously variable 0–20 volt d.c. outputs for circuit design work. For workbench testing of mobile transceivers and other d.c.-powered equipment, a heavy-duty workbench power supply/battery eliminator is a useful item of test equipment. (Photo courtesy Heath Company)

Admittedly, the measurement process was cumbersome, but it was reasonably precise—after all, it constituted a *physical* measurement of wavelength. While a few v.h.f. and u.h.f. experimenters still may make use of Lecher wires, instruments such as the ANB, GDO, and frequency counter have pushed this interesting device off-stage.

Some "Words of Wisdom"

Regarding *cost*, good test equipment costs money; in some cases, this cost can be more than that of the gear that it is intended to serve. Yet one of the best investments you can make is in good, dependable test equipment, whether for "r.f. purposes" or for workbench servicing. Good test equipment rarely becomes outdated.

Naturally, it doesn't make a great deal of sense to make yourself a "test equipment pauper" by buying far beyond needs. Very few amateurs, for example, require a spectrum analyzer, or a frequency counter that will count to 1 gigahertz or higher. The decision to purchase more- or less-expensive test equipment should be based on your needs and the frequency with which you anticipate its use. For example, it pays to obtain some good, basic test equipment such as a pre-

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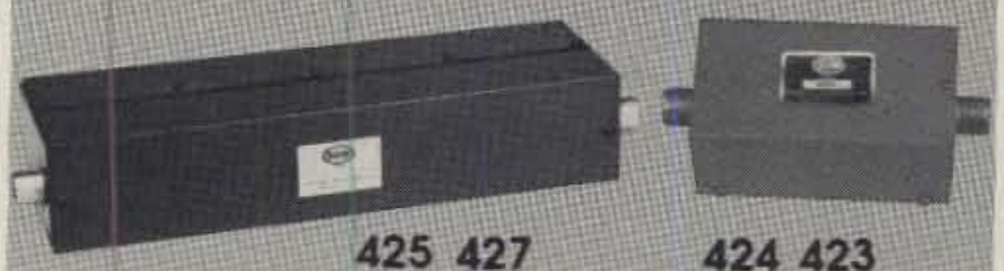

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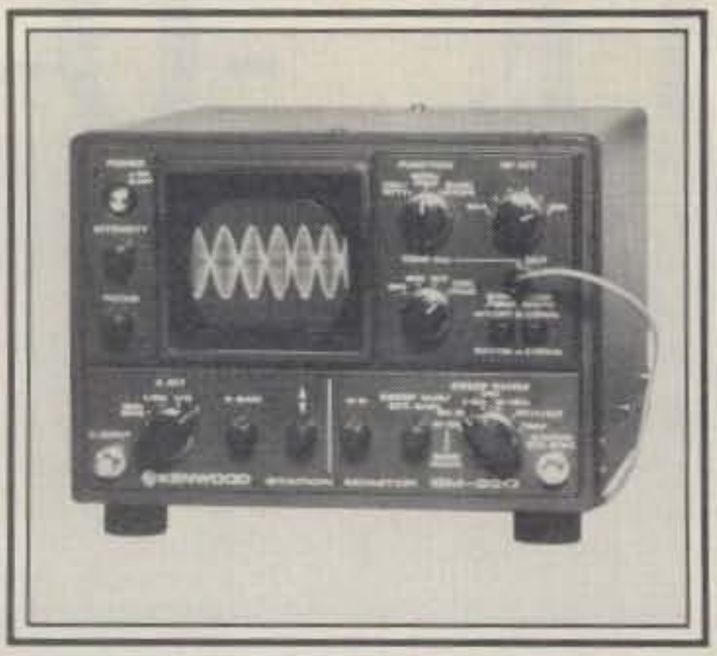
cision multimeter or s.w.r. bridge, because you'll likely use these instruments every day, and they'll probably never go out of style. On the other hand, to invest in a frequency counter good to an accuracy of less than one part per million would not be cost-effective if you are but a casual v.h.f. or u.h.f. operator.

After deciding on what kind of test equipment you need and expect to use enough to justify its purchase, you should carefully select it by evaluating performance, features, and price. Shop the electronics distributors in your area and the amateur radio magazines, and send for comparative spec sheets. Like anything else you buy, careful comparison shopping pays off handsomely.

It is amazing how the same number of dollars will buy vastly differing quality and specs from different manufacturers. And, while you can usually save a great deal of money by buying kits, they're not *always* the best buy. For example, you may find that it's less expensive to buy a precision wired-and-tested frequency counter from one of the newer firms that specialize in digital test equipment than it is to purchase an equivalent kit.

A worthwhile club project can be the purchase of a high-quality set of r.f. test equipment for use by the membership. While this may not be a particularly cost-cutting effort for the more inexpensive items of test equipment, when it comes to the complex and costly equipment often needed, it's a good way to allow all of the members to share in the benefits of using the higher-priced gear on a cooperative basis. If your club goes this route, buy only the best, most rugged instruments, as shared equipment tends to get much rougher treatment than individually owned gear.



More than an item of r.f. test equipment, the so-called "station monitor" type of accessory is capable of various monitoring functions, and also performs as a wideband oscilloscope. The Kenwood SM-220 shown here monitors s.s.b. and c.w. waveforms from 1.8 to 150 MHz, monitors received signals in the receiver's i.f. stage, provides trapezoidal pattern for linearity testing of linear amplifiers, allows observation of RTTY cross-pattern tuning points, and can expand to pan-display capability for observing the number and amplitude of stations within a switchable ±20 kHz/±100 kHz bandwidth. The unit has a built-in 1000 Hz and 1575 Hz generator. (Photo courtesy Trio-Kenwood Communications, Inc.)

In any case, it's better to pay a few dollars more for your test equipment to obtain accurate, dependable gear, than it is to try to use cheap gear the reliability and accuracy of which may be doubtful. A good question to ask is, will the accessory provide me with more value in terms of improved operating and servicing convenience than I have to pay for it?

Now that you've bought the right equipment at the right price, what about its maintenance? It's true that most test equipment requires little maintenance; for the most part, your test equipment will just sit there, doing its job for a long time without needing any calibration or servicing. However, it does pay to have a regular program of preventive maintenance and calibration on your test equipment in order to keep it in good shape. This program need not be a fancy one, but there is nothing more frustrating than to have your rig go up in smoke due to an excessive s.w.r. or for whatever other reason, just to discover that your test equipment itself needs fixing!

You should, at the least, periodically inspect your test equipment both externally and internally. You should check the lubrication of moving parts; clean switch contacts and terminals; make any self-tests or self-checks that can be accomplished; and occasionally dust off the unit's innards. It's also a good idea to spot-check the calibration of your equipment, such as frequency counters and signal generators, by checking them against WWV or another reliable signal source.

You can check your s.w.r. bridge or ANB against your dummy load, and your GDO dial accuracy against your communications receiver. You should also regularly check the batteries in any piece of test equipment that uses them, and replace them when weak—surely before they go "sour" and make a sorry mess of the instrument.

For the most part, if you make an honest effort to care for and maintain your test equipment, you can usually keep it running and working up to factory specs for years to come.

Wrapping Up

In this series, we've taken a long look at some of the more commonly used pieces of r.f. test equipment. And, while it's not necessary to clutter the operating position with gadgets, we have suggested that several of these are near-musts in the well-equipped hamshack. We have also taken a brief look at some early ham test equipment, highlighting the early antecedents of some current gear. In addition, we've presented some tips on purchasing and maintaining your "tools of the trade."

It's been a lengthy series we've run on antenna and r.f. accessories. We hope that this extended discussion of a wide variety of such instruments has been worthwhile—one that will lay a firm foundation for future columns. Bear in mind that buying or building high-quality test equipment, and becoming thoroughly familiar with its operation, will serve you well. After all, the life of your ham gear and the potency of your signal may largely depend upon the quality of your r.f. test equipment!

Next month, we will return with another subject of topical interest. See you then.

73, Karl, W8FX

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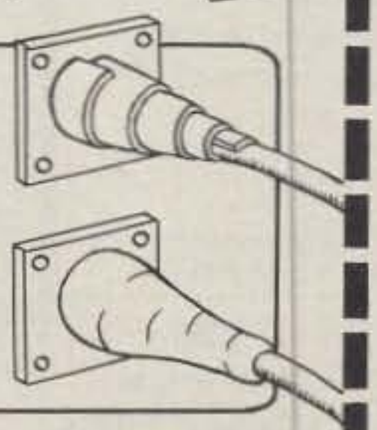

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BY DICK SANDER*, K5QY

I have a Ham-IV rotator with 260 feet of lead-in. Because of the long lead length, the turning torque of that rotator was weak. Instead of adding a series transformer inside the control box to up the voltage, or going to the expense of buying heavy-gauge rotator cable to overcome the IR losses, I chose to use an industrial-grade motor-run capacitor and mount it outside at the rotator. The capacitor is a 105-126 uF at 125V a.c. (Grainger part number 4X058, which can be purchased from C & W Electric Supply, 1770A Millard Drive, Plano, Texas 75074, phone 214-422-2280, for about $5.25). By mounting it at the rotator, I can parallel the extra capacitor leads with the motor leads to reduce the losses. After rewiring the control cable and installing the new capacitor, the increased turning torque was significant. See the accompanying schematic of the change (fig. 1).

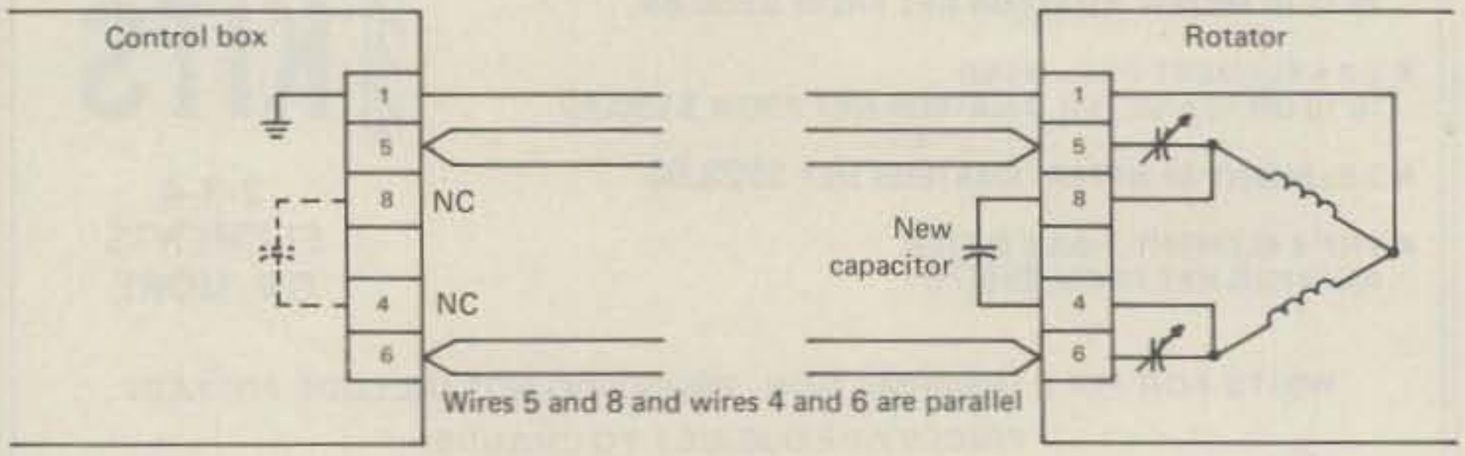

Fig. 1– The additional capacitor will improve the torque capability.

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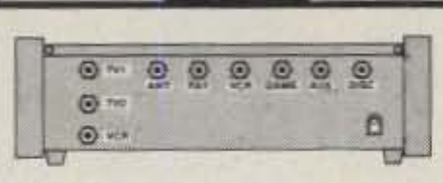

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The distaff side speaks out with the voice of experience.

A HAMFEST SURVIVAL GUIDE FOR XYL'S

BY MAGGIE HUNT COHN*

This "how-to" compendium is meant for the committed XYL, and not for the XYL in training (an XYL-in-T). Any XYL-in-T with a new interest in a ham has just had a strange thing happen in her brain. This is a phenomenon often observed, but never, I believe, understood in quite this way. We can hypothesize that some brain structure resembles "Silly Putty." Imagine that it connects with an appropriate stimulus. A long look, a warm hand in hers, beautiful words like "Sweetheart," "I love you," "Your cooking is great" will suffice. Then this "Silly Putty" (SP) molds itself into all sorts of new ideas. None of the resistance which everyone's brain generally puts up to new ideas is present. This means that the XYL-in-T experiences an astonishing glow or magnetic force in anything connected with the source of those stimuli. It is documented that an XYL-in-T can become excited at the sight of a telegraph key whether or not her special ham is manipulating it. She may caress unthinkingly some old grey box with knobs and a dial on it. She may share her thrill secretively with friends, whispering that her ham talked with Australia or Kenya—or Michigan. Some grow soupy mellow at the sight of a face bending over a Collins transceiver.

It is in this condition that the typical XYL-in-T goes to a hamfest, blissfully unaware of her surroundings, only concerned that the shoulder brushing hers is her own ham's.

No, I am not talking to the XYL-in-T. Let her fend for herself, and I am sure she will. My audience is the XYL signed, sealed, and delivered to her ham, who is now her Old Man (OM). Her SP seems at times to have hardened into a cement road in matrimony. Thank goodness this condition can be reversed. The hardness is usually temporary. Following are some guidelines:

Guideline #1. I suggest that activation of SP be part of the XYL's survival kit. Be aware of your SP. Enjoy it. If you are at a hamfest, it is because your OM enjoys your company, and that turned your SP on (unless you are there merely to keep your OM from spending too much money). But XYL's cannot live on SP alone, especially when the OM, whose stimuli put the SP all a'twitter, is turning fascinated eyes on an endless lineup of funny tubes and cubes, itsy bitsy metals and wires, beads, hinges and screws, boards, and brads, something which makes anyone's SP wilt. Now that we are at a hamfest, fellow XYL's, let us stuff away the SP and consider other aspects of the scene.

Guideline #2. Wear comfortable shoes, and under the same heading, provide yourself with layers of clothing so that you can cope with summer sun, cold draft, thunderstorm or persistent drizzle, hot lights, or air conditioning adjusted to masculine metabolisms. Of course if you are planning an escape, feet that hurt, a soaking wet dress, or a sneeze and goose pimples may—note, I say *may*—spring you from cement floors, dusty roads, or unpleasant climatic conditions and extract your OM unwillingly from his absorption in the machine culture. My OM with the gentlest of eyes just urges me to make myself comfortable, and then goes his way, promising, though he does not carry a watch, to be back in an hour.

Pressed to its conclusion, lack of comfortable shoes, etc., can cause a dilemma which results, at the very least, in having to sit down and talk it out. On occasion, this escalates to accusations of "You don't care how I feel" on both sides, and you know what that leads to! I seriously recommend comfortable shoes, raincoat, and sweater. Sun-tan lotion is a nice little extra for outdoor hamfests. I have acquired some nice tans on patches of greensward with my eyes closed next to a table of "boat anchors."

Guideline #3. Clarify the status of the budget and reach a pre-hamfest agreement on the cash available. Of course, you'd better be prepared to relax on this and eat beans for a month if necessary. You never know when a magnificent hi-fi system might be going for a song—or more likely, a small piece of chamber music—that you too would want to go in hock for. There could be princess® or touch-tone® telephones, phone answering machines, tape recorders, computers. . . . Surely you have some electric dreams, too.

Guideline #4. Keep an optimistic outlook. If your OM finds something that looks like it came out of an airplane cockpit and trails long wires and clips, perhaps he will save a big bill on fixing the car with it. On the other hand, if the gadget sits in the basement getting tangled with your wash while your OM mumbles, "It's gonna come in handy someday," remember that you can't win them all.

Guideline #5. Beachcomb. If you were on the sands of Sanibel Island, you wouldn't be above sorting through damp sand and ordinary shells for the sight of a *tiger* or an *olive*. Treat a hamfest the same way. Suddenly among the bins of little anonymous metal parts you will discover a table of paperback books, or a stand hung with soft crocheted dolls suitable for an adorable little someone (probably not your own; if you have one, she's probably with you, not very adorable, and twice as bored as you).

There certainly will be what looks like the remnants of a garage sale. You may wish to muse over these once used, possibly loved memorabilia: a souvenir plate from Toledo, Ohio; a paper apron still packaged; a Japanese fan decorated with a plump, moustached gentleman in a kimono, high in forehead, a hand on his sword; a candle, turtleshaped, slightly bruised; a ceramic cup that says "Granddad" on the side; a green toy snake with eight articulations and yellow eyes. Certainly there will be excellent bargains in pens, their inks often in exotic colors. I fall for the brightly hued, and for months after each hamfest I write to my friends—or my grocer for that matter—in lavender, green, or coral.

Guideline #6. Beware—a hamfest can distort your judgment. At one of an otherwise singularly cold metallic nature, I found downy chicks of Girl Scouts selling their handiwork—small circles of plastic in which they had embedded insects and weary blossoms. Tiny insects and small blossoms! Unmistakably the real thing! The blossoms looked genuinely wilted.

*445 Ridge Ave., Clarendon Hills, IL 60514

The plastic had spikey frames of silvery paper. I was transfixed with delight. My point? A hamfest hazard is that in that atmosphere such small ornaments become magnetically alluring. None of the people I sent them to in my letters found them so.

Guideline #7. If your OM says the biggest hamfests are the best, agree and go. Such hamfests cater to us XYL's. They know your OM will wander those acres freer if we're involved. The big granddaddy of them all, the Dayton Hamvention, gave me a grounding in CPR (Cardio Pulmonary Resuscitation) and showed me the rudiments of belly dancing.

At other hamfests you may acquire a new makeup or the list for a complete layette for your new puppy, do arts-and-crafts projects, or even see grain ground and made into gloriously good, healthy bread before your eyes in a machine that kneads up to five loaves, with the process taking hardly more than 30 minutes before rising and baking. (I personally had to get the works from that exhibit, even though it cost not a piece of chamber music, but a whole blasted symphony! After all, an XYL can spend money at a hamfest, too!) Sometimes there are art displays, and often there are speeches by lady hams about how easy it is to become a ham and what fun!

Guideline #8. I don't know whether this last guideline is a confession of weakness or a personal discovery of some talent or hope of talent in myself. Possibly it is a small transfiguration of SP into something stern or tough. Maybe if you can't beat 'em, join 'em. You may take this, then, as a suggestion or a warning.

What happens to me is this: At some point somehow I land at a technical literature table. When I walk away later in a hypnotic trance, I am clutching some book that tells me to just read it and I will understand those secrets of the universe with which my ham communicates: *Morse Code Made Easy: The 200 simple things you should know to pass the FCC test.* Who knows what I may be doing at next year's hamfest? CQ

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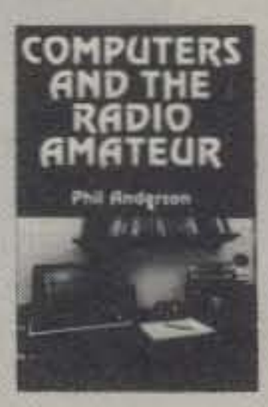

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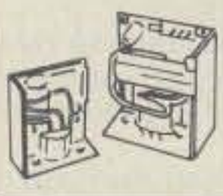

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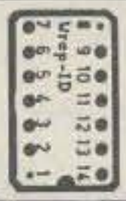

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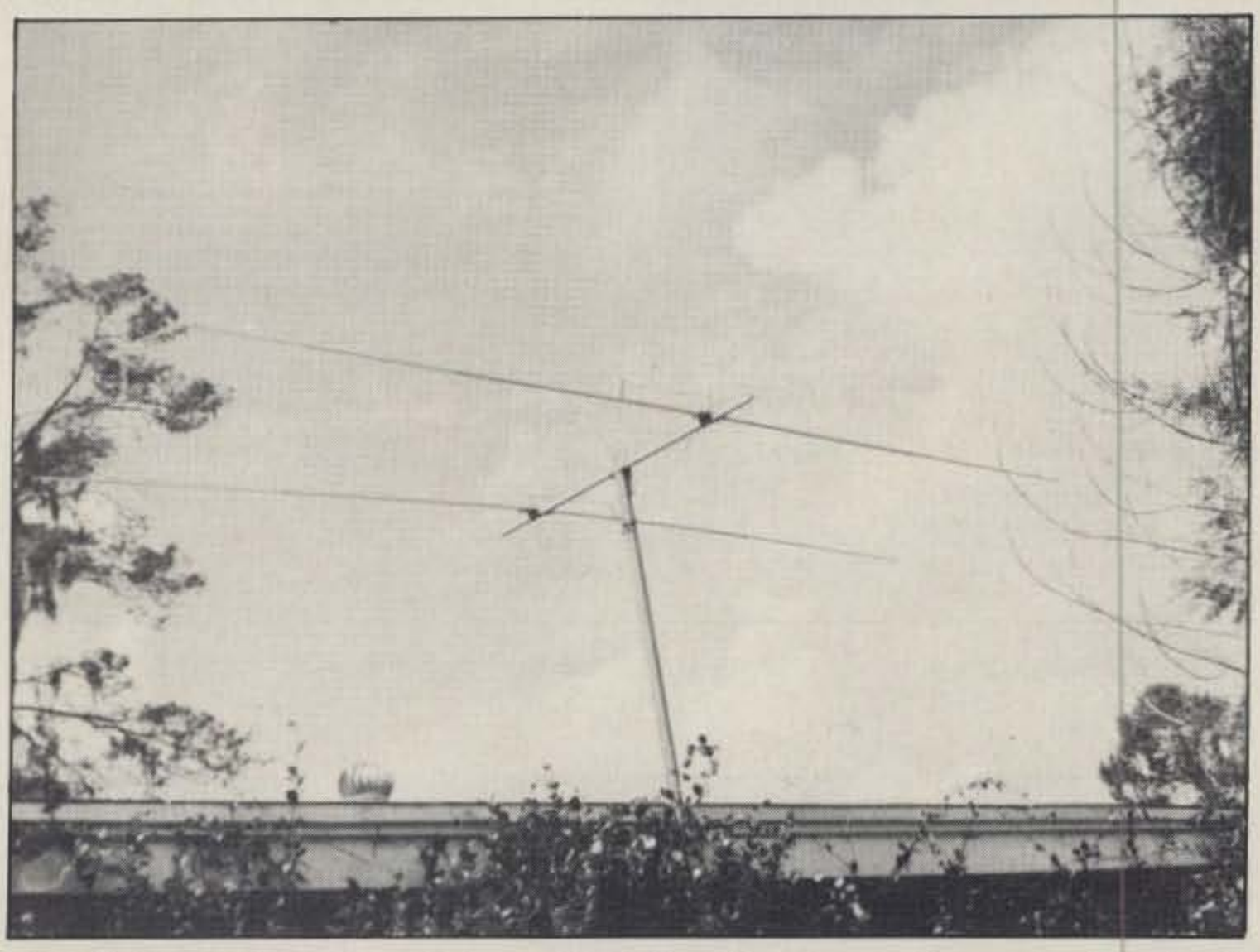


Basic 2-element beam I use in town. It is 18 feet high mounted on a wooden 2" × 4".

As with the other antennas described by K4JZB in this issue, it is evident that once you get started building them it gets hard to stop.

This article is about a series of antennas laid out to attempt to arrive at a high-gain phased beam. A lot of time and work, to say nothing of the study and thought, have gone into this project. I personally built and installed all the antennas to be described.

The first antenna (fig. 1) was the W8JK bidirectional beam. The feeding system was changed to use gamma matches and 52 ohm cable, hence no need for a matching unit. The spacing between element is 1/8 wavelength, which figures out to be 4 feet on 10 meters, 5½ feet on 15 meters, and 8 feet 8 inches on 20 meters. The use of gamma matches permits the elements to be fastened directly to the boom—no need for split elements or high-loss insulators.

The boom is 1½" aluminum tubing, but any tubing, including conduit and TV masts, could be used. The element mounting plates are aluminum angle plate 12" long × 5" wide × 3/16" thick. The plates were obtained from a building supplier. As the plates were not perfectly true, they were obtained as scrap and are perfect for my use.

The elements used are 1" O.D. × 8' for 10 and 15 meter center sections, with 7/8" and 3/4" telescoping sections added to make up the necessary lengths on 15 meters. The 1" tubing was cut to length on 10 meters. On 20 meters the center sections should be 1⅛" O.D. × 12', with two telescoping end sections of 1" × 12'. The elements are joined by cutting two slots about 1" long, 90° from each other, and are fastened with stainless steel hose clamps.

Now to the gamma matches. Many good ones have been described over the years. The first one I used was a piece of RG59U cable cut to the specified length. The inner conductor was connected to the feed line, and the shield to the element under a hose clamp. The s.w.r. was always under 1.5:1 and worked fine for many years under all kinds of weather conditions. The latest one in use here uses 3/8" tubing from scrap TV antennas and is much more durable. The RG8U or RG11U coax with the outer covering and shield removed slides nicely into the 3/8" tubing and is very easy to adjust and seal.

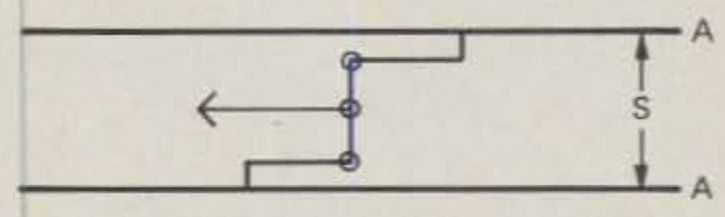


Fig. 1– The bidirectional antenna uses a low-impedance feed system for untuned operation.

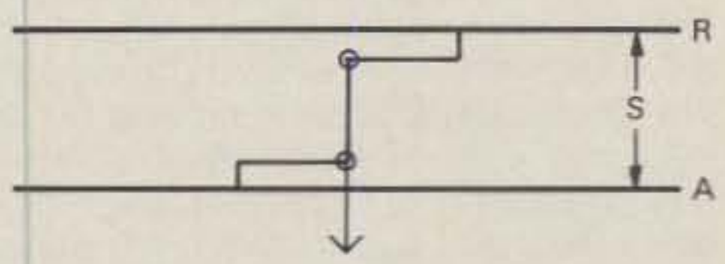
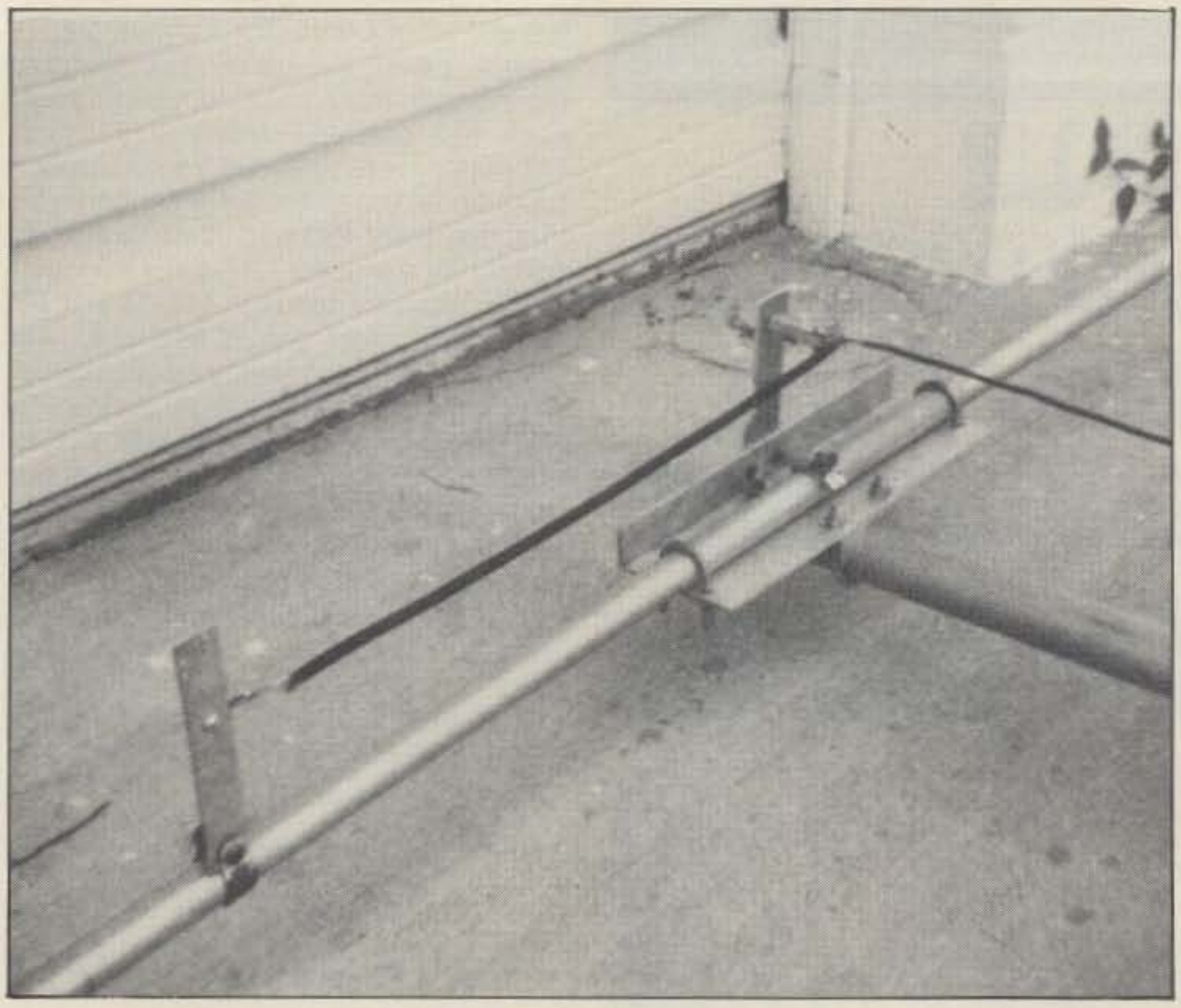


Fig. 2– The unidirectional antenna is a very simple beam with an untuned feed system.

The feed line between elements is made of No. 12 electrical wire. It has proven to be preferred over coax cable, but care must be taken that the elements are connected electrically to the boom. Short lengths of aluminum strips are used for this purpose.

For the unidirectional beam (fig. 2), it was only necessary to increase the length of one element by 5% and attach the feed line to the other element. To determine the results of this change I had the cooperation of Fred Morgan, W8FOU, who lives about 5 miles south of

*P.O. Box 232, Land O'Lakes, FL 33539



This view shows the element mounting plate and the feeding method.

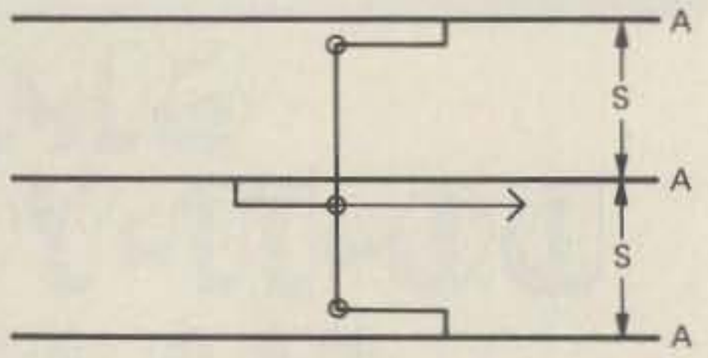


Fig. 3– A bidirectional beam antenna with low-angle radiation that is quite simple to get working.

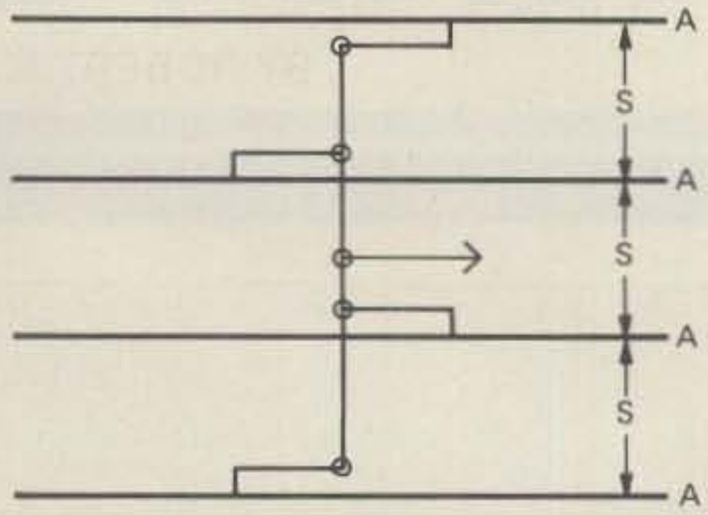


Fig. 4– This bidirectional beam is a very good DX antenna at low heights.

me. With the antenna bidirectional, signals ran S-9 plus 20 dB. When the changes were made, the signals fell to S-7, as the favored direction is now north. The signals have never been over S-7 in over one year of three times a week schedules with our buddies in Ohio. They also reported a big jump in signal strength when the antenna was made unidirectional. This antenna is in town, aimed north only, and it is just 18 feet high. With it I have worked JT, VU, and JA using only the Kenwood Twins on 15 meters—not bad for just 18 feet high.

Meanwhile, out at the farm the bidirectional beam was expanded to 3 elements (fig. 3) and 4 elements (fig. 4). They worked very well for DX with a very low angle of radiation, but the bidirectional feature made for a lot of unnecessary QRM, both in receiving and transmitting.

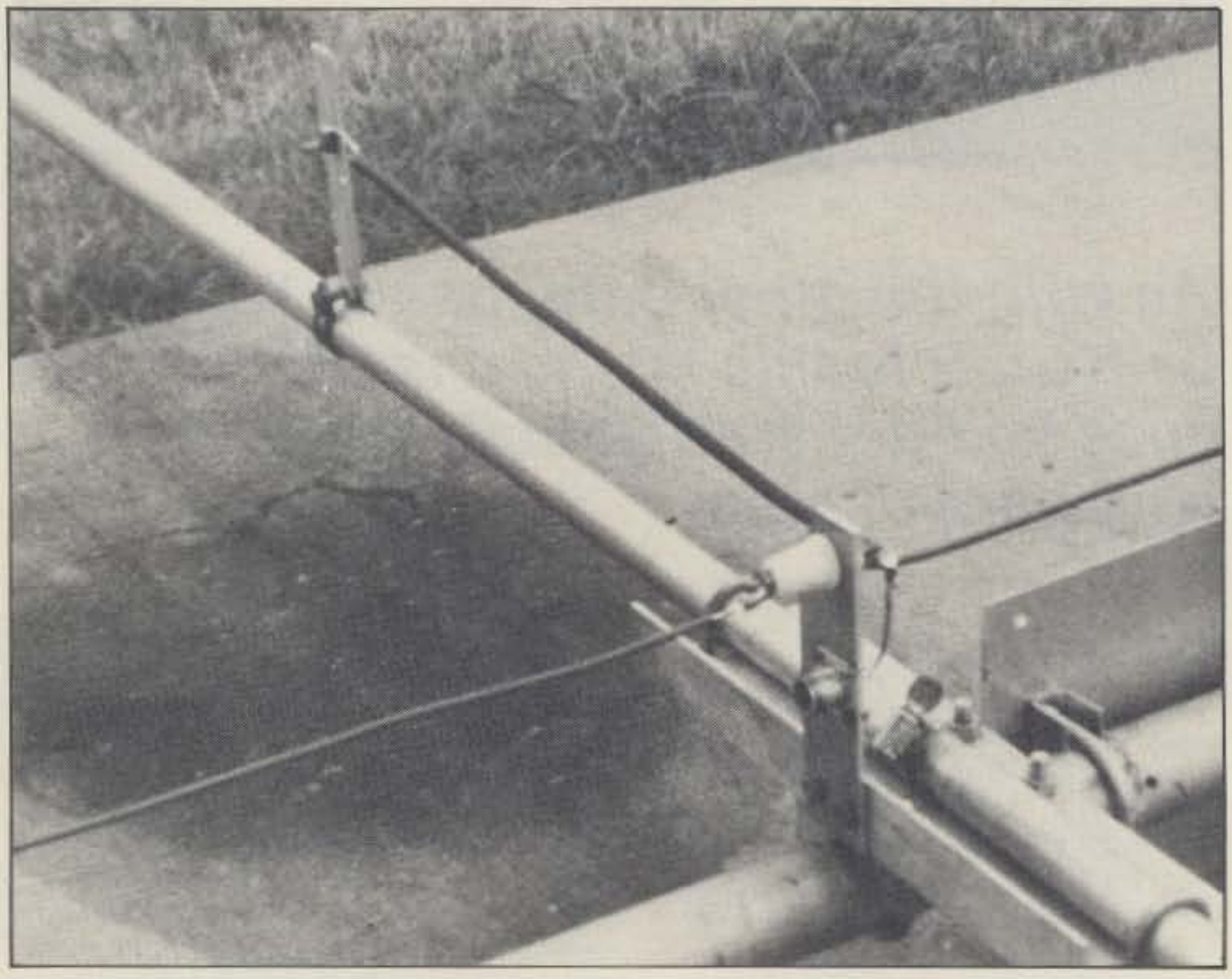
The bidirectional antennas were replaced by the unidirectional beam antennas, but they are very useful, and much knowledge was obtained by experimenting with them.

Trial and error has shown that at low heights the driven antennas are much superior to the parasitic types. The Yagi antennas are fine if they are up 50 to 70 feet, but at low heights they put out too high an angle of radiation. The driven beam seems to put out low-angle radiation at very low heights. I used one at a height of 14 feet for over 5 years and managed to work all over the world with little effort.

The 2-element antenna gives the best return for the money and effort spent. It also can use a smaller rotator. So, if you don't have a tall tower and a fat pocketbook, "try it—you'll like it."

Freq.	A	R	S	Gamma Length	Spacing	Diameter
14 MHz	400″	420″	8½′	40–48″	3″	⅜″
21 MHz	267″	280″	5½′	30–36″	2″	⅜″
28 MHz	198″	208″	4′	20–24″	2″	⅜″

Table I– Dimensions used for all antennas described in this article. These dimensions are not critical.



This close-up shows the RG-59U coax used as a gamma rod. The capacity between the inner wire and the outer shield forms the coupling to the antenna element.

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

I often have this strange and moving dream
Of unworked DX that I call,
And it hears me. . . .

Along the way you may come across some who apparently were never young—those who were born old, never to know the wonders and anticipations of youth, never to be DXers. Even some of the most active DXers might be noted to fade suddenly, going strong and mightily in their acquired DX strengths and then faltering. When the joys are dulled, some DXers start wondering, and last week one came up the hill to talk.

"Two years ago I could not find a day long enough for DXing," he told us. "I was up long before every dawn to listen for the Indian Ocean and the deep Russians. Every weekend I whirled the beam incessantly looking for anything I might need, and when the bands were quiet, I constantly worked on the gear and antennas to be ready when things picked up. I lived for DX. But now that I'm within striking distance of the Honor Roll, I just don't seem to care as much. What happened?" It was obvious that this one was concerned. But then again, there have been others such as this one.

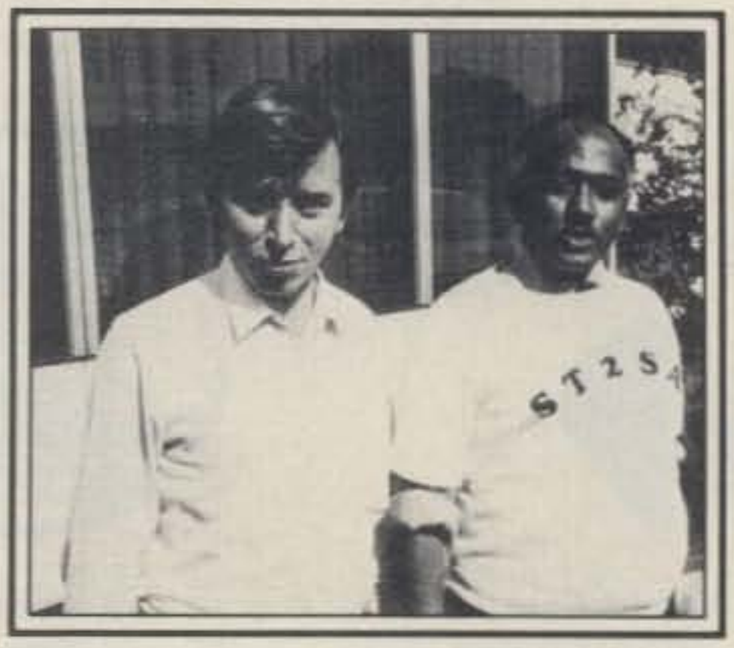
"What is your country total?" we asked, suspecting that this alone could be the reason for the worry, that perhaps the question could well give the answer.

"Three hundred and nine good ones on the DXCC standings and a couple more cards I'm waiting for," he replied. "But what has that to do with it?" If he did not know then, he soon would.

We recognized the worry. Others also have noted it, and one said it was almost as looking out into the blank night and across far black ridges, wondering if something was out there waiting for you. Some have said that it is the 300 DXCC sticker, for then you have moved from the land of plenty to a desert of scarcity. There are few DXCC counters beyond the 300 mark, and even fewer available.

There had been no quick reply given to the question, for it is sometimes best to allow a troubled DXer to find some inner peace before hearing what might be unwanted truths. "You've gained the 300 country sticker," we told the QRP type, "and while many DXers will grasp it triumphantly when it is within reach, it often marks the divide where one loses DX Incessant and finds DX Lethargy. Many, though not all, find that the scarcity of DX after passing this point dulls their interest, for this is the area where DXCC counters are rare and seldom found, and many of the needed ones may not have been on the air for 10, 20, and maybe even 30 years. For many it is a time and place of resignation. Maybe you've even thought about this."

77 Coleman Dr., San Rafael, CA 94901



Here are a couple of packages of big DX. On the left is Franz Langner, DJ9ZB, with Dr. Sid Ahmed Ibrahim of downtown Khartoum on the right. Franz has been heard from a number of rare DX spots; last time out it was Mellish Reef. Dr. Sid, an opthamologist, long has been the big hope for an ST QSL. This photo was taken during a visit of ST2SA to Friedrichshafen.

We had a thoughtful DXer on our hands. It is always hard for one completely dedicated to the glory and joys of DXing, one who started out facing what appeared to be an unattainable total of countries, to find when there are 300 or more counters on the wall and the whole bag is within reach that the last handful might be long, if ever, in coming.

"I never thought of it that way," he finally said, and we thought we heard a note of worry in his voice. "When I first started DXing, I never thought I would ever get up to the 300 mark. There were DX countries I had never heard of, and I found that a lot of non-DXers had never heard of them either. But I thought that DX was so endless that it would go on forever. After all, there always seem to be a lot of old DXers around. How about them? Or were they already in their 70s before they started chasing DX?"

We had to suppress a smile at the QRPer's puzzlement. Such questions are not surprising, but one learns that these 70-plus DXers are not especially enthusiastic about climbing 70-foot-plus towers. They only do it when necessary. But there is still life possible after the 300 sticker—possibly different than what went before, but still life.

"DXing probably will go on forever," we finally said to reassure the worried type, "but DX has always been a relative thing, mostly relative to what you don't have. Just because you have cornered most of what's available shouldn't make it less exciting. It may be a time of long waiting and little action. However, just recall when rumors of China activity started to surface after the long silence, and the recurrent rumors of Bouvet. Also, remember the shrill cries of delight when Heard Island was available a few months back. When such things happen, doesn't your interest return as strong as ever?" At this point we were starting to get the QRPer to nod in agreement.

"But waiting seems to be so nonproductive," he said. "Maybe the DXCC Desk will figure out some way to make new countries. Seems like there have not been any new ones for a couple of years now."

Should one think that this might be either new or original insight to DXing, forget it. Though some may think that DXers will loudly acclaim any new country, remembrances of things past—especially Okino Torishima—should quickly fade that thought. The DX criteria has stood for centuries, or perhaps since the end of WW II, and although each new country that might appear will be greeted with delight and happy smiles, stretch the criteria and you will find the DXers suddenly irate, beating the rationale that would bring such an aberration with the bar sinister.

All of this was reviewed with the QRP type, and he was slowly nodding his head in agreement. But he needed more solace in his hour of trouble, and we continued to fill-in his knowledge.

"We know of one prominent DXer," we continued, "who for years has advocated changes in Rule Two of the DXCC criteria, looking to reduce by progressive steps the distance in Section 2(a) so that the current stipulation of 225 miles of open water between the mainland and offshore islands now required would be lessened. He proposed that a reduction would come every certain number of years, and thus at each reduction a batch of new DXCC countries would be created. It was also proposed that the 500 mile separation between islands in a group be progressively reduced. Think of what that would do to the DXCC country list!"

We had a shiny-eyed DXer on our hands. "That sounds like a great idea," he said enthusiastically. "How come they've never seen the logic of it. You'd surely have DXers staying interested."

We were not ready to answer that

The WPX Program

Mixed

1028	KO9Q	1030	YU4FRS
1029	YU4YA	1031	KQ8M

S.S.B.

1554	WB7VHA	1560	TG9EW
1555	I1KWI	1561	JA8EZR
1556	DL1ZC	1562	KBØTD
1557	K2POF	1563	DL1AM
1558	KBØZZ	1564	I1EEW
1559	WA3OID		

C.W.

2187	KN7K	2189	K7DBV
2188	K2POF	2190	YU4BR

Award of Excellence: Endorsed 160 meters for W8ILC.

Endorsements

Mixed: 450 YU4YA, YU4FRS, KQ8M, AKØG. 500 KØREF, YU4YA, YU4FRS, KQ8M, AKØG. 550 IT9KMU, KQ8M, HB9BYZ, YU4FRS. 600 IT9KMU, KQ8M, W8LKG, YU4FRS. 650 K9BQL, IT9KMU, KQ8M, W8LKG, YU4FRS. 700 IT9KMU, KQ8M, W8LKG, KSØZ, YU4FRS. 750 F6BVY, AE1T, KQ8M, YU4FRS, W8LKG. 800 ISØMVE, G3ZRH, YU4FRS, YU4BR. 850 YU4FRS, YU4BR. 900 DA2DC, YU4FRS. 950 I2MQP, DA2DC, KC8CC, YU4FRS. 1000 I2MQP, DA2DC, KC8CC, YU4FRS. 1050 HI8LC, DA2DC. 1100 HI8LC, DA2DC. 1150 Hi8LC, DA2DC. 1200 DA2DC. 1650 N2AC. 1800 W4BQY. 1850 W4BWY. 1900 W4BQY. 1950 W4BQY.

S.S.B.: 350 TG9EW, JA8EZR, KBØTD. 400 TG9EW, KBØTD, I3DUB. 450 KBØTD. 500 KA3A, KBØTD. 550 KBØC, KBØTD, JA1-23967, YBØACL. 600 KC8YM, KBØC, KBØTD, XE1OX. 650 KC8YM, ZE1OX, DK5WQ, W3ARK. 700 XE1OX, W3ARK. 750 XE1OX. 800 SM4-3434, XE1OX. 850 WA2FKF. 900 KC8CC. 950 I2MQP, K4CKS, KC8CC. 1000 I1MQP, K4CKS. 1600 I4ZSQ. 1700 N4MM. 1950 IØAMU. 2000 IØAMU.

C.W.: 350 YU4BR. 400 YU4BR. 450 YU4BR. 500 SM5DAC, YU4BR. 550 YU4BR. 600 AGØA. 700 OK3YCA. 750 OK3YCA. 750 OK3YCA. 800 OK3YCA. 850 OK3YCA. 900 OK3YCA. 950 OK3YCA. 1000 OK3YCA. 1350 N4MM. 1550 DL1QT. 1600 N6JV, DL1QT. 1900 W2NC.

10 meters:	KC8YM, KQ8M, KB9BYZ, OK3YCA.
15 meters:	KC8YM, KQ8M, AG5C, OK3YCA, W3ARK.
20 meters:	KQ8M, AI8M, K7DBV, KC8YM.
80 meters:	AI8M.
160 meters:	W5UR.
Asia:	KQ8M, DK5WQ, HG9BYZ, AG5C, DL1AM.
Africa:	W8LKG.
Europe:	K2POF, JA1-23967, DL1AM, AI8M, DL1ZC, K2POF, KQ8M, IN3VZE.
No. America:	DK5WQ, KC8YM, KQ8M, AI8M, DL1AM.
Oceania:	WØULU, W8LKG, SM4-3434, AI8M.

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.

question . . . yet. We had a few more things to throw into the fire. "And there was the time," we continued, "when the 'distinctively separate administration' stipulation in the criteria brought some new countries, passing delight to some DXers. The potential was enormous when one considered whether an island was administered by one or another government agency. It might be the Navy administering one island while the Interior Department administered an adjacent one. You could think of more possibilities such as Indian reservations, diplomatic enclaves, free-trade zones, national parks, and things like that. The possibilities were beyond imagination, but somehow the idea withered. They even changed the DXCC criteria in Item I by dropping " . . . or a distinctively separate administration," so now all it reads is 'An area by reason of government constitutes a separate entity!' and that's it."

The QRPer was thoughtful. "You know something," he said, "I really had always thought that the DXCC criteria never changed. But if it changes, why don't they run in some of the good ideas such as reducing the mileages between islands and things like that? What are DXers supposed to do when everything available has been worked, and there is little hope that anything else will show? Are we expected to go into suspended animation?"

We started to tell him that no true-blue DXer ever goes voluntarily into suspended animation. One always waits; one always hopes. "Have you ever thought of some of the other possibilities," we asked, "those things that will give you something to work at but still keep you ready and alert should a needed country show on the morning long-path?" We thought that this might be a good point, but the QRPer was not yet ready to understand.

"Like what?" he asked, and we had to continue.

"How about 5 Band DXCC?" we asked. "That will keep you going for a long time, maybe even through a couple of sunspot cycles. And there's the one that many say is really tough: 5 Band WAZ. Work that one and you will walk tall among DXers. Look around and you will find a lot of interesting DX action, each a goal in itself." At this point we were thinking that we might be getting some ideas across. Maybe, but not quite.

The QRPer was thinking this over. After a bit he shrugged his shoulders. "All of this is interesting," he said, "but you would think that something could be done to keep DXers active after they've worked over 300 countries. You have to wonder if they ever thought about it."

Truthfully, we thought that they had. We didn't bother to ask him who "they" were. Everyone knows who "they" are. They've always been there.

"Maybe they have," we countered. "Years back we also wondered why such steps were not taken to bring the needed joy and excitement to the lives of needy DXers. But after awhile the thought came that there might be another side of the coin, that the more there is bending and wrenching and changing, the less validity there is in those in hand. And while you really can seldom go back and correct what was done in the past, caution can be maintained in present times to avoid some alluring proposals. Okino Torishima showed that DXers would not be universally enthusiastic in greeting some contrived new countries. Perhaps in the long run some of the things that happened in the past were good in that they drew a line of demarcation for DXers. Certainly there is some reason to believe so."

The QRPer was quiet, and we thought that we had won the day. But we quickly learned not yet. While it is often the role of the young to rail at authority, maturity often brings a fuller understanding. DX matured types always understand such things. But the QRPer still had some questions.

"Maybe you are right," he said, "and maybe DXCC has been held close to a meaningful path. But what of the future? With everyone already having gone everywhere and the criteria tightening up a bit, what hope is there that a new country will show? Not that I wouldn't jump to work 10 or 12 that have been on the DXCC list since Old Sam the DXer was on the banana boat run to Puerto Rico, but none of these are active and there is little hope of new ones. Have we reached the point in DXing where we can only hope for what has gone before?"

"Not necessarily," we were quick to reply, for we felt we possibly had the answer before he asked the question. "There are still remote areas of the world that should a DXer loaded with a power

The WAZ Program

10 Meter Phone

227	DF4TO	229	JA1HSF
228	K8NA	230	CX7BF

15 Meter Phone

152	VK2DPN (Mobile)	154	JF1CKL
153	I5ZJK	155	CX7BF

20 Meter Phone

429	KB5DN	433	N4KE
430	VK2DPN (Mobile)	434	I1SNW
431	N6MB	435	W2LDG
432	IØGFP	436	F5RC

80 Meter Phone

22	N7RK	23	N4KE

10 Meter C.W.

43	W3AP	44	DL8CM

20 Meter C.W.

182	W2VAV	184	JAØCGJ
183	AA4KT		

All Band WAZ

S.S.B.

2571	KB5DN	2583	DK4QO
2572	KC4AL	2584	WA3CGE
2573	I4YSS	2585	OH2CE
2574	SMØJOO	2586	DL4FV
2575	I4ZNU	2587	W5CRP
2576	DF2SU	2588	WDØFSJ
2577	DL9TW	2589	W2LDG
2578	DF9QC	2590	EA8TE
2579	DF1UF	2591	K2NT
2580	DK8ON	2592	WA4VEK
2581	KQ4M	2593	I5MXX
2582	DK8IF	2594	WB3HTK

C.W. and Phone

5484	SM4CQW	5498	N4OT
5485	DJ5FT	5499	I5UNA
5486	OH2ZAS	5500	I2OEA
5487	IV3PVD	5501	I2QMU
5488	DF7AU	5502	DF3TL
5489	DJ1QX	5503	DJ4LN
5490	DJ1QQ	5504	OK1DDS
5491	W3BBL	5505	EA5AMR
5492	JAØDAI	5506	K8NA
5493	VE7VX	5507	WB8OZX
5494	ZS3BT	5508	G3VIE
5495	ZS5BK	5509	KC4OO
5496	K2NT	5510	KR5X
5497	ZS5MY	5511	WA4VEK

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the W A Z 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.

supply and transceiver reach one, it might qualify for a new country. And there are probably more than one."

"Such as?" was the quick query.

"How about the Kingdom of Mustang?" we asked, and the disbelief was instant.

"Now you're not even being serious," we were told. "Where would the Kingdom of Mustang be? In west Texas?"

The words brought a remembered joy, for we had spent some days of our youth in that far country. "It might be," we said, "up in the Panhandle around Dalhart where the old XIT brand is a well-remembered symbol. But Mustang isn't there. It's in Asia. Get an atlas and look around 84°E and 29°N and you will find a square bulge in the northern boundary of Nepal. Some have said that the boundary is questionable, possibly more form than fact, but Mustang is actually an autonomous kingdom. It is remote, on an old caravan route across the Himalayas from Tibet through Nepal to India, and possibly even a sensitive political area with no one wanting to disturb an old trading path. Put it on the air and you might have a chance for a country. Some in other years have thought that."

This time we had an interested DXer on our hands. "If what you say is true, why hasn't someone gone and put it on the air?" It was a fair question.

"Some have thought of it," we countered. "Years back when Gus Browning was kicking up the DX dust all over the world, he made a reference to Mustang and apparently had looked at it. But because of difficulty in travel, and possibly more because of the difficulty of getting permission from local authorities to go there, it never seems to have been much of a certain thing. Possible, yes! Probable, maybe, but don't ask when. New country—we live in hope."

During the CQ CQ WW S.S.B. Test last fall some west-coast types found a lot of action in Belize, running up over 15K QSO's in 12 days over the contest period. V3CQ in the picture is Joe Hypnarowski, WA6VNR; center is John, V3JY (KA7EST); and Ski, N6ADI, signed the V3DX call.

Perhaps we had not answered all the questions, but there were signs that something might have been found again by the QRPer. "Maybe you're right," he said. "Maybe there is still something to look for after the 300 sticker. But it sure is a bleak future, isn't it?"

We weren't ready to agree to that. "There are other compensations," we came back with, "and think of how much more joy and appreciation you will find when you do catch a new one. Meanwhile you can continue to enjoy DXing."

And that is really true. For although many falter when they clutch the 300 country DXCC sticker, the real true-blue DXer always looks to the possibility that he'll eventually work everything a couple of times, plus perhaps any of the new countries that might show some fine day when the winter is over.

Haiti

Victor Paounoff, HH2VP, will be active from Haiti for the rest of the year operating 160 through 10 meters mostly c.w., plus possibly some s.s.b. if he can find where his microphone has fallen.

Victor will be living at the Hotel Ibo Lele in Petionville, not far from the Port au Prince airport (actually only about 20 minutes by car). He has been putting HH2VP on the air since 1979.

QSLs go, in order of preference, to: (1) Al Rousseau, 180 Den Quarry Rd., Lynn,

5 Band WAZ

Standings as of January 1, 1983

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)
11. EA8OZ, Julio Rosello (Spain)
12. W0SD, Edward Gray (U.S.A.)
13. K0ZZ, Gary Knutson (U.S.A.)
14. ON6OS, P. Michiels (Belgium)
15. OK3TCA, E. Melcer (Czech.)
16. K6SSS, Fred Capossela (U.S.A.)
17. ZL3GQ, Peter W. Watson (New Zealand)
18. OK3CGP, Stefan Melcer (Czech.)
19. SM0AJU, Leif Lundin (Sweden)
20. OZ3PZ, Preben Thomsen (Denmark)
21. I3MAU, Reno Mauri (Italy)
22. I2ZGC, Gianni Zillio (Italy)
23. 4Z4DX, Dov Gavish (Israel)
24. N4KE, Ron Blake (U.S.A.)
25. K5UR, Rick Roderick (U.S.A.)
26. K9AJ, Michael McGirr (U.S.A.)
27. SM3EVR, Tord E. Julander (Sweden)
28. LA5YJ, Bjorn Hugo Ark (Norway)
29. DL3RK, Walter Geyrhalter (W. Germany)
30. N4WJ, Frank McCormick (U.S.A.)
31. G3MCS, W.R. Hawthorne (England)
32. SM5AQD, Hakan "Hawk" Eriksson (Sweden)
33. W0MLY, George McKercher (U.S.A.)
34. I0RIZ, Gianni Rizzi (Italy)
35. ON5NT, Ghislain Penny (Belgium)
36. OH6JW, Antti Kiviuoma (Finland)
37. OK1AWZ, Milan Dlabac (Czech.)
38. IV3PRK, Pierluigi "Luis" Mansutti (Italy)
39. DJ6RX, Klaus Heintzenberg (W. Germany)
40. OH3YI, Ossi Lehvas (Finland)
41. I4RYC, Relli Claudio (Italy)
42. ZL1BIL, Mike Edwards (New Zealand)
43. I4EAT, Fausto Minardi (Italy)
44. ZL1BQD, R.J. Runciman (New Zealand)
45. TG9NX, Francisco Capuano (Guatemala)
46. XE1J, Joe Levy (Mexico)
47. F5VU, Jean Brunner (France)
48. W3AP, Norwood Lowry (U.S.A.)
49. YO3AC, Andrei Giurgea (Romania)
50. K3TW, Tom Warren (U.S.A.)

The top contenders for 5 Band WAZ:

1. JA3EMU, 199
2. N4WW, 199
3. CT1FL, 198
4. W1NG, 198
5. N4RR, 198
6. W8UVZ, 198
7. EA8QL, 197
8. K1MEN, 197
9. K7UR, 196
10. K4CEB, 196

188 Stations have attained the 150 zone level

Mass. 01904; (2) Victor Paounoff, Hotel Ibo Lele, Petionville, Haiti; (3) N4XR or the W/K4 QSL Bureau; and (4) Radio Club of Haiti. Box 501, Port au Prince, Haiti.

Any DXer passing through Port au Prince might give Victor a phone call. He says that he would be happy to see the visiting DXers. Also, if you have waited in vain for a previous HH2VP QSL, he would like you to try again. One of the above addresses will produce.

Kurt Bindschedler, HB9MX, of Winterthur in Switzerland. If the face looks familiar, Kurt is a familiar DXer at the California International DX Conventions. Not so familiar are some of those QSL's on the wall, like that ZA2RPS (not many of those heard recently). How about AC3PT and A51KV? Shows what a good grip on the mike can do for you!

Heard Island

Although this is largely history by now, those who followed the action know that both groups got underway at about the turn into the new year. However, the VK0JS effort ran into some problems. In mid-January they were reported as turning back to Tasmania, their vessel having encountered some fuel problems. One report on January 12th indicated that they had turned back at 44°S and 142°E. Such a position would place them not far off their initial starting point of Hobart.

About this time the VK0HI group was approaching Amsterdam Island and were within a week of a landfall on Heard. You can QSL for this one to: Dan Handlesman, N2DT, 16 Attitash, Chappaqua, New York 10514. Should the VK0JS effort get their problems under control, any QSLs for their Heard operations would go to Jim Smith, VK9NS, Norfolk Island.

WARC 79

WARC 79 may seem a long way in the dim past, but it was only this last December when the Senate finally ratified the pact. The whole lash-up actually is another ITU treaty, and these are negotiated "... with the advice and consent of the Senate," a phrase you previously may have heard. Final Presidential signature followed Senate approval.

All of this will bring closer the new amateur frequencies plus a few more changes in some familiar areas. The a.m. broadcast area will be expanded in the coming years, this necessitating a possible move of radiolocation transmitters from current 1625–1705 kHz to something up the band, possibly in the 1900–2000 kHz area, and making the current 160 amateur operation there a "secondary" allocation. Although this and other possible changes are currently in the "proposal" category, they are indications of the direction things might go.

There will be other studies in the 220 MHz area, the 420 MHz area, and the 2300 MHz area, the FCC wishing to eliminate any possible interference to aeronautical flight-testing telemetry. This might find the amateur 2300–2310 MHz frequency eliminated, but might improve the action and status at 2300–2310 MHz and 2390–2450 MHz. These are hardly DX bands, but one must be vigilant.

Down in the 75 meter country, it has been reported that the WARC Canadian allocation table has removed Canadian broadcast allocations in the 3950–4000 kHz area. The temporary allocation of amateur privileges at 10.1 MHz appears to be going towards a permanent allocation with the FCC accepting amateur proposals that they be responsible for avoiding interference to other services on this band.

Southeastern DX Club

In the southeast quadrant of the country, if you are a DXer you know of the activity in the Atlanta area. And if you know DX clubs, there are always a thousand ready volunteers to serve as club officers. Winners in the Southeastern DX Club for 1983 are: President, Harry Saunders, K4GFH; Vice-President, Carl Henson, WB4ZNH; Secretary, Grovern Meinert, KC4BX; Treasurer, David Hibbert, KC4TJ; and Contests, Lee Sheridan, W6OKK. W6OKK? That's right. Those W6s are always working their way in. You might also recognize the call of the Vice-President. He is often working his way out to some DX spot. But don't ask where the list is when Carl is active. It isn't!

CQ DX Awards Program

S.S.B.

1203	OE1KJW	1207	K8NA
1204	DL1ZC	1208	WA6DTG
1205	KM6B		

C.W.

565	K8NA	566	KC4OO

S.S.B. Endorsements

310	DJ9ZB/313	275	KM6B/289
310	VE2WY/312	275	KB9KD/287
300	OK1MP/308	250	WA6DTG/272
300	AA6AA/303	200	AI9F/248
300	K8CMO/300	150	WD5ABG/199
275	WA0TKJ/299	150	KC4OO/182
275	K8NA/298	28 MHz	KM6B

C.W. Endorsements

300	AA6AA/301

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. Effective with the next report, all totals will be adjusted to reflect the deletion of Serrana Bank, Bajo Nuevo and the Saudi Arabia/Iraq Neutral Zone. Total countries will be 315.

Saba

The *CQ* WPX Contest comes the last weekend in March, as every alert DXer knows full well, and Michael Marafo, K3UOC, will be working the Dutch islands from contest time through Easter. Michael will be active on all bands from 10 through 80, s.s.b. and c.w.

Opening on Saba on March 26th, he will be signing K3UOC/PJ6 until March 28th. After the action over the WPX weekend, he will sign K3UOC/PJ8 from Eustatius from March 29th to the 31st. April 1st through the 3rd it will be K3UOC/PJ7 from Saint Maarten.

Michael has been living in Venezuela for four years now, often being heard with several different calls, but currently signing K3UOC/YV4. If you catch him during the above operations, you have multiple-choice routes for QSLing: his home callbook address; via the W3 QSL bureau; via the YV-QSL bureau; or to his current QTH (Michael Marafo, Colegio Internacional de Carabobo, Apartado 103, Valencia, Venezuela).

The WAZ Award

This award has been around so long that it takes an Old Timer to remember when it started. Even some Old Timers are not even sure, but it got started back in the first administration of Franklin D. Roosevelt, and you know how long ago that was—way back before WW II.

Leo Haijsman, W4KA, has directed the WAZ program for a number of years and reports that there were 716 applications for WAZ in 1982.

The fiftieth anniversary of the WAZ program is not far off, an event that will be noted by *CQ* with banners, trumpets, and a few renditions of "Auld DXers, Lang Syne." But since the award first dazzled the DX types, Leo says that the total number of certificates issued through 1982 in the various categories has been: S.S.B. 2594; CW/Phone 5511; All Phone (S.S.B./AM) 581; Single Band All Phone 80 meters 23, 40 meters 22, 20 meters 436, 15 meters 155, 10 meters 230; Single Band All C.W. 80 meters 2, 40 meters 38, 20 meters 184, 15 meters 83, 10 meters 44.

WAZ has never been an easy award to attain, the numbers for some of the single-band awards being sharp comments in themselves. WAZ is often a long struggle, but should you not yet have joined the triumphant WAZ types, drop a note to Leo and he will send you the forms and necessary information. You can always find Leo's address in the DX column; it has been here for a long time—about as long as some Deserving DXers have waited for that last needed QSL for the last needed zone.

20 Meter Beacons

The Northern California DX Foundation for some years has planned the establishment of a network of 20 meter beacons around the world. Jack Troster, W6ISQ, has long pushed for the idea, and the first beacons came on the air at the start of this year with others scheduled to come on line as things fall into place.

Eight beacons were working at 14,100 kHz or scheduled to come on this spring. Operating in sequence, except for the South Africa beacon, the sequence is repeated every 10 minutes starting at the hour. A c.w. message running about 58 seconds is sent at 20 w.p.m., this allowing but a brief interval between the end of one station's transmission and the start of the next station's. Following station identification, a signal stepped down each time in power is sent for about 9 seconds, starting with 100 watts and backing down to 0.1 watt, ending with the signature of the station back at 100 watts. The "Q" in the QST station identifier will be within a small fraction of a second of the WWV signal at the assigned beacon time. The 9 second signals are:

100 watts	. ———	(9 sec. dash)
10 watts	.. ———	
1 watt	... ———	
0.1 watt	.... ———	
100 watts		SK 4U1UN/B

This is a do-it-yourself ionospheric observation system, and the 9 second dash is enough to check different antenna systems. A quick check of conditions can be made by checking signals in various directions and checking their signal strength as they step-down power. Reports are requested, and Al Lotze, W6RQ, is looking for reports from those making extensive observations, as well as volunteers to observe in various parts of the world.

The beacons early this year were either in place or due shortly at, with their transmitting time:

00:00 4U1UN/B United Nations, New York
00:01 K6OPO/B Stanford University, Calif.
00:02 KH6O/B Honolulu Community College, Hawaii
00:03 JA2IGY Tokyo, Japan
00:04 4X6TU/B Tel Aviv Univ., Israel
00:05 OH2B Espoo, Finland
00:06 CT3B Madeira Islands
00:07 ZS6DN/B Transvaal, South Africa

Other stations will be added, and possibly the keying sequence will be changed when other stations start up. Further information on the 20 meter beacons or questions about the DX Foundation can be directed to the home office: Northern California DX Foundation, Box 2368, Stanford University, Calif. 94305.

SP, Poland

With the problems developing in recent years, the number of SP stations dropped almost out of sight, except for a few club stations that were intermittently heard. Early this year reports of some c.w. stations being heard were noted, and hopes were voiced that there would be an early return to operation by the amateurs in Poland.

A note from Marek Czarnecki, SP9UO, in downtown Przystajn notes that the SP-QSL Bureau for all practical purposes has been QRT, and that those looking for a QSL that might increase in rarity unless things ease a bit should consider going direct.

SP9UO, ex-SR9UO, can be reached at: Marek Czarnecki, 41-141 Przystajn, ul Czestochowska 136, Poland. Marek promises 100 percent QSLing.

Some Short DX Notes

Tom Christian, VR6TC, was in the Queen's New Year's Honors List this year. Newspaper accounts were quick to note that one of his ancestors was flouting the British authority some years back. However, DXers remember that Tom is the one who has been primarily responsible for Pitcairn contacts over the years.

YI1BGD has been showing on the long path into the states usually after 1300Z and somewhere below 14,250 kHz. The station also shows at times down in c.w. country around 14,025 kHz after 1400Z, also on the long path. QSLs can go to: Scientific Radio Center, Box 5864, Baghdad, although it is also reported that W1FZ has been given as a QSL route.

The Canadian Amateur Radio Federation has asked their Department of Communications to authorize a CY prefix for use in the period May 17 to July 25th to mark World Communications Year. Vic Clark, W4KFC, has been appointed by President Reagan to the U.S. Council for World Communications Year '83. Also serving on the WCY 83 commission is Under Secretary of State Bill Schneider, K2TT.

Last fall, Mark Nelson, AA6DX, and Ted, KN6Q, were out in the Pacific on Christmas Island operating in late November through the *CQ* WW Test signing T32AM and T32AL. They ran up over 8000 QSO's during the stay, 3160 of which were during the *CQ* Test when they signed the T32AL call. QSL's go to: Al Berg, WB7SIC, Box 25088, Portland, Oregon 97225.

Early this year there was a burst of Argentine action in some of the Antarctic areas and in the Palmer Peninsula. LU5ZA and LU1ZA were on the South Orkneys, LU1ZC was on the South Shetlands, and LU1ZR and LU1ZB were in the Palmer Peninsula area of Antarctica. QSL's for LU5ZA go to: LU2A, P.O. Box 100, 1428 Buenos Aires, Argentina. The operation at LU5ZA on Laurie Island had LU8EKC and LU3MDO as the operators.

Elsewhere in the Palmer Peninsula area, LU1ZR was on Dundee Island and LU1ZB was on Observatorio Island in the same area. LU1ZC was on Deception Island in the South Shetlands, and LU1ZA was on Laurie Island in the South Orkneys. These four QSL to: SARA LU2CN, Malabia 3029, 1425 Buenos Aires, Argentina. Work three LU-Z stations and send list with dates, bands, and 10 IRC's to Ra-

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee $2.00, with no fees required for up-dates.

MIXED

2377	YU2DX	1605	N2AC	1240	K6ZDL	989	EA9IE	793	WD9IIC
2330	F9RM	1584	DJ7CX	1216	4Z4DX	980	KC8CC	793	DK2BL
2223	YU4HA	1542	N4NO	1207	DA2DC	942	N4IB	787	JA9FAI
2153	K6JG	1505	SM7TV	1200	W8RSW	921	YU2CBK	769	EA1JO
2112	W2NC	1493	W8CNL	1198	JH1VRQ	900	KA3A	765	AI8M
2078	K6XP	1448	YU7AW	1185	K8LJG	893	JA1KRU	757	AJ6O
2061	K2VV	1419	W9FD	1170	SM3EVR	865	WB8ZRL	752	VE2FOU
2019	VE3GCO	1415	AA4A/8	1149	YU1OBA	854	KO8T	741	N8BJQ
1940	N4MM	1370	I6SF	1145	N6AW	849	YU1DZ	727	K7CU
1882	YU7BCD	1346	KF20	1142	N6JM	826	K2QF	722	W6OUL
1832	W4BQY	1307	WØSFU	1129	W7CB	825	G4FAM	700	KJ7N
1798	W9DWQ	1292	K9BG	1124	DJ2UU	822	G3ZRH	700	KC8JH
1718	W7LLC	1283	WA1JMP	1051	KL7AF	820	K7AGJ	700	I1ZQD
1707	PAØSNG	1282	N6FX	1021	W8ILC	814	WØJIE	658	K9TI
1689	K5UR	1269	PA2TMS	1018	I2MQP	805	YU2CQ	642	K8HF
1674	N6JV	1262	IN3ANE	1005	LA7JO	800	W6YMH	630	OE1KJW
1619	N9AF								

S.S.B.

2244	F9RM	1437	K5UR	1109	PY3BXW	949	G4CHP	750	WB8ZRL
2039	IØZV	1422	OZ5EV	1108	W4BQY	938	KC8CC	743	PY4OD
1986	IØAMU	1410	IØMBX	1107	F2MO	922	TG4NX	739	VK6YL
1855	K6JG	1405	WØYDB	1060	DJ7CX	920	N2AC	703	W3GXK
1845	K6XP	1403	W9DWQ	1044	W2CC	851	I8KCI	668	DK4AP
1832	K2POA	1300	N2SS	1037	OE2EGL	850	WA2FKF	652	KB2DE
1739	K2VV	1275	I6ZJC	1018	I2MQP	850	KL7AF	650	OE8MOK
1735	N4MM	1266	WA4QMQ	1017	CT1UA	833	TG9GI	640	I1POR
1700	N6CW	1201	AA4A/8	1009	W2NC	828	IØRIZ	611	JH5FQO
1667	ZL3NS	1201	WD8MGQ	1005	ZP5RS	809	K8LJG	607	KC8YM
1609	I4ZSQ	1190	YU7AW	1003	WA4OIB	809	W8ILC	606	W8RSW
1583	I8YRK	1189	HP1JC	993	N6FX	800	AC2J	605	KBØC
1551	I8KDB	1134	N4NO	990	KC4OV	768	W6LQC	603	IØSGF
1523	YU7BCD	1113	KF2O	981	W6YMV	756	N4IB	602	WØULU
1462	PAØSNG								

C.W.

1901	W8RSW	1516	K6XP	1312	W9FD	1056	N6FX	726	KA3A
1883	W2NC	1447	W3ARK	1258	VO1AW	965	JE1JKL	682	JA5MG
1757	W8KPL	1426	N2AC	1225	DJ7CX	930	N4YB	660	VE2FOU
1639	WA2HZR	1413	W4BQY	1136	YU7AW	861	K9LJG	646	AG5C
1636	N6JV	1412	W9DWQ	1127	W1WLW	853	DJ3LR	645	EA1JO
1606	K6JG	1406	G2GM	1122	I6SF	827	I1YRL	618	G4FAM
1599	ON4QX	1356	N4MM	1104	YU3NP	804	KF2O	616	W8ILC
1575	DL1QT	1330	VK4SS	1102	VE7CNE	801	KL7AF	600	OE1KJW
1558	K2VV	1325	K5UR	1077	K6ZDL	750	DJ1YH		
1524	YU7BCD	1324	N4NO	1069	LZ1XL	731	AA4A/8		

dio Club Argentina, C C 97, 1000 Buenos Aires, Argentina, and you will get a special award. You probably already know it, but the "Z" in the Argentine suffixes denotes an antarctic station.

The Kansas City DX Club has elected officers to lead them through the wilderness months ahead. Jim Walker, KBØX, is the new leader; John Chass, WØJLC, Vice Pres; Mike Crabtree, ABØX, Honorable Secretary; and Bill Henderson, KØVBU, Treasurer.

Far from the banks of the Missouri, the Radio Club of Polynesia has also fielded a 1983 slate of officers to direct the action in the Society Group. President is FO8IK; Vice-Pres. FO8EW; Treasurers FO8HI and FO8HL; Secretary FO8IK; and Tech Advisor FO8IQ. Along with the new slate comes a bit of advice on FO8-QSLing.

Cards sent via the Radio Club in Tahiti are handed out to members at the meetings held monthly. Unless the FOØ station tells you to use the Tahiti Bureau, you had best get an address. The FOØ usually indicates a visitor, and the cards are not forwarded once they leave Polynesia. Ross Forbes, WB6GFJ, who frequently visits down that way signing FOØFB, usually tries to pick up all the unclaimed FOØ cards and bring them back stateside for possible delivery. This helps, but is neither sure nor guaranteed. What is guaranteed is that there will be action during the Bastille Day celebration July 14th.

The new address of the FØ QSL Bureau is: Radio Club of French Polynesia, B.P 5006, Pirae, Island of Tahiti, French Polynesia. This is also good for correspondence and a possible scouting area for visiting DX types.

The Colvins were expected to open from A7 Qatar in mid-January after the operation from Abu Ail in December. In 41 hours of operation some 4000 QSO's were run up on 5 bands, this including the 10 MHz band. In addition to Lloyd and Iris, Christian Dumong, FØECV, and Jean Michel Gabouriaud, F6GBQ, were operators on this trip. All QSL's go to: YASME, Box 2025, Castro Valley, Calif. 94546.

Ask some just what "time" might be and you might get a reply that time is when they take the lists for the rare DX. Just mention that premise and you will get an argument. Some may think DXers are single-issue single-minded amateurs. This is not true. DXers always show two dimensions—one on either side of any argument or issue. But that's why we've turned down this path. We're concerned with the time between work on the col-

umn and when it shows in print. We get interesting items which sometimes are after deadlines.

Material must be on hand three months before the magazine cover date. If you are headed out for a big record-breaking run in the October *CQ* WW Contest, we have to have the information by the first week in July. Even if it is only tentative, we want to know.

Time brings changes. Some countries which not too long ago were like local DX are getting hard to find. Times change, DX changes, and local governments change. In EL Liberia there was a "freeze" put on radio communications last year, and though local efforts to qualify new amateurs have gone ahead, licenses have not. In 1981 efforts brought six new and eager amateurs who passed their license tests, and applications were sent to the communications ministry. They are still there along with another group filed in 1982. Once EL's were thick on all bands. At least it is remembered that way. Many were tied in with business at the Firestone rubber plantations. In other places, Afghanistan, Cambodia, Vietnam, Libya, and some others were not difficult to find. A lot of the African countries were on the air, although some were easier to catch than others. Some thought that the conditions would last forever. They didn't.

Sometimes one thinks that action from a country will go on forever. Should Father Moran not be available as he has for years, or should Father Dave Reddy not be on from Easter Island, things could get difficult. All this again brings up "time." Always remember: Work 'em now, worry later. Maybe you won't have to worry at all.

KL7IHP should be on from VS6 Hong Kong during the WPX Contest. Dick was looking to open March 26th and operate through April 2nd signing KL7IHP/VS6 with extended periods of operating everyday during that period. Granada stations started signing the J37 prefix early this year, this replacing the former J3 prefix with the suffixes remaining the same. KG4CD should be active from Guantanamo for the rest of this year. He says he will work c.w./s.s.b. from 160 to 10. QSL to Dick Sands, Box 585, FBPO, Norfolk, Va. 23593.

FG7AR/FS7's address in the 1983 Callbook has produced cards. Seems there is also a QSL manager, although this may mean a wait. W9LNZ has found that he is not alone in looking for a handle for 4W1AA QSL's for back in 1963. QSL information was to VS9AD, and anyone with information will be welcomed.

V3DX in the '82 *CQ* S.S.B. Test did 15K QSO's in 12 days of operating. They worked everything from 6 meters to 160. They are still smiling at the fun they had. One can get the feeling of being desirable when operating from a DX spot. Everyone listening treasures every word you say.

OE2DYL has the new second edition of his "DX Nets Around the World." The first edition was well received. If you would like more information, drop a note to: Dieter Konrad, OE2DYL, Bessarabierstr 39, A-5020, Salzburg, Austria.

W4KA says that the recent operation of W8OK/VE2 is good for WAZ Zone 2. This operation was 80 km north of the village of Matagami in Quebec.

In the past but not quite correct department, in the November 1982 issue of *CQ*, the callsign listed as VK3DHJ on page 112 in the caption of the group on Mellish Reef should have been VK3DHT. Sorry about that.

There has been talk that a 9V1 group is aiming for a Spratly operation this spring. Planning seems to be well along. Having come this far, and again realizing that DX is always interesting and there are still more DX items to come next month, all we can say is "keep listening!"

QSL Information

First a couple of updates—a euphemism useful when one has to correct what has gone before: 4S7AJG goes to K9AJ, *not* to K9AJG; FO8GM goes direct (see below), *not* to WB6GFJ.

George Glendinning, VK4KGG, Box 1004, Mackay, Queensland 4740, Australia, has stood up to volunteer as a QSL Manager for a DX station.

Stuart Farmer, W2NW, has been receiving QSL's for CE1VES and wonders why the largess. Doc has not worked c.w. for some years. DX is no longer his cup of tea, and there is a nagging feeling that CE1VES might be a bootlegger named Slim. Most of the cards are from Europe with a lot of UA's.

Here, with a bit of help from W9LNZ, is the QSL information.

C31NP to A3BN
DL2CG/YV5 to DJ Bureau
FC8GSE to French Bureau
FK8AE to F6EWK
FM8GA to N6ZV
FO8JO to W6GO
FP8JA to KP2A
GD4BLG to DL4FF
GD4CGV to FL7FH
G5ACI/AA to YASME
HH2JR to KA5V
HH2VP to W1FJ
HL9TP to N6TP
H44R to H44SH
H44SH to AD1E
IR8VMB to IS0VMB
JW5VA to LA7JO
K6PVM/PJ5 to XE2PG
OE2VDL/3D6 to OE2DYL
PJ7VL to W2BBK
PY8CW to PY7ZZ
T30DB to G8LGB
T32AF to WH6AIF
T32AL to WB7SIC
T32AM to WB7SIC
T32AK to W9RCJ
V3CQ to WA6VNR
V3DX to N6ADI
V3JY to KA7EST
VP2MLQ to KC2LQ
VP5XX to WB9TIY
VP8ADF to KA5IRZ
VP8APQ to G4LPQ
VP8SB to G4DMA
VQ9GD to KA6MKY
K3UOC/YV4 to K3UOC
VK8CW/HI/MD to N3DT
4N1R to YU1DZ
4S7AJG to K9AJ
5T5TO to F6BUM
5V7NW to AK3F
5W1EE to W6OUL
6Y5IC to G3XTJ
7P8CI to KA3CDE
7P8CL to SM5GOJ
8P6PC to N2AWM
8Q7BQ to K9AJ
8R1Y to 8R1B
9Y4IH to WB3AKI
8Y5OLL to K2QIE
FR8GGL/G to P.B. 386, St. Pierre, Reunion Island
M1V to P.B. 1, Republic of San Marino
S83H to P.O. 14 (Ayliff) 4850, Republic of Transkei
TL8ER to P.B. 1503, Bangui, Central African Republic
H44SH to Box 258, Honiara, Solomon Islands
LU3ZA to LU2A B/P 100, 1428 Buenos Aires, Argentina
LU1ZA/ZB/ZC/ZK to SARA, Malabia 3029, 1425 Buenos Aires, Argentina
WH2HCV to P.O. F.Y Agana, Guam 96910
YS1GMV to P.O. 1557, San Salvador, El Salvador
ZK2RS to Box 37, Niue Island
Z21GO to P.O.B. 39, Coull Dr., Mt. Pleasant, Marare, Zimbabwe
ZD7AL to Box 25, St. Helena Island
5B4LY to Box 375, Warri, Nigeria
5Z4DA to P.O.B. 3037, Nairobi, Kenya
8P6QK to P.B. 167, Bridgeport, Barbados
8R1J to P.O. Box 10767, Guyana

73, Cass, WA6AUD

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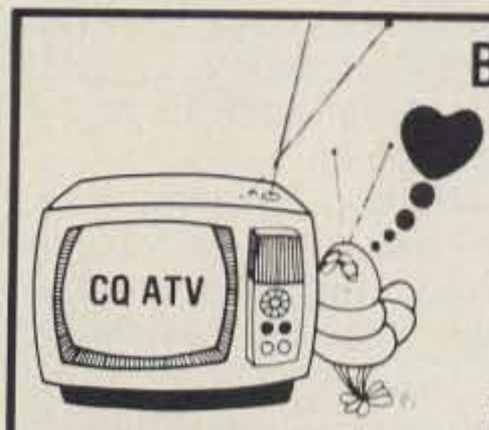

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220 MHz
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- No Corosion
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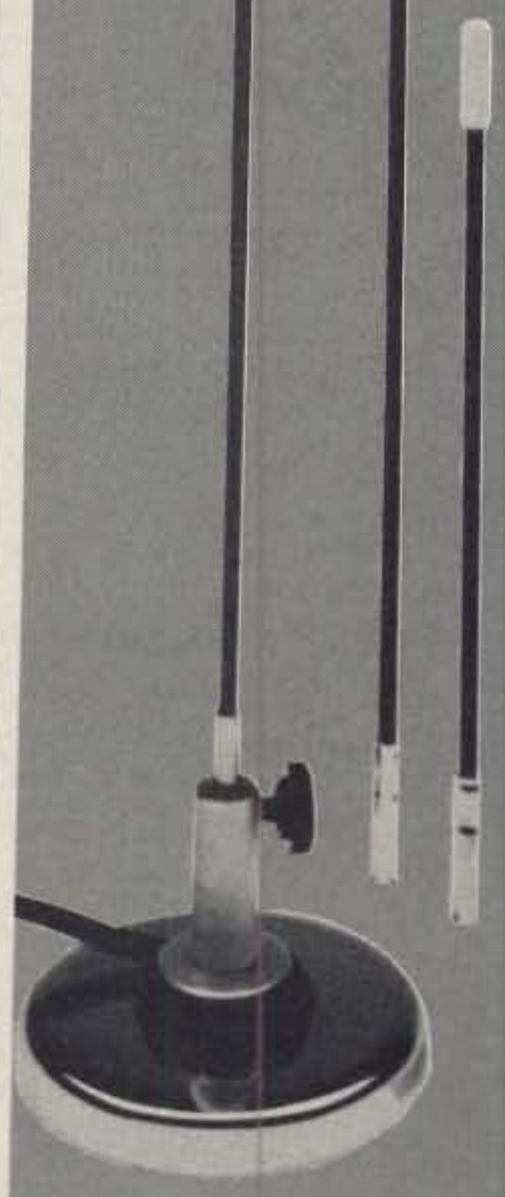

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CIRCLE 94 ON READER SERVICE CARD

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Generally good shortwave propagation conditions can be expected during April. The effects of *equinoctial* propagation should continue through much of the month, to the advantage of DX openings between the USA and the southern hemisphere.

A seasonal decrease is expected in generally east-west DX openings on *10* meters, but the band should continue to remain open to many areas of the world during the daylight hours. Optimum DX during the daylight hours is expected on *15* meters, with openings possible to most areas of the world. Peak DX conditions are forecast for *20* meters for an hour or two after local sunrise, and again during the afternoon hours. Daytime openings on *10, 15,* and *20* meters should follow the sun. Signals should peak before noon in the quadrant extending from the northeast to the southeast. Openings towards the north and south should maximize during the afternoon hours, and signals toward the sector from the southeast to the northwest should peak during the late afternoon and sunset periods.

During the hours of darkness expect some *15* meter openings towards the south and west until as late as midnight. *Twenty* meters is expected to remain open to many areas of the world during the night. *Forty* and *80* meters should continue to produce good DX openings from shortly after sundown, through the hours of darkness, and into the sunrise period. Some DX may also be possible on *160* meters during this same period.

As thunder storm centers move further towards the north during April, a seasonal increase in the atmospheric noise or static level is expected during the month. This should be most noticeable on the *40, 80,* and *160* meter bands, but may also be bothersome on the other bands as well.

For short-skip openings during April, use the *40* and *80* meter bands during the day for distances less than 250 miles, and *80* and *160* meters at night. For distances between 250 and 750 miles, try *40* meters during the day, and *80* and *160* at night. *Twenty* meters should be optimum for daytime openings between distances of 750 and 1300 miles, with *40* and *80* meters best during the period of darkness. For openings beyond 1300 miles, try *20* and *15* meters during the day, with *40* and *80* meters expected to be optimum at night. Some good openings may also be possible on *20* meters during the night.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for April 1983

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 4, 7, 19, 26	**A**	**A**	**B**	**C**
High Normal: 3, 6, 8, 18, 20, 24-25, 27	**A**	**B**	**C**	**C-D**
Low Normal: 2, 5, 10, 14-17, 21, 23, 28, 30	**A-B**	**B-C**	**C-D**	**D-E**
Below Normal: 1, 9, 11, 13, 22, 29	**B-C**	**C-D**	**D-E**	**E**
Disturbed: 12	**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

1. 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 fair-to-poor (C-D) on April 1st, good-to-fair (B-C) on the 2nd, good (B) on the 3rd, excellent (A) on the 4th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

The DX Propagation Charts in this month's column contain DX propagation predictions for each amateur band between *6* and *160* meters for the period April 15 through June 15, 1983. Beginning this month and continuing through the summer and fall months, the times shown in the charts will be given in local *daylight* time (EDT, CDT, MDT, and PDT). For detailed predictions of short-skip openings between distances of 50 and 2300 miles, see the Short-Skip Propagation Charts which appeared in last month's column.

Solar Cycle Activity

Monthly mean solar activity increased significantly during December 1982. The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a mean level of 126.4 for the month. This is the highest mean level observed since March 1982. It results in a smoothed sunspot number of 117.2 centered on June 1982. The present cycle continues to decline at a slow, but steady pace. A smoothed sunspot level of approximately 90 is expected during April 1983.

V.H.F. Ionospheric Conditions

With steadily decreasing solar activity and seasonal changes in ionospheric propagation, very little *F*-layer *6* meter propagation is expected during April, but some may be possible between the USA and the southern hemisphere. The best times for such *6* meter openings are shown in the charts with an asterisk.

Sporadic-*E* produced short-skip openings begin a seasonal increase during April. Some openings should be possible on *6* meters during the month over distances ranging between approximately 750 and 1300 miles. When the skip is beyond 1100 miles on *6* meters, check for sporadic-*E* openings on *2* meters. An occasional *2* meter ionospheric opening may be possible during April. While sporadic-*E* openings may occur at any time of the day or night, there is a tendency for them to peak between 8 a.m. and noon and again between 6 and 9 p.m., local daylight time.

Widespread auroral activity often occurs during April. This can produce intensely ionized regions which are capable of reflecting *6* and *2* meter signals over distances up to approximately 1300 miles. Check for likely auroral activity on the v.h.f. bands on those days shown as Below Normal or Disturbed in the Last Minute Forecast, which appears at the beginning of this column.

There is a good chance for some meteor-scatter openings on the v.h.f. bands during April 19–22. This is the time that the *Lyrids* meteor shower is expected to appear. A maximum of 15 large-sized meteors may enter the earth's atmosphere hourly during this shower.

Some trans-equatorial (TE) ionospheric openings between the southern areas of the USA and South America may be possible during April. The best time to check for TE openings on *6* meters is between 8 and 11 p.m. local time. A rare opening on *2* meters may also be possible this month. At best, expect very weak signals with strong flutter fading.

Shortwave Propagation Handbook

The revised 2nd edition of the popular *Shortwave Propagation Handbook*, by George Jacobs, W3ASK, and Theodore J. Cohen, N4XX, contains up-to-date sunspot and solar data and additional prediction charts. It is written in simple, understandable language and is intended to be *read and used* by radio amateurs, shortwave listeners, and all others who make use of the shortwave radio spectrum. See *CQ*'s Book Shop on p. 92.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate 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
(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. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 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 10dB loss, it will lower by one level.

6. 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.

April 15 - June 15, 1983
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	10-13 (1) 13-17 (2) 17-18 (1)	07-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-21 (1)	09-13 (1) 13-15 (2) 15-17 (3) 17-21 (4) 21-01 (3) 01-04 (2) 04-07 (3) 07-09 (2)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-02 (1)*
Northern Europe & European USSR	10-15 (1) 15-17 (2) 17-18 (1)	08-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 22-00 (1)	06-09 (2) 09-13 (1) 13-16 (2) 16-20 (3) 20-22 (4) 22-02 (3) 02-03 (2) 03-06 (1)	19-20 (1) 20-23 (2) 23-01 (1) 20-23 (1)*
Eastern Mediter-ranean & Middle East	14-17 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	12-16 (1) 16-18 (2) 18-21 (3) 21-00 (4) 00-02 (3) 02-03 (2) 03-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 21-23 (1)*
Western Africa	10-11 (1) 11-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-21 (1) 10-13 (1)**	07-08 (2) 08-10 (3) 10-13 (2) 13-16 (3) 16-20 (4) 20-23 (3) 23-04 (2) 04-07 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-02 (4) 02-05 (3) 05-07 (2)	20-22 (1) 22-02 (2) 02-03 (1) 22-02 (1)*
Eastern & Central Africa	16-17 (1) 17-19 (2) 19-21 (1)	08-12 (1) 12-14 (2) 14-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	14-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-01 (3) 01-04 (2) 04-06 (1) 06-08 (2) 08-09 (1)	21-01 (1) 22-00 (1)*

Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1) 01-03 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 00-01 (1) 01-02 (2) 02-04 (3) 04-05 (2) 05-06 (1) 06-08 (2) 08-09 (1)	21-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Central & South Asia	19-21 (1)	09-12 (1) 15-18 (1) 18-20 (2) 20-22 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1) 05-06 (1) 06-08 (2) 08-09 (1)	05-07 (1) 19-21 (1)
Southeast Asia	18-21 (1)	08-11 (1) 18-20 (1) 20-22 (2) 22-23 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	05-07 (1)
Far East	18-20 (1)	08-10 (1) 15-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-08 (1)
South Pacific & New Zealand	15-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1) 15-18 (1)**	09-11 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-00 (2) 00-01 (1)	19-21 (1) 21-22 (2) 22-23 (3) 23-04 (4) 04-08 (3) 08-09 (2) 09-10 (1)	00-02 (1) 02-05 (2) 05-06 (3) 06-07 (2) 07-08 (1) 02-07 (1)*
Australasia	17-19 (1) 19-21 (2) 21-22 (1)	09-10 (1) 10-11 (2) 11-12 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	23-00 (1) 00-03 (2) 03-05 (3) 05-08 (4) 08-09 (3) 09-10 (2) 10-11 (1) 17-19 (1)	03-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	11-12 (1) 12-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1) 11-14 (1)**	07-08 (1) 08-09 (2) 09-14 (3) 14-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	02-06 (2) 06-07 (3) 07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-23 (4) 23-02 (3)	19-20 (1) 20-21 (2) 21-05 (3) 05-07 (2) 07-08 (1) 21-02 (1)* 02-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-10 (1) 10-14 (2) 14-17 (3) 17-19 (4) 19-20 (2) 20-21 (1) 11-15 (1)**	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	05-06 (1) 08-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-00 (4) 00-02 (3) 02-05 (2)	20-21 (1) 21-04 (2) 04-06 (1) 23-03 (1)* 03-04 (2)* 04-06 (1)*
McMurdo Sound, Antarctica	17-19 (1)	16-18 (1) 18-20 (2) 20-21 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-07 (2) 07-08 (1)	20-01 (1) 01-05 (2) 05-06 (1)

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	11-15 (1) 15-16 (2) 16-17 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	05-09 (2) 09-14 (1) 14-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-05 (1)	19-21 (1) 21-23 (2) 23-01 (1) 00-01 (1)*
Northern & Central Europe & European USSR	14-16 (1)	08-10 (1) 10-13 (2) 13-16 (3) 16-17 (2) 17-18 (1) 21-23 (1)	01-07 (1) 07-09 (2) 09-14 (1) 14-19 (2) 19-23 (3) 23-01 (2)	19-21 (1) 21-23 (2) 23-01 (1)
Eastern Mediter-ranean & Middle East	15-18 (1)	10-13 (1) 13-17 (2) 17-18 (1) 20-22 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (4) 22-00 (3) 00-01 (2) 01-03 (1)	20-00 (1)
Western Africa	10-12 (1) 12-14 (2) 14-17 (3) 17-18 (2) 18-19 (1) 10-12 (1)**	09-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-00 (3) 00-01 (2) 01-03 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Eastern & Central Africa	14-16 (1) 16-18 (2) 18-19 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-03 (1) 07-09 (1)	20-23 (1)
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	09-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-16 (1) 00-02 (1)	14-16 (1) 16-19 (2) 19-22 (1) 22-00 (2) 00-02 (3) 02-04 (2) 04-05 (1) 05-07 (2) 07-08 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Central & South Asia	18-21 (1)	16-18 (1) 18-21 (2) 21-22 (1) 09-11 (1)	05-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-00 (1)	06-08 (1) 19-21 (1)
Southeast Asia	18-20 (1)	09-11 (1) 11-13 (2) 13-15 (1) 17-19 (1) 19-21 (2) 21-23 (1)	23-03 (1) 03-07 (2) 07-09 (3) 09-11 (2) 11-12 (1)	05-07 (1)
Far East	17-18 (1) 18-20 (2) 20-21 (1)	08-11 (1) 15-16 (1) 16-17 (2) 17-21 (3) 21-23 (2) 23-00 (1)	23-02 (1) 02-04 (2) 04-06 (3) 06-08 (4) 08-09 (3) 09-11 (2) 11-13 (1)	03-05 (1) 05-06 (2) 06-07 (1) 05-06 (1)*
South Pacific & New Zealand	11-14 (1) 14-16 (2) 16-20 (4) 20-21 (2) 21-22 (1) 14-18 (1)**	08-09 (1) 09-11 (2) 11-14 (1) 14-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	16-19 (1) 19-20 (2) 20-21 (3) 21-03 (4) 03-07 (3) 07-09 (4) 09-10 (3) 10-11 (2) 11-12 (1)	00-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-04 (1)* 04-05 (2)* 05-06 (1)*
Australasia	15-17 (1) 17-19 (2) 19-21 (3) 21-22 (1) 15-18 (1)**	08-09 (1) 09-10 (2) 10-11 (1) 16-18 (1) 18-20 (2) 20-22 (4) 22-23 (2) 23-00 (1)	05-07 (3) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-05 (4)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
Caribbean, Central America & Northern Countries of South America	09-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 11-14 (1)**	07-09 (1) 09-11 (2) 11-14 (3) 14-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	03-06 (2) 06-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-23 (4) 23-03 (3)	19-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-10 (1) 10-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1) 11-15 (1)**	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	05-06 (1) 06-09 (2) 10-15 (1) 15-17 (2) 17-19 (3) 19-00 (4) 00-02 (3) 02-05 (2)	21-22 (1) 22-00 (2) 00-02 (1) 02-05 (2) 05-07 (1) 01-05 (1)*
McMurdo Sound, Antarctica	18-20 (1)	15-17 (1) 17-19 (2) 19-21 (3) 21-23 (2) 23-00 (1)	16-18 (1) 18-19 (2) 19-02 (3) 02-04 (2) 04-06 (1)	20-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-06 (1)

Time Zone: PDT
(24-Hour Time)
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-12 (1) 16-17 (1)	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	01-07 (1) 07-10 (2) 10-13 (1) 13-17 (2) 17-19 (3) 19-21 (2) 21-23 (3) 23-01 (2)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	14-16 (1)	11-14 (1) 14-16 (2) 16-17 (1) 22-00 (1)	02-07 (1) 07-09 (2) 09-13 (1) 13-16 (2) 16-18 (3) 18-22 (2) 22-00 (3) 00-02 (2)	19-23 (1) 21-22 (1)*
Eastern Mediter-ranean & Middle East	NIL	09-11 (1) 11-15 (2) 15-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-20 (2) 20-22 (3) 22-23 (2) 23-03 (1)	20-23 (1)
Western Africa	10-14 (1) 14-17 (2) 17-19 (1)	08-12 (1) 12-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	02-06 (1) 06-08 (2) 08-15 (1) 15-17 (2) 17-18 (3) 18-22 (4) 22-00 (3) 00-02 (2)	20-23 (1)
Eastern & Central Africa	15-18 (1)	10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 21-23 (2) 23-00 (1)	11-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (3) 23-00 (2) 00-02 (1)	19-22 (1)
Southern Africa	09-11 (1)	07-09 (1) 09-11 (2) 11-12 (1) 12-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-18 (2) 18-22 (1) 22-23 (2) 23-01 (3) 01-02 (2) 02-03 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	17-18 (1) 18-19 (2) 19-20 (1)	08-09 (1) 09-11 (2) 11-16 (1) 16-17 (2) 17-19 (3) 19-21 (2) 21-23 (1)	05-06 (1) 06-07 (2) 07-09 (3) 09-10 (2) 10-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	05-08 (1)
Southeast Asia	13-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	08-09 (1) 09-12 (3) 12-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	04-07 (2) 07-10 (3) 10-11 (2) 11-13 (1) 22-00 (1) 00-02 (2) 02-04 (3)	04-07 (1) 05-06 (1)*
Far East	13-15 (1) 15-17 (2) 17-19 (3) 19-20 (1) 15-18 (1)**	08-10 (1) 10-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	04-07 (2) 07-08 (3) 08-09 (4) 09-10 (3) 10-11 (2) 11-12 (1) 12-14 (2) 14-21 (1) 21-23 (2) 23-00 (3) 00-03 (4) 03-04 (3)	01-03 (1) 03-07 (2) 07-08 (1) 03-06 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-22 (2) 22-23 (1) 12-18 (1)**	09-10 (1) 10-12 (3) 12-16 (2) 16-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-03 (1)	06-08 (2) 08-11 (3) 11-12 (2) 12-17 (1) 17-19 (2) 19-21 (3) 21-02 (4) 02-06 (3)	22-00 (1) 00-02 (2) 02-07 (3) 07-08 (2) 08-09 (1) 01-02 (1)* 02-06 (2)* 06-07 (1)*
Australasia	13-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (2) 20-21 (1) 14-18 (1)**	13-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-00 (3) 00-02 (2) 02-03 (1)	05-07 (2) 07-09 (3) 09-10 (2) 10-12 (1) 18-20 (1) 20-21 (2) 21-23 (3) 23-03 (4) 03-05 (3)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Caribbean, Central America & Northern Countries of South America	10-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-20 (2) 20-21 (1) 11-14 (1)**	07-08 (1) 08-09 (2) 09-13 (3) 13-19 (4) 19-20 (3) 20-22 (2) 22-23 (1)	00-03 (3) 03-05 (2) 05-06 (3) 06-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-00 (4)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1) 21-00 (1)* 00-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 11-15 (1)**	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	00-02 (3) 02-03 (2) 03-05 (1) 05-09 (2) 09-15 (1) 15-17 (2) 17-18 (3) 18-00 (4)	19-22 (1) 22-03 (2) 03-04 (1) 20-03 (1)*
McMurdo Sound, Antarctica	15-19 (1)	15-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-01 (4) 01-03 (3) 03-05 (2) 05-07 (1)	21-22 (1) 22-00 (2) 00-05 (1) 05-07 (2) 07-08 (1)

*Indicates best times 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 Propagation Index of (2), or higher.

**Indicates best times to listen for F-2 layer openings on 6 Meters.

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Electric Shock

The information in this column was gleaned from courses I have taken, plus printed publications produced by the Navy, American Red Cross, and U.S. Public Health Service. This is not an article by an expert on the subject of electric shock; it is simply a case of one amateur trying to share with other amateurs a very limited amount of knowledge about a vitally important subject. If reading this column causes you to be more careful when working on electrical and electronic devices, I have attained my objective.

Most of the people who are killed by electric shock are knowledgeable in electric theory; they know the dangers related to working on energized circuits, but their familiarity causes carelessness. Amateur radio operators fall into this category, and too many of us are injured or killed every year. My personal close calls have taught me to take extra precautions when I am repairing equipment with experienced amateurs around, because they too often take unnecessary and foolish chances. I will not let anyone else come near any gear while it is energized and I am working on it; they have come close to killing me once too often!

Anita L. McCormick, KA8KGI, operates from Huntington, West Virginia. She was the only West Virginia Novice to submit an entry in the 1982 ARRL Novice Roundup Contest. She is a freelance artist, so she designed her own QSL (confirmation) card (right). Anita has been active on the air for about three years. She has contacted amateurs in 43 states and 15 countries using a Heathkit HW-8 (3 watt) transceiver and a trap dipole antenna. Anita holds the Rag Chewers Club certificate. A few of her more memorable contacts have been the WWII submarine USS Cod (K8KRG special event), the Smithsonian Institute (NN3SI), and the Pentagon Amateur Radio Club (K4AF). Anita is also a shortwave listener.

Body Resistance and Current Flow

As most amateurs know, it is the electric current flowing through a person which causes injury or death. Naturally, it takes a voltage to create the current through the portion of a person across the electricity source. The resultant current flow depends upon the voltage across the person and the resistance of the portion of the person across this potential. The resistance path through the person depends on the points of contact and the skin condition. If the accidental contacts are made between two close points on the body (such as between two fingers on the same hand), the resistance path will be much lower than if the two contact points are further apart (such as between a hand and a foot). If the skin is soft or moist at the contact points the resistance is lower than it would be if the skin were callused or dry. As we all know, the higher the resistance between the contact points, the lower the current, and vice versa.

Skin condition is a major factor in determining the resistance path through the victim. Basically, skin condition varies from about 1000 ohms (for moist, uncallused skin) to around 50,000 ohms (for dry, callused skin) at each contact point. It is interesting to note that people are (unfortunately) pretty good conductors internally. We average about 100 ohms from ear to ear and around 500 ohms from hand to foot, ignoring skin contact resistance. Since a current of just 10 milliamperes is enough to cause pain and a current of 100 milliamperes can cause death, it is obvious that one has to be stupid to take chances with electrical shocks. If you want to determine your resistance between any two points (such as from one hand to the other), wet the two contact points in a saline (salt water) solution to simulate human sweat and measure the resultant resistance with the ohmmeter prods held firmly against these contact points. I have found that the hand-to-hand resistance values of students varies a lot, and that women generally have lower electrical resistance than men. I've also noticed that older people have higher resistance, probably due to more calluses.

Physioligical Effects of Electric Currents Flowing Through the Body

Currents of 2 to 8 milliamperes (ma) can produce a barely noticeable to a mild sensation of electrical shock. Currents in excess of 10 ma can produce painful shock. Breathing becomes difficult at currents as low as 20 ma, and it can cease completely at 75 ma. The heart goes into ventricular fibrillation (uncontrolled contractions of the heart's ventricles) at current levels around 100 ma. If the current exceeds 200 ma, the muscular contractions of the heart are so severe that the heart is clamped (stopped) during the shock. This clamping action stops the heart from going into ventricular fibrillation, increasing the victim's chances to be saved. Although currents above 200 ma cause severe burns at the body contact points (plus unconsciousness), they do not usually prove fatal if the victim is immediately revived with artificial respiration.

Extreme Danger of Low-Voltage Shocks

As detailed in the previous paragraph, victims of high-current shocks can be resuscitated. Until one studies the effects of electric shocks, it is reasonable to assume that the victim is much more likely to be killed by a higher voltage/current than by a lower one; however, this is not true. It is true that the severity of the shock increases as the current increases and that current is proportional to the value of the voltage accidentally connected through part of the victim's body. The clamping action of the heart serves to protect the victim above 200 ma, but this natural safeguard does not function in the range between 100 and 200 ma, which means that a victim is much more likely to be killed by lower voltage shocks involving lower current flows in this 100

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to 200 ma range. Low-voltage/current shocks are not only *as* dangerous as high-voltage/current shocks, but they can be *more* dangerous. People have been electrocuted by contact with voltages as low as 24 volts, and common 115 volt house power has killed more people than some wars. Almost any electrical device can produce a shock which can kill a person if certain conditions exist.

Aiding the Victim

Since you have no simple way of knowing the amount of current that flowed through a victim of electrical shock, you have no way of knowing the victim's exact condition. If the victim is still "hung up" on the source of voltage, immediately free him/her without endangering yourself. If it is easy to turn off power switches or to pull a plug out of the power receptacle, do it! Do anything that will immediately stop the electric shock. If you can't turn off power quickly or safely, use any available non-conducting item (such as a blanket, pillow, throw rug, or drape) to pull the victim free. The important thing is to free the victim from the source of electric shock as quickly as possible, but **without endangering yourself.** The victim's resistance path decreases as the current flow continues, making it possible for lethal currents (100–200 ma) to develop in cases in which the original current value was not in the lethal range. Speed is essential, but you must not endanger yourself while freeing the victim; otherwise, there may be two victims with no one left to provide aid!

If the victim is unconscious and has stopped breathing, begin artificial respiration as soon as he/she has been freed from the source of electric shock. It sometimes only takes a few minutes to revive a victim, but it has been known to take as much as eight hours of artificial respiration (resuscitation) to revive victims of electrical shock. The victim may have no pulse and may develop a condition similar to rigor mortis, but these conditions can be just manisfestations of shock, and the victim still can be revived by continued resuscitation. The best advice is to keep up the artificial respiration until a medical authority tells you the victim is dead. Victims of high-voltage/current shocks respond to artificial respiration faster than those who have been subjected to low-voltage/current shocks. Have patience and do not give up; treat the victim as you would want to be helped if you were the victim.

I advise you to take first aid training to learn the proper modern resuscitation techniques. Your local Red Cross Chapter probably offers these courses, including the more desirable **C**ardio**P**ulmonary **R**esuscitation (**CPR**) techniques. Have someone in your family attend the course with you to learn resuscitation techniques. The older resuscitation techniques are not even close to being as ef-

fective as the modern ones. You must be particularly careful not to harm a child you are trying to revive.

Precautions

When it comes to electric shock, an ounce of prevention is worth much more than a pound of cure. Anyone who is not careful around electric circuits may not get the opportunity to make the same mistake a second time! Worse yet, your lack of caution may injure or kill someone else. Work cautiously when installing and repairing any electrical or electronic apparatus. Do not work alone, and make a conscious effort to fight complacency based on knowledge, because it is often the experienced amateur who exposes herself/himself to unnecessary risks.

Take the extra time to turn off power or to pull the power plug before making a risky measurement. Don't work on live equipment when you are tired. Learn to keep one hand in a pocket while taking measurements; do not rest it against anything. Do not work on powered equipment while wearing wet clothes or when you are sweaty; it is particularly dangerous to be wearing wet shoes and socks. Take your time and think out each move before doing anything on live gear. Keep the area (bench, desk, table, floor, etc.) clear and move slowly around powered gear. Do not lunge after falling tools or test equipment. If you have to turn gear over to work on it, take the time to brace it so that it can't tip over. I personally recall injuries which happened when amateurs tried to prevent a piece of equipment from tipping over. It is perfectly normal to want to prevent equipment damage, but you must condition yourself to accept equipment damage rather than to risk your life. Naturally, you should follow all the common-sense safety precautions such as grounding equipment (including power tools), discharging capacitors, and eliminating any possibility that electrical power could be applied inadvertently.

Station Considerations

Remember that children are curious. Tape all exposed terminals to make your station safe for prying fingers. Many a wife and child has been hurt by exposed external wiring used to power antenna changeover relays and other station accessories. Even a simple error such as connecting the wrong lead to the base of your handkey or bug can create a hazard with some gear. Make sure the base is attached to the barrel (ground) of the plug.

The location and installation of antennas and associated transmission lines is of primary importance in determining just how safe (or dangerous) your station is to your family and yourself. Too many amateurs suffer damage to their homes, plus injury to their families and themselves, due to antennas, towers, and transmission lines falling down and coming in contact with electric power lines. Be sure to erect a completely safe antenna installation for your station. Borrow a copy of the *National Electrical Code* book from your local public library and read it. You may be surprised to learn that it contains information which applies specifically to amateur radio stations. Remember to establish a really effective electrical ground system for your station and tie each piece of equipment to ground. Do not be naive enough to believe that your station is adequately grounded just because it is connected to your water pipe, electric power ground, gas pipes, or a ground stake; you may not live to learn from your mistake!

S.W.L. Club List

The Association of North American Radio Clubs (ANARC) serves as a clearinghouse for information about Canadian and American s.w.l. clubs that are members of ANARC, which includes most of the major ones. If you want a copy of the recently updated ANARC club list, you can request it from the ANARC Publisher, 1500 Bunbury Drive, Whittier, California 90601. Americans requesting this information should enclosed 25¢, plus the usual self-addressed and stamped envelope (#10 s.a.s.e.); Canadians should enclose 50¢ in mint stamps, and all others should include three International Reply Coupons (IRC's) with their requests. This ANARC list shows areas of interest, annual dues, and sample bulletin costs for listeners' clubs.

Terry Colgan, WD5GWC, is the Executive Secretary of ANARC. He advises that a single copy of the ANARC newsletter is available to anyone who requests it. As usual, it is a good practice to enclose an s.a.s.e. or IRC's when requesting such material.

The May through October 1982 Novice columns contain an in-depth introduction to shortwave listening. Letters continue to be received from people who have read part (or all) of the s.w.l. article. If you have an interest in supplementing your amateur radio operating activity with some shortwave listening, I urge you to read the s.w.l. article printed in the indicated *CQ* issues.

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

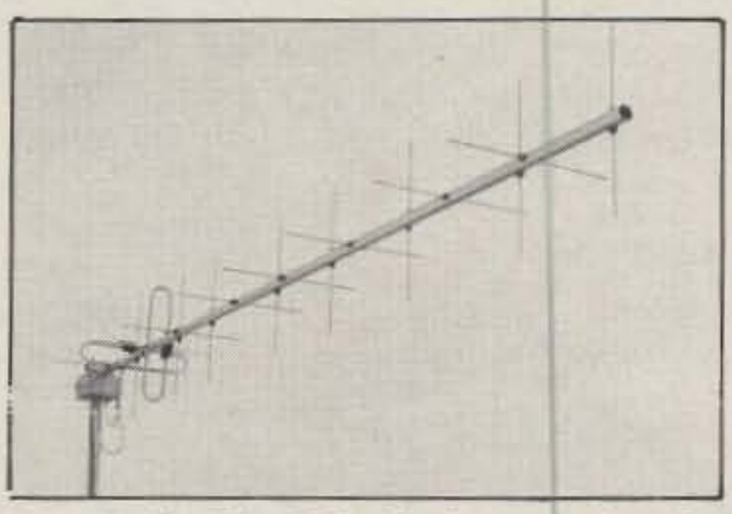
A LOOK AT THE WORLD AROUND US

OSCAR Satellites—Conclusion

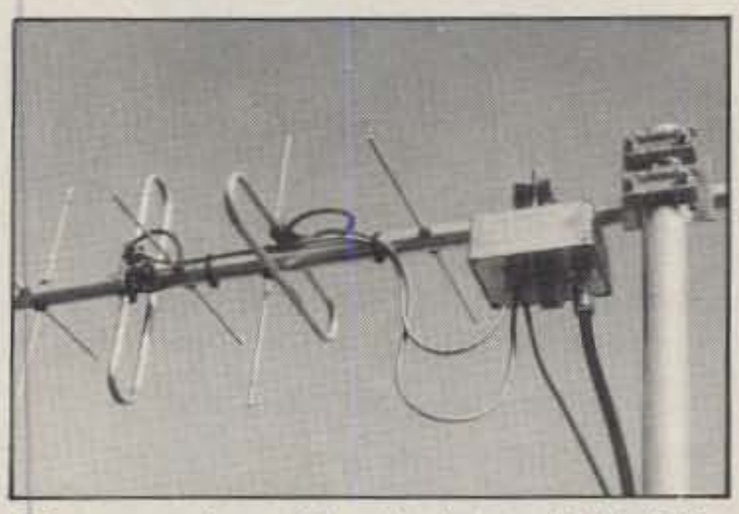
Last month's column carried a "working introduction" to OSCAR satellite communications. We hope you found that introductory information useful in achieving a few QSO's via OSCAR 8 or via one of the RS satellites. Maybe you were fortunate enough to contact one of the RS robot operators. Hopefully, you also tuned in the AMSAT Net and now have all the late-breaking news on this month's projected launch of OSCAR Phase IIIb (April 21, 1983). The international AMSAT Net, you'll recall, is conducted on 14,282 kHz at 1900 GMT Sundays. As launch time for the new OSCAR approaches, the Net probably will finalize plans for direct on-the-air coverage and coordination of the event. We encourage you to tune in the excitement, but emphasize that you *please listen* and *refrain from transmitting.* Activity probably will be hectic, but the gang does a great job of keeping everyone informed. You surely will not want to miss following the action of this historic event.

If you're new to the amateur satellite game, your operations thus far have probably been less than optimum. Antennas may be conventional Yagi's, orbital calculations may be slightly inaccurate, etc., giving noticeable room for improvement and better returns. (The Project OSCAR calendar mentioned last month will set you split-second accurate on specific passes, so that's one hurdle overcome.)

The signal emanating from a conventional Yagi doesn't "roll" with a satellite slowly tumbling in space; consequently, slow and deep fades will be noticed as signal polarities change. A circularly polarized antenna, such as the popular "twist" or "crossed Yagi's" (and their associated phasing harness), reduces such fades by causing the transmitted signal to spiral similar to a rifle bullet. Through hardwiring or coax switching of the phasing harness, either right-hand circular (clockwise) or left-hand circular (counterclockwise) signal rotation can be achieved. Coax switching is preferable, as it allows immediate selection of "RHCP" or "LHCP" to match a particular satellite and operation mode. OSCAR 8, for example, uses "LHCP" on 2 meters for uplinking, while "RHCP" is expected to be used for Phase IIIb's 2 meter downlink. Selectable polarity is thus vital for amateurs using both modes of satellite operations (amateurs interested in a single mode of satellite operation can, however, mount prephased harnesses outdoors on the "twist"). Essentially, a phasing harness consists of two transmission lines (one ¼ wavelength longer than the other) which cause horizontal and vertical antenna elements to radiate approximately 90 degrees out of phase. Installation is simple, but be sure to carefully cut cable ends, use high-quality connectors (type N or BNC), and weatherproof everything securely.



The KLM 420–450 18-element circular polarized antenna for 70 cm should prove an outstanding performer for OSCAR 8 and Phase IIIb operations.



Close-up view of feedpoint on KLM 420–450, showing optional CS2 circular switcher. Only one feedline is required: coax relay is inside shielded box.

Here's ICOM's recently introduced IC-490A, an all-mode, 10 watt transceiver covering 430 to 440 MHz. The unit can be used for receiving OSCAR 8 mode "J," and when combined with a 50 or 100 watt amplifier and 10 dB gain antenna, will provide a good uplink signal for OSCAR Phase III mode B. Another Phase III capability, mode "L," can also be received on 435 MHz.

Stepping Up OSCAR Activities

Although mode "A" satellite activities have served as an introduction to space communications for several years, their operations leave substantial room for improvement. In addition to terrestrial interference within mode "A" frequency ranges, the ionosphere often plays havoc with 10 meter downlink signals. The obvious solution here involves "moving up" in both satellite operations and in operating frequency. The most logical way of instigating that progression involves adding a 70 cm transceiver, antenna, and (in the case of Phase IIIb) a linear amplifier. When used in conjunction with an all-mode 2 meter transceiver as suggested last month, one can thus operate OSCAR 8 or Phase III and be fairly well situated for future SYNCART satellites. A mating 70 cm/435 MHz "twist" antenna will also be required, and if mode "J" operations are planned, a mode "J" cavity filter is heavily suggested. (These 2 meter, third harmonic filters are available from Henry Radio, Spectrum International, etc., or you can make your own from information presented in recent ARRL handbooks.) You're probably bubbling over with enthusiasm at this point, so let's take a closer look at the requirements for getting active on mode "J."

OSCAR 8 Mode J

Assuming you've acquired all-mode transceivers and twist antennas for 144 and 435 MHz, your move toward mode "J" (and future Phase III) is almost complete. As illustrated in fig. 1, the antennas are mounted at each end of a crossboom which is center-fitted with an Alliance U100 (or equivalent "through boom" mounting capability) rotor. A home-fabricated boom-to-mast plate is then used for securing that lashup to a vertical mast, which is rotated by a second rotor. In order to maintain balance and symmetry of the satellite array, we suggest mounting a counterweight "behind" the 435

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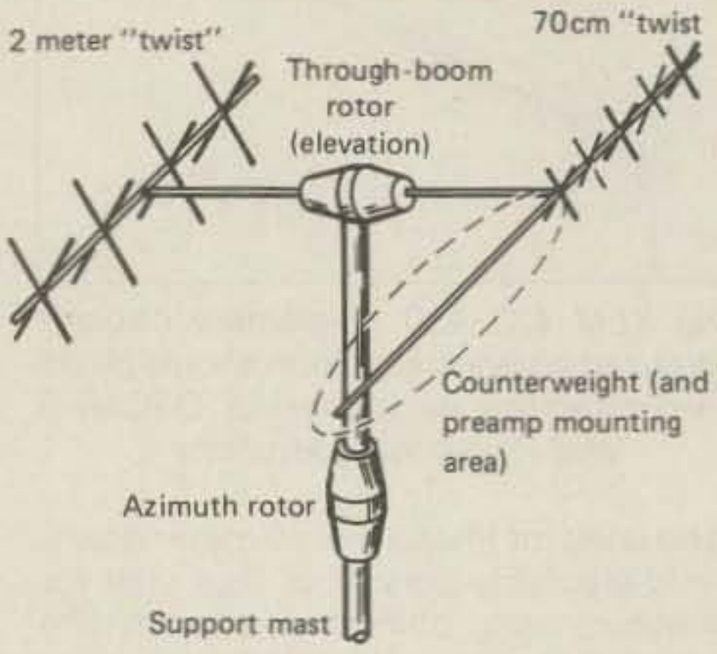

Fig. 1– OSCAR satellite antenna system for use on mode "J," "B," and "L." Dual rotors give both azimuth and elevation movements. A mode "J" filter and 435 MHz preamp can be mounted in the counterweight area and bypassed with coax switches during mode "B" transmissions. These items must be weatherproofed and mounted in a suitably insulated enclosure.

MHz antenna. This area is also ideal for locating the mode "J" filter, 435 MHz receiving preamp, and coax switches (for bypassing the preamp during transmit, and for switching circular polarizations between modes of operation).

Since only one of the two all-mode transceivers will be transmitting at a time, both units probably can be powered from the same 12 volt supply. If a question on that capability arises, simply add the "receive current" of one rig to the "transmit current" of the other rig and compare with the 12 volt supply's capability. Placing a couple of small ferrite beads over each unit's power cord "TVI filter style" should eliminate any extraneous coupling. One final word: Mode "J" is doing great these days, and QRM is nil. Join the fun!

Phase III: A New World Opens

Assuming everything has progressed according to plans and projections as of this column's writing (early days of 1983), the first Phase III OSCAR should be winging its way into orbit on April 21, 1983. This is not just another amateur satellite; indeed, this spacecraft represents a true revolution in and to amateur communications. What makes this satellite so different from previous "birds"? This spacecraft's highly eliptical orbit and broadband transponder will permit all properly equipped amateurs in the northern hemisphere to reliably and predictably communicate on a 10 to 12 hour basis each day. This has the impact of a new band . . . a band in which one can communicate with, for example, amateurs in Japan and England, plus friends in other states or adjacent cities, all in the same roundtable QSO! Since this satellite will seem to appear nearly stationary during the previously mentioned 10 hour periods, beam antenna positionings will be simplified to small movements each hour or so and "beacon transmitters" will relay information to almost half the world.

Getting this new super satellite (equivalent in sophistication to all previous OSCARs combined) stabilized in "final orbit" and checked out, and then getting initial activities settled down will probably take a few months. Each new OSCAR satellite has experienced similar entanglements. Ill-informed newcomers clamor to join the confusion . . . err . . . action, and QRM mounts. Following that brief period of adjustment, activity settles down to an enjoyable and useful stage. We thus suggest *only monitoring* activity on the new satellite with your 435 MHz transceiver and enjoying mode "J" on OSCAR 8 a few months more. Phase IIIb is predicted to live a very long and productive life. Let's welcome it accordingly. (See fig. 2.)

A Glimpse Ahead: Phase IV

While Phase III OSCAR activities are now getting underway, plans are also being made for the next generation of amateur satellites. As presently planned, these OSCARs will be SYNCART packages placed in geostationary orbit on three separately positioned space platforms. This means the satellites will appear stationary at fixed points, this eliminating any antenna tracking movements. Since each satellite will be capable of "seeing" almost one third of the world, amateur communications will be similar.

The major aspect of these unique

The perfect "final touch" for a top-of-the-line OSCAR Phase III setup: a 10 watt input/100 watt output linear amplifier. This D1010 model (available through KLM Electronics and dealers) operates from 13.8 v.d.c. at 20 amperes.

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CIRCLE 174 ON READER SERVICE CARD

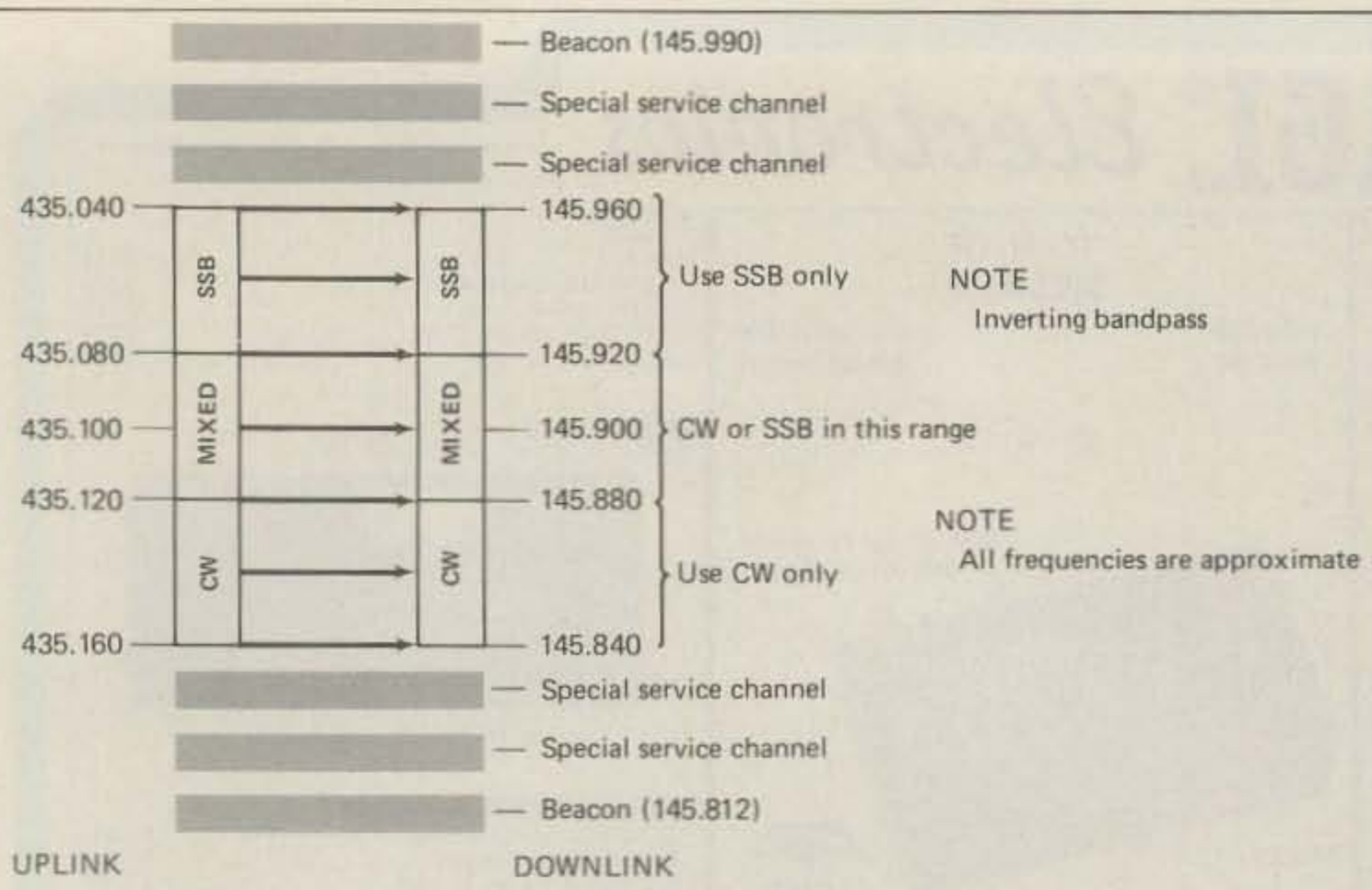

Fig. 2– Projected bandplan for OSCAR Phase IIIb due for launch this month. Frequencies shown are for mode "B," and are approximate until system calibration and launch. A similar arrangement of bandpass will be used for mode "L," except uplink will center on 1261 MHz and output will center on 435 MHz.

OSCARs, however, will be realized when authorization for earth-interlinking any two SYNCARTs is acquired. Amateurs with suitable equipment will then be able to reliably and predictably communicate worldwide 24 hours a day. An example of the proposed transponder bandpass is shown in fig. 3. Specific communications directions can be selected according to

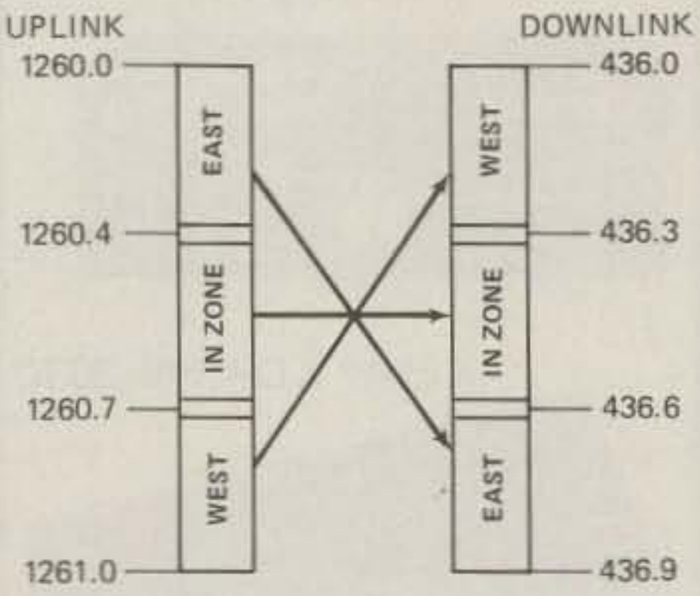

Fig. 3– Example of the proposed transponder bandpasses for the Phase IV SYNCART amateur satellites (tentatively dubbed mode "M"). Note use of inverting bandpass. Information courtesy AMSAT and Orbit *magazine. (Have you joined AMSAT yet?)*

frequencies used, while ground-based relays can employ identical "reverse-mode M" transponders. If, for example, an amateur in the U.S. desired to communicate with Australia or areas to his west, he would uplink in the 1260.7 to 1261.0 MHz range. If this amateur wanted to communicate with Africa or Europe, he would uplink in the 1260.1 to 1260.4 MHz range. Ground-based transponder stations would receive downlinks and transpose them to associated frequency uplinks for intro-satellite linking, as required.

Trying to put all this in a "nutshell description" is, to say the least, difficult. One thing is vividly apparent, however: A completely new era of amateur space-age communications is forming on our not-too-distant horizon. This will be amateur radio at its best, especially when supplemented with another item also in the planning stages at this very time: a moon-based linear transponder/repeater.

Your Turn

You'll never know what you're missing until you check it out for yourself. Seriously! An amateur who never operates anything but, for example, 20 s.s.b. can spend all his time there and enjoy it. If that same amateur begins operating 30 c.w., OSCAR, RTTY, and blends in some s.w.l.'ing, his same amount of operating time is multiplied and enjoyed tenfold. (This is the area where solid state, broadband rigs with dual v.f.o.'s and memories prove their worth, but that's a story for another month in this column.)

OSCAR Satellites—Addendum

A couple of days after mailing this column to the *CQ* offices, things began to boom in the commercial equipment area (didn't we tell you Phase III wasn't just another satellite?). A summary of happenings are thus included.

Yaesu announced their FT-726R triband OSCAR transceiver, a unit capable of operation on 29, 144, 220, and/or 440 MHz as configured by its owner. The basic unit is a 2 meter all-mode transceiver. Modules for full duplex and desired bands are simply plugged in to awaiting slots. The unit runs 10 watts output, has built-in a.c. supply, speech processor, i.f. shift, variable bandwidth, and frequency/mode memories. Price range is tentatively $800 to $1400, depending on the configuration. The size of the FT-726R is slightly smaller than that of the FT-102.

Ten-Tec announced that they are ready to produce a model 2510 satellite station when Phase III attains orbit. This unit consists of a 435 MHz, 10 watt s.s.b./c.w. transmitter and a 145 MHz to 28 MHz receiving converter. The unit looks similar to the Argosy h.f. rig. Price is around $500 dollars.

Kenwood is also gearing up for Phase III; their unit appears to be the TS480. At first glance, it reminds me of the TS700 series. The literature we studied was written in Japanese. Sorry about that.

Remember, gang, that operation via satellite wouldn't be possible without AMSAT. Your donations keep things working.

Coming Attractions

Next month we're off to another popular and "hot" area of amateur interest: RTTY operating and monitoring with the new and exciting units available at relatively low prices. This includes home computers with RTTY/ASCII/Morse interfaces, RTTY readers (copy news bulletins right in your hand!), and those self-contained reader/converters which allow you to transmit and receive RTTY with only a hand key—no keyboard or clattering printer. Don't miss it!

73, Dave, K4TWJ

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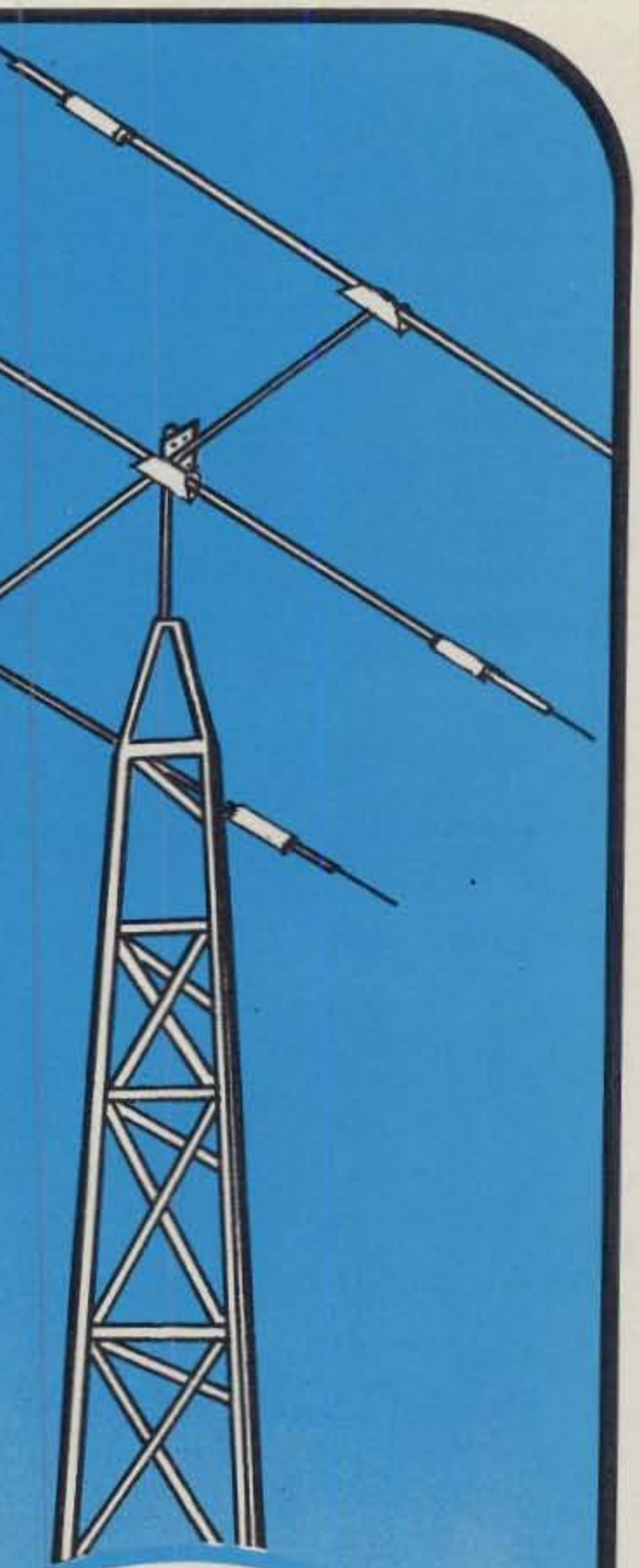

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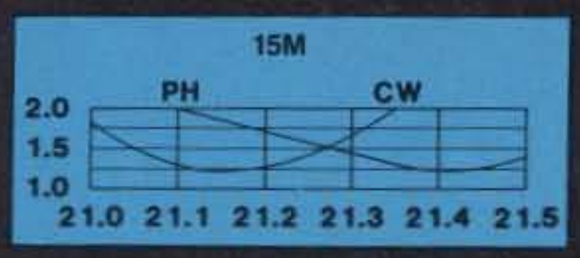

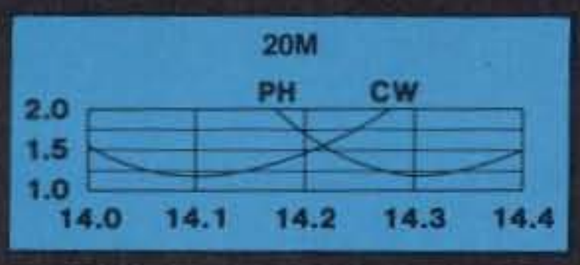

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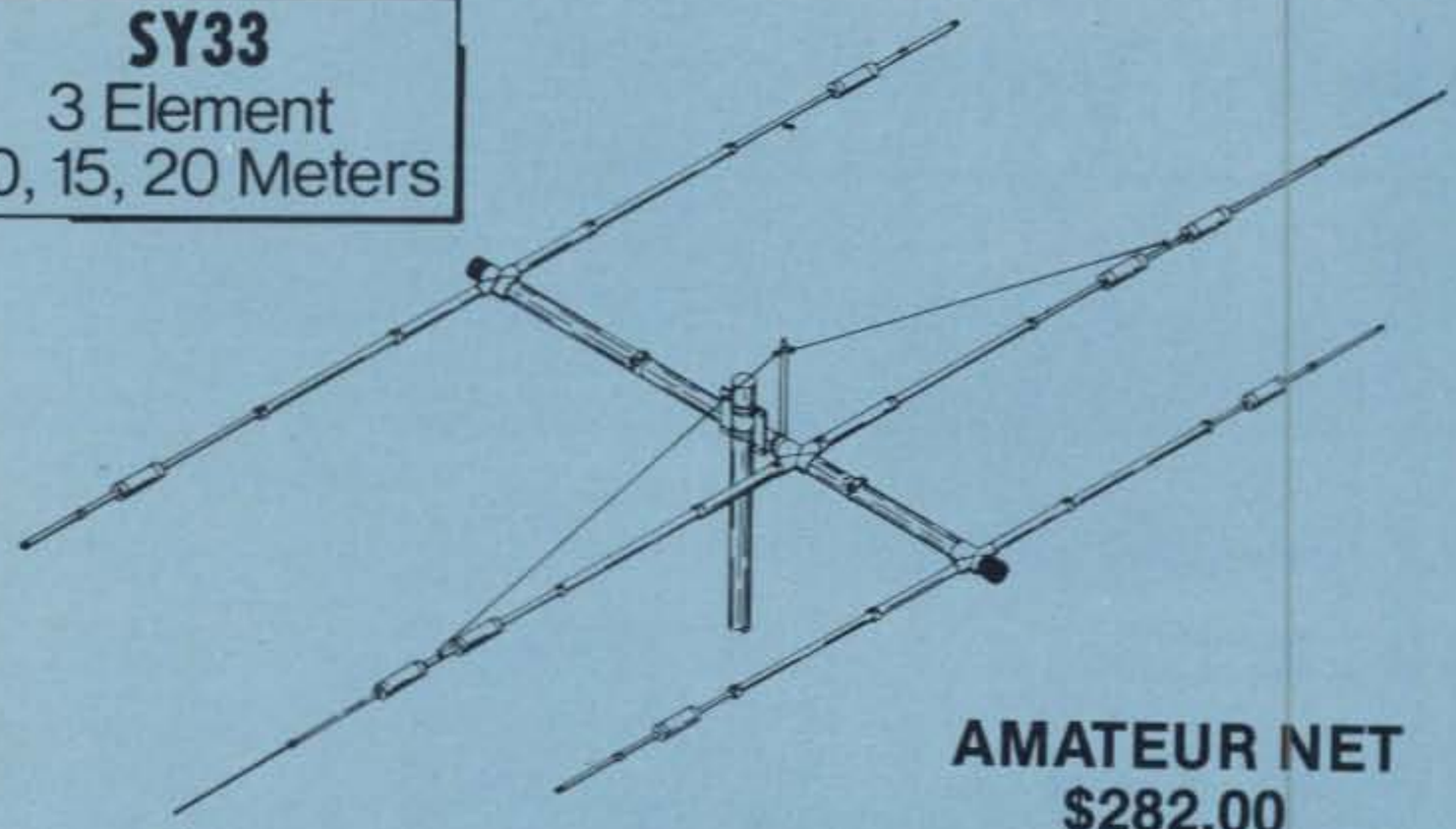

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No. elements:	3	Direct 52 ohm feed, no balun required	
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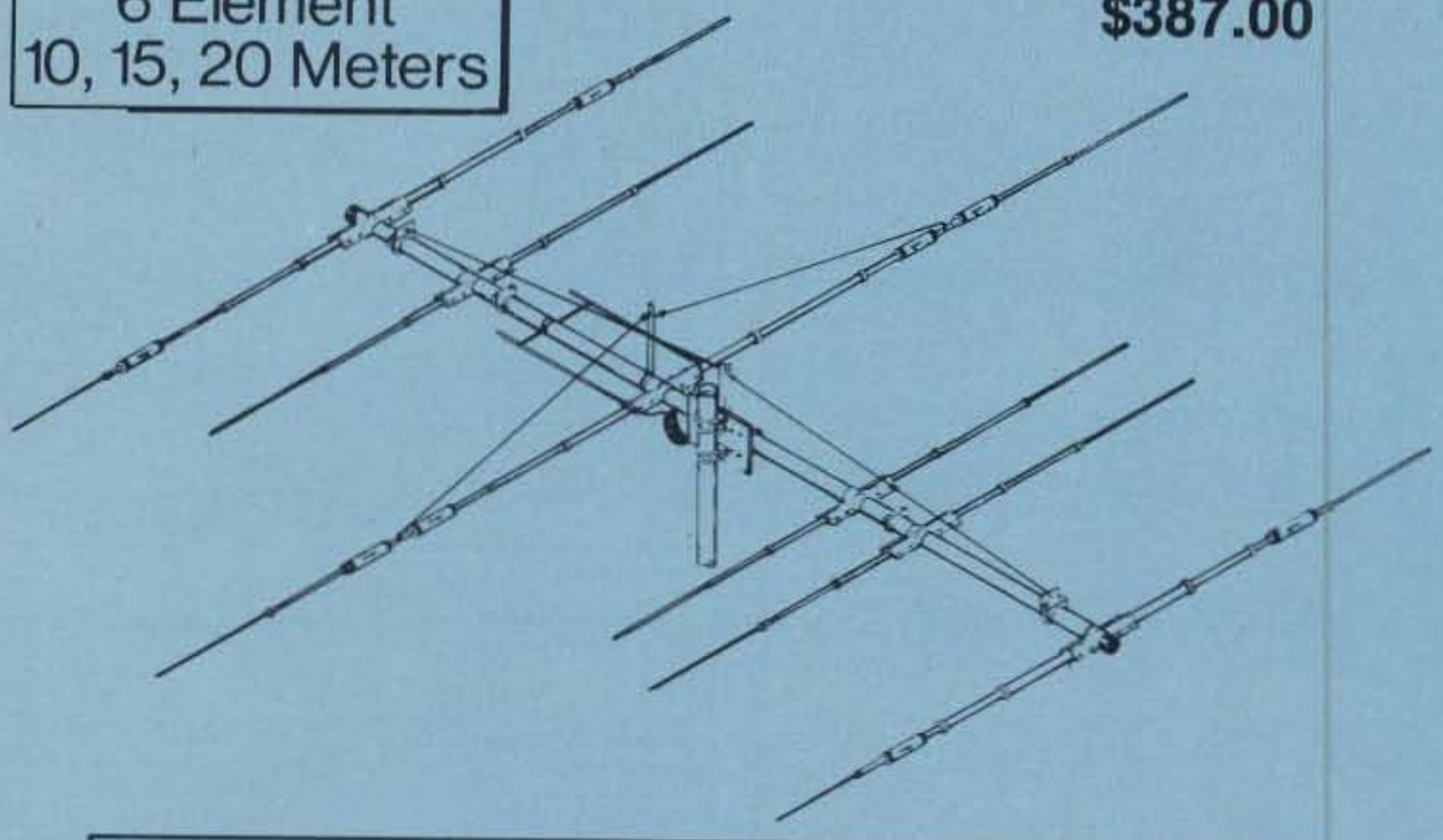
SY36
6 Element
10, 15, 20 Meters



AMATEUR NET
$387.00

Band MHz	14-21-28	Longest Element:	29'6½"
Maximum power input	legal limit	Turning radius	19'1"
Gain (dBd)	up to 9 dB	Maximum mast diameter	2" O.D.
VSWR at resonance	1.1:1	Surface area	8.6 sq. ft.
Impedance	50 ohms	Wind loading at 80 mph	215 lbs.
F/B ratio	up to 20 dB	Assembled weight (approx.)	53 lbs.
Boom (O.D. x length)	2" x 24' 2½"	Shipping weight (approx.)	62 lbs.
No. elements	6	Maximum wind survival	100 mph

M68
At last the Big 6 Meter Yagi is back—8 Elements on a 36'10" Boom . . . Proven Design and Light Weight (34 lbs.) make a Superior 6 Meter Beam. Handles a full 2 KW PEP. Gamma fed for Simplicity at 50-54 MHz.

$190.00

M68
6 Meter Monobander

SPECIFICATIONS:	
Frequency Coverage	50-54 MHz
Gain	13.5 dB
Front To Back Ratio	26 dB
Front To Side Ratio	30 dB
Matching Method	Gamma
No. Elements	8
Boom	2" To 1½" O.D. x 36'10"
Longest Element	9'8"
Turning Radius	19'0"
Wind Surface Area	2.4 Sq. Ft.
Wind Load At 80 MPH	48 Lbs.
Assembled Weight (Approx.)	34 Lbs.
Shipping Weight (Approx.)	39 Lbs.

VISIT OUR BOOTH AT DAYTON

CALL US FOR THE DEALER CLOSEST TO YOU

Maco Manufacturing Co.
Division of Majestic Communications, Inc.

4091 Viscount, Memphis, Tennessee 38118
(901) 794-9494

CIRCLE 36 ON READER SERVICE CARD

CIRCLE 16 ON READER SERVICE CARD

Advertiser's Index

MEET THE NEW YAESU FT-102

The FT-102 is factory equipped for operation on all present and proposed Amateur HF bands. An extra AUX band position is available for special applications. Equipped for SSB, CW, and AM (RX), the FT-102 may be activated on FM and AM (TX) via the optional AM/FM-102 Module.

The all-new receiver front end utilizes a low-distortion RF preamplifier that may be by-passed via a front panel switch when not needed. Maximum receiver performance is yours with this impressive lineup of standard features: IF Notch Filter, Audio Peak Filter, Variable IF Bandwidth Control, IF Shift, Variable Pulse Width Noise Blanker, Independent SSB and CW Audio Channels with Optimized Audio Bandwidth, and Front Panel Audio Tone Control. Wide/Narrow filter selection is independent of the Mode switch.

The celebrated transmitter section is powered by three 6146B final tubes, for more consistent power output and very low distortion. An RF Speech Processor, Mic Amp Audio Tone Control, VOX, and an IF Monitor round out the transmitter lineup.

Futuristic panel design and careful human engineering are the hallmarks of the FT-102. Convenient pop-out controls below the meters may be retracted when not in use, thus avoiding inadvertant mistuning. Abundant relay contacts, rear panel phono jacks for PTT, microphone/patch input, and other essential interface connections make the FT-102 extremely simple to incorporate into your station.

SPECIFICATIONS

TRANSMITTER

Power Input: (1.8-25 MHz) (28-29.9 MHz)

SSB, CW	240W DC	160W DC
AM	80W DC	80W DC
FM		160W DC

RECEIVER

Image Rejection:
Better than 70dB from 1.8-21.5 MHz
Better than 50dB from 24.5-29.9 MHz

IF rejection:
Better than 70 dB

Selectivity (−6 dB/ −60 dB):
SSB, CW, AM; 2.7/4.8 kHz (with no optional filters)
Width adjusts continuously from 2.7 kHz to 500 Hz (−6 dB)

Spurious Radiation: Better than −40 dB

SP-102

The SP-102 External Speaker/Audio Filter features a large, high-fidelity speaker with selectable low- and high-cut audio filters. The front panel A-B switch allows selection of two receiver inputs for maximum versatility. Also available is the SP-102P Speaker/Patch.

See your Authorized Yaesu Dealer today for a hands-on demonstration of the rig that everybody's talking about. It's the FT-102, The Transceiver of Champions!

FV-102DM

The FV-102DM Synthesized External VFO tunes in 10 Hz steps. Keyboard entry of frequencies, UP/DOWN scanning, and 12 memories make the FV-102DM a "must" for serious DX or contest work.

FC-102

The FC-102 Antenna Coupler is capable of handling 1.2KW of transmitter power, with an in-line wattmeter, separate SWR meter, and A-B input/output selection expanding your station's capability. The optional FAS-1-4R allows remote selection of up to four antennas via one coaxial cable connected to the FC-102.

Price And Specifications Subject To Change Without Notice or Obligation

1082

CIRCLE 48 ON READER SERVICE CARD

YAESU **ELECTRONICS CORP.** 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007
Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 • (513) 874-3100

IC-R70

NEW!

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

GENERAL COVERAGE RECEPTION AT ITS BEST

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

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

DESIGN

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

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

HAM'ING

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

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

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

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

SWL'ING

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

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

ICOM SYSTEM

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

PRICE

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

ICOM

The World System

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